



Opportunities in agricultural value chain digitisation

Learnings from Ghana





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1. Executive Summary

The deployment of digital solutions in the last mile of agricultural value chains allows agribusinesses to address a wide array of business challenges and increase farmer loyalty, operational efficiency and real-time visibility in the last mile. Digitisation of value chains benefits farmers too, by promoting financial inclusion, enabling transparent transactions and reducing travel times and transaction costs associated with the deployment of near-to-home cash-out points.

This report presents four case studies of last mile digitisation in Ghana:

- **The first two case studies are examples of mobile-enabled enterprise solutions for the digitisation of Business-To-Person (B2P) transfers to smallholder farmers for the payment of agricultural produce and quality premiums.** These digital solutions target commercial agribusinesses procuring crops from smallholder farmers and address the inefficiencies agribusinesses and farmers face when operating in cash.
- Solutions to these challenges can be delivered under a mobile money provider-led model for payments digitisation, whereby a mobile money provider uses core proprietary technology to offer a digital enterprise solution to agribusinesses.
- **The latter two case studies are examples of last mile digital tools with a more holistic suite of services** that extends beyond digital payments to areas as diverse as traceability and information dissemination, among others. For farmers, these tools can help to address production issues, such as the distribution of seeds, fertilisers and pesticides, and can offer a path to accessing formal financial services.
- Solutions are available under a tech provider-led model whereby third-party tech providers with different skillsets and capabilities use core MNO assets, such as connectivity and mobile money, to develop their own digital solutions marketed directly to agribusinesses.

2. Digitising the last mile in Ghana's agricultural value chains

Over the past few years, Ghana has seen several initiatives aimed at digitising processes in the so-called “last mile”¹ of agricultural value chains, such as procurement payments to farmers or profiling farmers and their farms. These initiatives have been supported by Ghana's mobile money providers and a number of tech providers that have shown an interest in the agriculture vertical. While mobile money and tech providers are pursuing digitisation opportunities based on their own organisational strategies, they have also recognised that partnerships can lead to mutually beneficial opportunities for growth, spurring collaborations and integration of technology.

Mobile money was first introduced in Ghana by MTN in July 2009,² with subsequent roll-outs by the country's other Mobile Network Operators (MNOs). Today, mobile money services are offered by MTN, Vodafone, Tigo and Airtel, attracting 22 million registered and 10.6 million active users.³ In addition to mobile money services offered by MNOs, e-zwich has emerged as a major alternative digital payments system run by the Ghana Interbank Payment and Settlements Systems Limited (GhIPSS), a wholly owned subsidiary of the Bank of Ghana.⁴ By the end of September 2017, 2.3 million e-zwich cards had been issued, generating 6.5 million transactions in just nine months.

An emerging opportunity currently being explored by mobile money providers is the digitisation of B2P payments made by formal agribusinesses to farmers upon procurement of crops. Formal agribusinesses are well placed to drive these digitisation initiatives given their need for streamlined processes, well-defined relationships with farmers and transparent and timely payments. Formal agribusinesses are also less likely to be concerned with the tax implications of digital payments compared to other commodity buyers, such as middlemen. In certain value chains, such as cocoa, digital payments are also being used to transfer premiums⁵ to farmers registered in certification schemes.

In Ghana, MTN and Tigo are leading efforts to digitise B2P payments in agricultural value chains. Shifting from cash to digital value chain payments not only allows MNOs to generate direct revenue from transaction and withdrawal fees, but also gives them the opportunity to increase repeat usage of mobile accounts and build the digital payments ecosystem.

While the focus of early initiatives to digitise agricultural value chains has been on B2P payments, the digital agriculture ecosystem in Ghana is evolving beyond payments. Tech providers, such as Farmerline⁶

1. In agricultural value chains, the last mile is the web of relationships and transactions between buyers of crops such as agribusinesses, cooperatives and middlemen, and the farmers who produce and sell their crops. Most of this activity takes place in the developing world, where about 1.3 billion people are employed in agriculture and are involved in the production of the majority (at least 70 per cent) of the world's food.

2. GSMA Mobile Money Deployment Tracker: <https://www.gsma.com/mobilefordevelopment/m4d-tracker/mobile-money-deployment-tracker>

3. The sum of active users refers to the number of accounts that had at least one transaction in the 90 days prior to reporting. Source: Bank of Ghana, Payment Systems Statistics, third quarter 2017. Available at: https://www.bog.gov.gh/privatecontent/Payment%20Systems/PAYMENT%20SYSTEM%20STATISTICS_Sept_2017.pdf

4. Company website: <http://www.ghipss.net/>

5. The premium is an additional cash amount that must be paid above the market price for cocoa, coffee, tea and other crops, because the product is produced sustainably and according to certification standards.

6. Company website: <http://farmerline.co/>

and Esoko,⁷ have been providing agricultural advisory solutions to farmers via mobile channels for years. They are now expanding into services aimed at digitising last mile procurement, building farmers' economic profiles and monitoring and tracking the activities of field agents. This transition to more holistic digital solutions is happening as tech providers recognise the needs of agribusinesses extend beyond information services and there is an opportunity to digitise the last mile in agricultural value chains.

Other ecosystem players are also showing an increasing interest in last mile digitisation. Financial institutions are looking at data-driven credit scoring models to provide farmer loans, which would also help to create an alternative revenue stream for data owners. In the nascent digital identity space, tech providers like Landmapp are using digital profiles and geolocation to map and register farmland in rural Ghana,⁸ providing farmers with a much-needed first step towards establishing an economic identity.

2.1 The opportunity of last mile digitisation for farmers

Of the 15.9 million Ghanaians aged 15 and over,⁹ 35 per cent had an account at a formal financial institution in 2014, with the percentage dropping to 30 per cent for rural residents.¹⁰ Similarly, mobile money account ownership was 13 per cent nationwide compared to just over 10 per cent for rural Ghana. In the last three years, mobile money has seen a huge uptake indicative of which is the tenfold growth in the number of active mobile money accounts from just under 1 million in December 2013 to over 10 million in September 2017.

More than 65 per cent¹¹ of Ghana's land area is used for agriculture, a crucial sector of the economy that accounts for 19.6 per cent¹² of GDP. It is therefore critical to drive efficiencies in agricultural value chains and the rapid growth of mobile money in recent years highlights the role digital financial services can play in creating these efficiencies.

7. Company website: <https://www.esoko.com>

8. "Most lands in Ghana are owned by stools, skins, families or clan usually held in trust by the chief, head of family, clan, or land priests for the benefit of members of that group." Source: FAO, Gender and Land Rights Database, Ghana, http://www.fao.org/gender-landrights-database/country-profiles/countries-list/land-tenure-and-related-institutions/en/?country_iso3=GHA

9. The World Bank, Findex 2014, <http://datatopics.worldbank.org/financialinclusion/country/ghana>

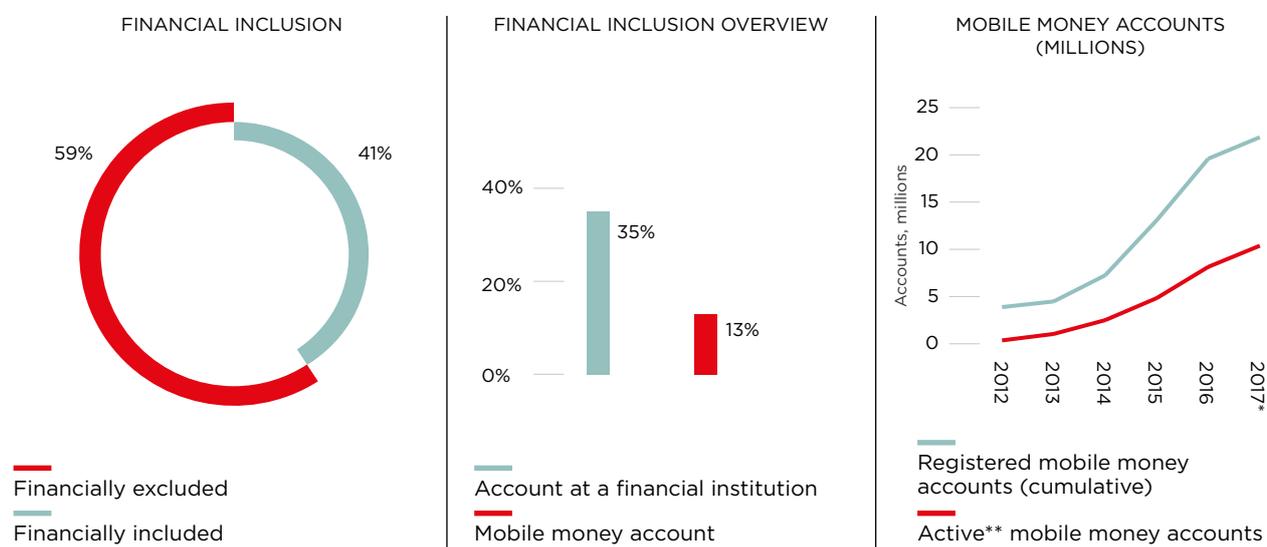
10. The World Bank, DataBank, <http://databank.worldbank.org/data/home.aspx>.

11. Ministry of Food and Agriculture, Ghana, 2014, CountrySTAT, <http://193.43.36.162/home.aspx?c=GHA&p=ke>

12. The World Bank, 2016, DataBank, <http://databank.worldbank.org/data/home.aspx>

FIGURE 1 Source: World Bank,¹³ Bank of Ghana¹⁴

Financial inclusion in Ghana



* Data for 2017 covers January to September

**The number of accounts with at least one transaction in the 90 days prior to reporting

While mobile money can play a significant role in improving farmers' access to formal financial services, additional elements of economic identity and digital infrastructure need to be addressed in parallel to create an ecosystem supportive of holistic financial inclusion and development of derivative financial services, such as savings, loans, and insurance products for agriculture.

In this context, last mile digitisation of agricultural value chains provides considerable benefits to farmers beyond basic financial inclusion. Digital payments enable transparent transactions and

reduce travel times and transaction costs by providing near-to-home cash-out points. Having a mobile money account allows farmers to make other transactions through digital channels, such as Person-to-Business (P2B) payments like utility, school and health fees through digital channels. This transaction history, coupled with other data points such as farm location and acreage, can provide a basis for assessing a farmer's creditworthiness, opening the way to formal agricultural credit, insurance and savings products.

13. The World Bank, DataBank, <http://databank.worldbank.org/data/home.aspx>

14. Bank of Ghana, Payment Systems Statistics, third quarter 2017. Available at: https://www.bog.gov.gh/privatecontent/Payment%20Systems/PAYMENT%20SYSTEM%20STATISTICS_Sept_2017.pdf

2.2 The opportunity of last mile digitisation for agribusinesses

In order to build a scalable digital ecosystem in the last mile of agricultural value chains, it is critical that all stakeholders share the benefits of digitisation, including agribusinesses, which are increasingly recognising the opportunities for digitisation of payments and other last mile processes.

When paying farmers, agribusinesses in Ghana face last mile challenges related to cash handling. For example, in the cocoa value chain purchasing clerks often carry large sums of cash to pay their smallholder suppliers. To mitigate the risk of injury, threat to life and loss of cash through theft or robbery, agribusinesses may have to purchase costly money insurance and invest in security guards and vans equipped with secure vaults. Digitising payments to farmers not only supports operational efficiencies by reducing the cost of

cash, but also allows agribusinesses to make more transparent transactions and reduces their reputational risk. Fraudulent activities by purchasing clerks who deal in cash are a significant pain point for agribusinesses procuring crops from farmers, especially in competitive value chains where farmers have access to more than one buyer.

For agribusinesses that take a more holistic approach to digitising the last mile, digital solutions can address an array of business challenges. These include areas as diverse as farmer registration and profiling, deployment of agriculture advisory services for registered farmers and generating predictive analytics, all of which help to increase farmer loyalty (returning to the agribusiness to sell their crops), operational efficiency and real-time visibility of operations in the last mile.

FIGURE 2

Digital solutions to optimise last mile procurement

BUSINESS CHALLENGES	Farmers do not follow best practices, and lack skills and access to agri-related information, educational resources etc.	Cash payments are risky and costly for agribusinesses and for farmers. A cash economy also prevents farmers from accessing credit savings and insurance	Farmers do not possess formal and/or economic identities that capture transactional history, geolocation, farm size etc.	Agribusinesses need full and real-time visibility for traceability and certification of goods when sourcing from smallholders	Agribusinesses rely on manual systems which do not capture the data required for efficient equipment, farm and warehouse management	Agribusinesses rely on manual data management systems and lack real-time visibility into their business data
						
DIGITAL SOLUTIONS	1. Information services: Agricultural extension, education, certification standards, skills development	2. Mobile money: Transfers, payments and digital financial services	3. Digital profiles: Mobile for authentication and verification and as a tool to create economic identities/ digital profile	4. Track and trace systems, farm management systems	5. IoT applications for agriculture: Equipment logistics, crop, soil and weather monitoring, smart warehousing	6. Agribusiness analytics: Predictive analytics, precision agriculture

2.3 The opportunity of last mile digitisation for MNOs

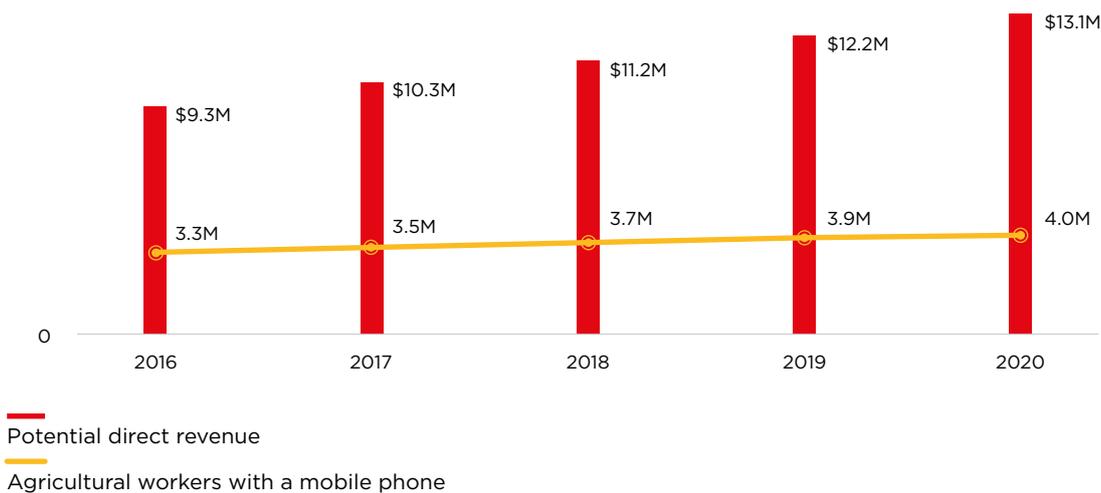
Formal procurement of agricultural produce is one area in which MNOs can form partnerships with agribusiness clients to digitise last mile processes and deliver benefits to all.

GSMA estimates that the value of digital agricultural B2P value chain payments in Ghana could be

as high as \$2.2 billion in 2017 and grow to \$2.6 billion by 2020. For MNOs, this represents a direct revenue opportunity of up to \$10 million in 2017 and \$13 million by 2020. It is also an opportunity to address a subscriber base of four million agricultural workers who will have mobile phones by 2020.

FIGURE 3 Source: GSMA Intelligence and GSMA mAgri

Potential direct revenue opportunity for B2P payments digitisation in agriculture in Ghana



Crucially, for MNOs, the last mile digitisation opportunity goes beyond payments. As MNOs seek to enhance their presence in the digital ecosystem, there are revenue-sharing opportunities to support agribusinesses that are streamlining their operations through farmer profiling, track and trace systems, predictive analytics and other procurement digitisation solutions.

To develop a holistic ecosystem for agricultural value chain digitisation, MNOs may need to engage with tech providers to develop viable partnerships and mutually beneficial business

models. As with any successful partnership, each party needs to bring clear value to the table. In the case of agricultural value chain digitisation in Ghana, MNOs bring their distribution footprint, a portfolio of existing enterprise partnerships with agribusinesses, core MNO technologies such as connectivity and mobile money, brand recognition and marketing skills. Tech providers, meanwhile, offer sector-specific knowledge, deep understanding of agricultural value chains, a set of last mile sourcing solutions and lessons from the field.

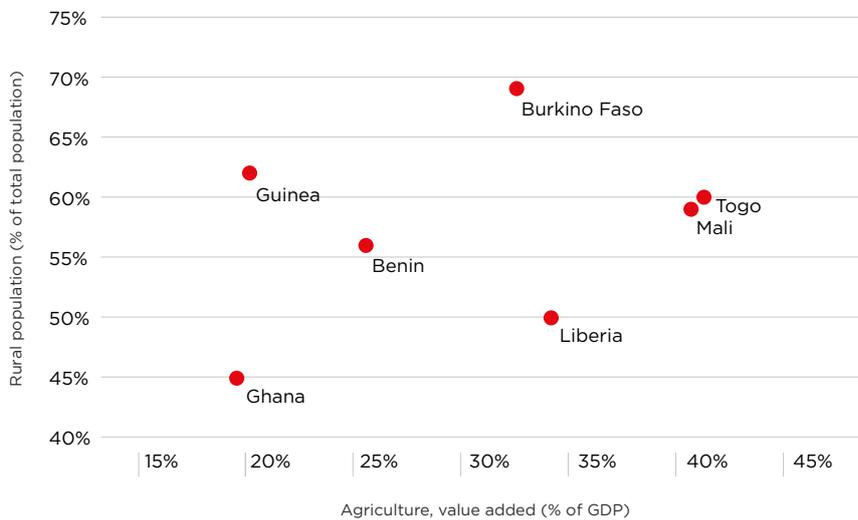
3. Agriculture in Ghana

In Ghana, over 45 per cent of the population is employed in agriculture¹⁵ making the sector one of the key contributors to the country's GDP. According

to The World Bank, agriculture's contribution to Ghana's GDP in 2016 was 19.6 per cent.¹⁶

FIGURE 4 Source: The World Bank

Relevance of agriculture in selected West African countries, 2016



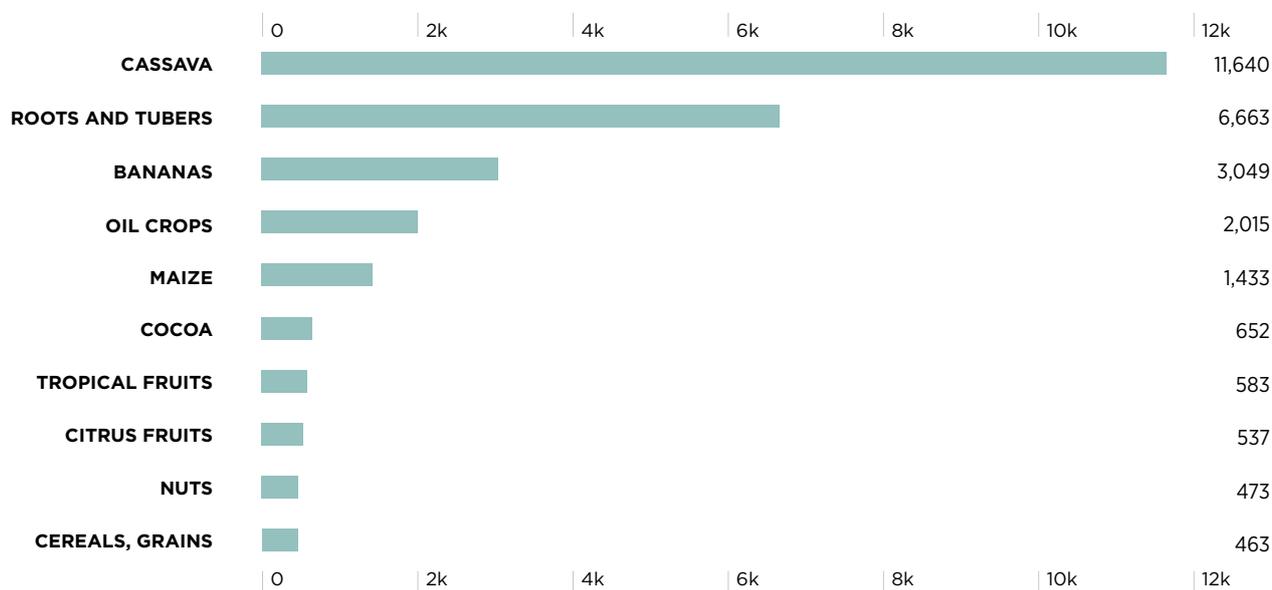
Ghana's agriculture sector is made up of crops, livestock, fisheries and forestry. The crops sub-sector includes industrial crops (e.g. cocoa, rubber, oil palm, coconut, cotton), starchy and cereal staples (e.g.

cassava, yam, maize, rice, plantain), and fruits and vegetables (e.g. pineapple, banana, cashew, citrus, mango).

15. The latest data from the International Labour Organization (ILO) indicate that the share of agriculture in total employment in 2013 was 45.2 per cent. Available at: <https://www.ilo.org/ilostatcp/CPDesktop/?list=true&lang=en&country=GHA>.
 16. World Bank data on GDP covers the period between 1960 and today. In 1978, agriculture's contribution to total GDP stood at 65 per cent. Available at: <http://databank.worldbank.org/data/home.aspx>

FIGURE 5 Source: GSMA Intelligence

Average yearly production (thousand tonnes) of the top ten value chains in Ghana, 2000–2014

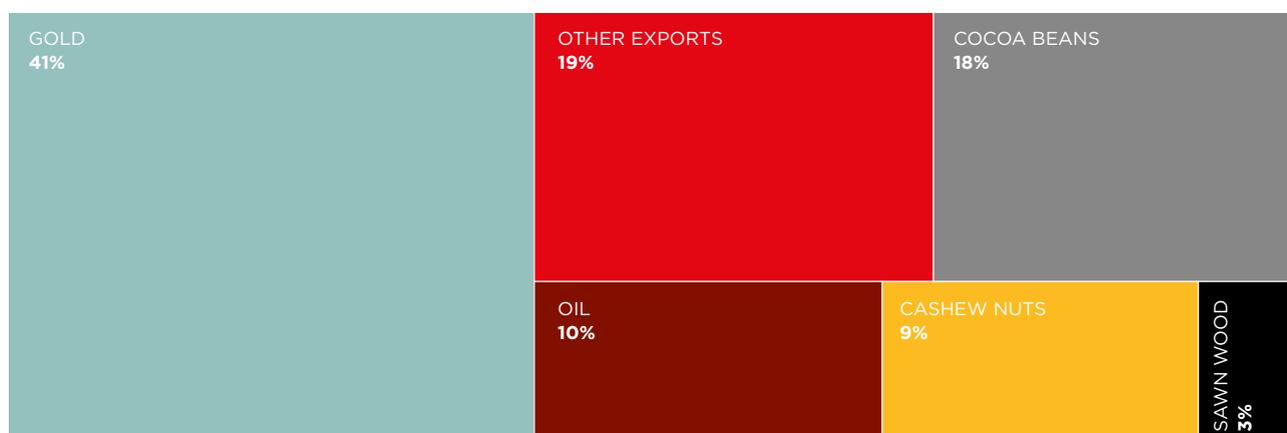


Although Ghana has reached lower-middle income status, the economy still relies heavily on the export of agricultural products and natural resources. Despite efforts to expand and diversify the export base, Ghana’s export basket is still dominated by a

small group of commodities (gold, cocoa and oil), which together account for about 69 per cent of total exports. Of these, the cocoa industry is a major source of employment for about 800,000 rural families in six of Ghana’s ten regions.¹⁷

FIGURE 6 Source: Source: World Integrated Trade Solution (WITS)¹⁸

Ghana’s commodity exports, 2016



17. Ghana Cocoa Board: https://www.cocobod.gh/home_section.php?sec=1

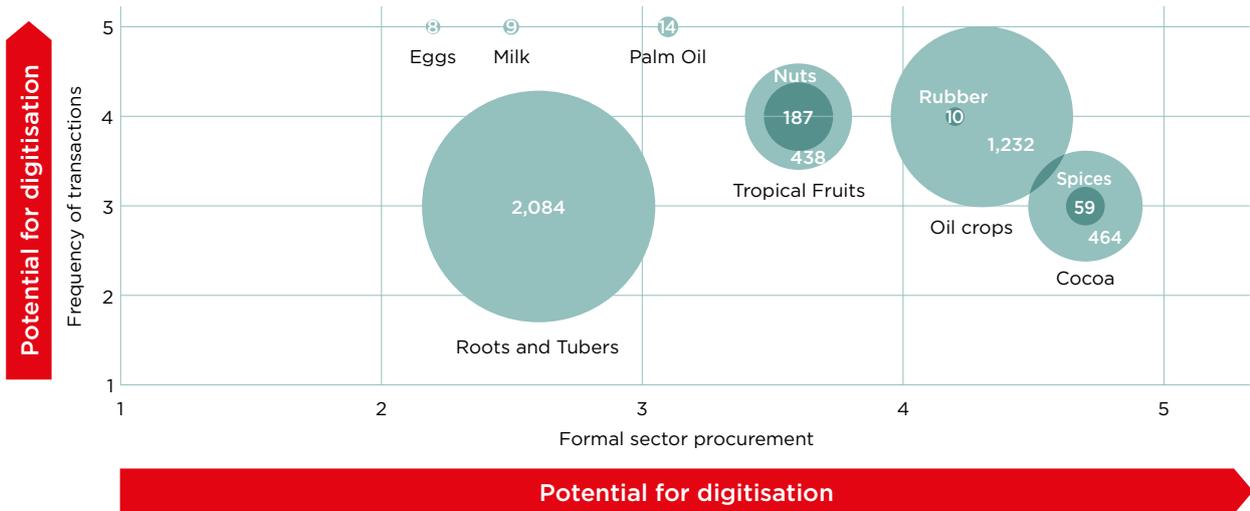
18. <https://wits.worldbank.org/CountryProfile/en/Country/GHA/Year/2016/Summarytext>

To identify priority value chains for digitisation, starting with B2P payments, GSMA mAgri and GSMA Intelligence have developed a model that identifies

the most attractive value chains for digitisation in 70 emerging countries, including Ghana (see Figure 7).

FIGURE 7 GSMA Intelligence, GSMA mAgri

Priority value chains for B2P payment digitisation in Ghana



Using a proprietary model developed by GSMA Intelligence and GSMA mAgri, this figure displays the ten (10) most attractive value chains for digitisation. Factors taken into account include, among others: the size of the value chain (volume of formal production in tonnes, FAO data, 2013), which is shown by the green bubbles; formal sector procurement by value chain (horizontal axis); and frequency of transactions by value chain (vertical axis).

Formal sector procurement is a metric calculated as the weighted average of three sub-indicators: Commercial Activity in the Value Chain (subsistence crop versus cash crop); Structure of the Value Chain (localised traders versus institutional buyers); Share of Exports (consumed locally versus exported). The assumption is that formal value chains with established structures and well-defined roles and economic relationships between stakeholders offer mobile money providers greater opportunities for digital payments. Each value chain has been given an aggregate score (1-5) for the sub-indicators; the higher the score the stronger the potential for digitisation.

Frequency of transactions is a major factor when assessing the viability of a value chain for digitisation, as regular transactions ease liquidity management for a mobile money provider and provide stable revenues to its mobile money agents. Similar to “formal sector procurement”, agricultural value chains receive a score of 1 to 5 depending on the estimated number of transactions per year: 1 transaction (scores 1); 2-5 transactions (2); 6-20 transactions (3); 21-50 transactions (4); 50+ transaction (5).

In Ghana, some of the early digitisation initiatives have focused on the cocoa value chain due to its importance to the country’s economy and high level of formal sector engagement. Other digitisation

initiatives have focused on crops such as rubber, groundnuts and palm oil, all of which appear to offer suitable entry points for digitisation.

4. Spotlight on digitisation initiatives in Ghana

4.1 MTN's mobile money solution for Cargill

In November 2016, Cargill's newly established Licensed Buying Company (LBC)¹⁹ for cocoa launched operations in Ghana. Nine years after establishing its first cocoa processing plant in Ghana, the new LBC, Cargill Kokoo Sourcing Limited, allows Cargill to source cocoa from farmers directly.

Cargill's purchasing model is built on two pillars. All payments to farmers are made exclusively through digital channels via partnerships with MTN, Tigo and e-zwich. In addition, Cargill mandates that all cocoa purchased by the LBC is fully sustainable and UTZ-certified.²⁰

Together with MTN Money, Cargill has been running joint campaigns to register and profile farmers for a digital payments scheme. During the growing season, Cargill provides agronomic technical assistance to farmers and works with farmer groups to implement sustainability certification schemes. At the end of the season, qualifying farmers are entitled to receive a premium for cocoa beans sold under the certification scheme. Farmers are also given access to agricultural inputs and training on how to regenerate their farms by replacing old, marginally productive trees with better quality and more resilient seedlings.

In Ghana, the cocoa harvest is spread over several months, twice a year. The main cocoa crop averages sixteen 64-kilo bags of cocoa beans and is harvested between October and January, while the smaller mid-crop averages five 64-kilo bags of cocoa beans and is harvested between March and May. The premium for the main crop is paid in September while the mid-crop premium is paid in June.

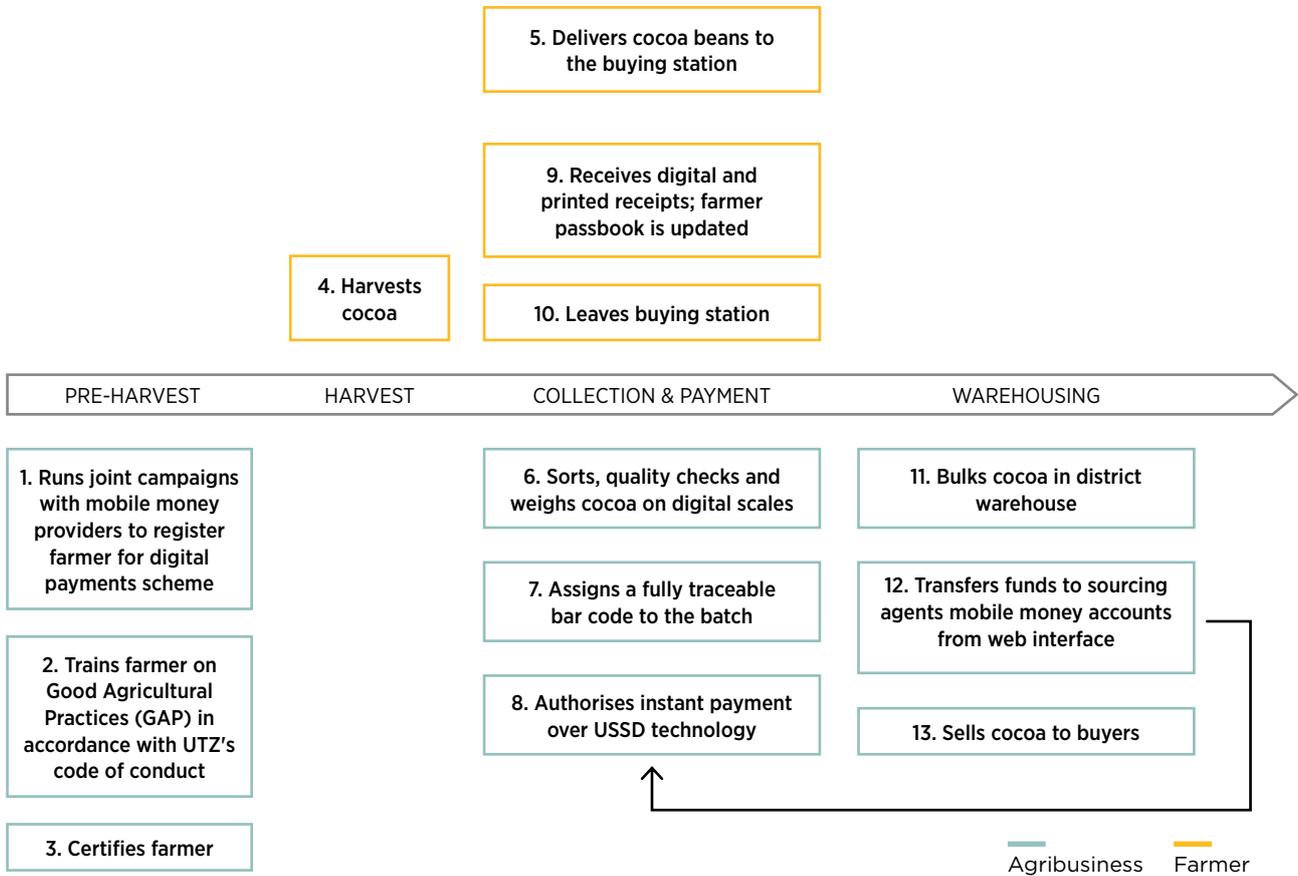
Farmers deliver their cocoa beans to buying stations where the beans are checked for quality, weighed digitally in the presence of the farmer and assigned a traceable bar code. Purchasing clerks then issue the farmer a digital receipt as well as a printed receipt, enter the purchase record in the farmer's passbook, and authorise payment to the farmer's mobile money account via Unstructured Supplementary Service Data (USSD) communications technology. Cargill ensures account liquidity for purchasing clerks by making free-of-charge transfers from the Cargill enterprise account to the clerks' mobile money accounts. Farmers are charged the standard mobile money transaction fees for cash withdrawal. Through Cargill's bar code system, details of the beans are recorded in its digital enterprise tool, which was developed in-house, before the beans are collected by larger trucks and transferred to district warehouses.

19. In Ghana, procurement of cocoa beans from farmers is controlled by LBCs, a group of private companies licensed by Ghana Cocoa Board (Cocobod). At the beginning of the harvest season, the Producer Price Committee sets the price LBCs pay to producers for the entire crop year. Few licensed buyers (LBCs) dominate the market. While licensed buyers may not compete on prices, they do offer occasional price bonuses (premiums), subsidised inputs, or credit extensions for producers. The external marketing of cocoa may be conducted by the LBCs under licence. LBCs that do not qualify to export may market and export their quota through any licenced exporter and the Cocoa Marketing Company. Source available http://documents.worldbank.org/curated/en/304221468001788072/930107812_201408252033945/additional/634310PUB0Yes0061512B09780821387450.pdf.

20. Company website: <https://utz.org/>

FIGURE 8

Cargill user journey



To date, over 25,000 farmers have registered with Cargill, 10,000 of whom are actively selling beans through Cargill's LBC network at a price of GHS 475 (USD 105) per bag. By September 2017, about

10,000 qualifying farmers had received the first-ever sustainable premium payment of GHS 25 (USD 5.50) per bag made via mobile money.²¹

21. Cargill, 11 September 2017, "For first time, 10,000 Ghana cocoa farmers able to receive premium payments by mobile phone", <https://www.cargill.com/2017/10000-ghana-cocoa-farmers-able-to-receive-mobile-phone-payment>

4.2 Tigo's mobile money solution for GREL

Ghana Rubber Estates Limited (GREL) is a rubber processing business near Takoradi, Ghana, with 20,000 hectares of its own plantations. The company also sources from 9,000 outgrowers who farm on 42,000 hectares.

The Rubber Outgrower Plantations Project was launched in 1995 and has since been implemented over five phases in the Western, Central and parts of the Ashanti regions of Ghana. The project is financed through sovereign loans from the development partners, Agence Française de Développement (AFD) and Germany's KfW Development Bank, to the Government of Ghana and available via local banks, National Investment Bank (NIB) and Agricultural Development Bank of Ghana (ADB), or through non-sovereign loans to ADB. GREL is the technical operator for all outgrower projects.

The project offers financing to outgrowers, through the two local banks, to establish their own plantations, with loan repayment starting six years later, once the rubber trees have reached maturity. Farmers receiving financing are contractually bound to sell to GREL

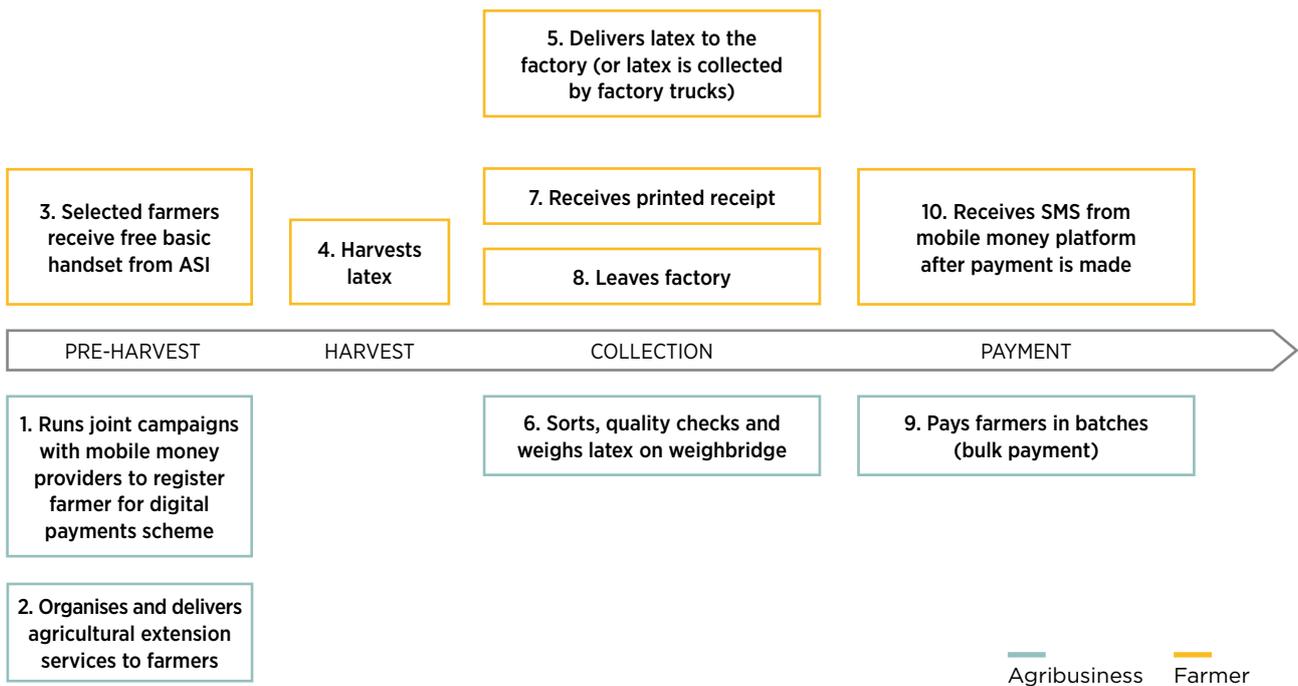
and loan repayments are deducted periodically from procurement payments made to farmers by GREL.

Although all payments were initially made by bank transfer to farmers' ADB or NIB accounts, payments in subsequent phases have been processed either through the banks or a mobile money service. The partnership with Tigo Money was established in 2014 and payments began shortly thereafter. It was facilitated by Agribusiness Systems International (ASI),²² which provided technical support and grant funding. A partnership with MTN Money was finalised recently, while discussions to partner with other mobile money providers are ongoing.

To register and onboard farmers, Tigo and GREL jointly arrange community meetings. At the point of collection, either the factory or the farm gate, the produce is weighed and quality tested. Weight and quality information are captured in a digital last-mile sourcing tool developed in-house by GREL. The enterprise tool then issues a paper receipt and payment is executed via Tigo Money bulk disbursements.

FIGURE 9

GREL user journey



22. Company website: <http://www.asintl.org>

To date, 1,400 farmers have registered to receive mobile money payments, but only 60 have been paid through this channel (almost exclusively through Tigo), with the remaining farmers receiving payment by bank transfer to their NIB or ADB accounts. GREL aims to transfer up to 50 per cent of all farmer payments to digital channels by the end of 2018. To achieve this, GREL is looking to leverage its recent partnership with

MTN, while discussions with Vodafone are ongoing to reach farmers in areas where network coverage and agent availability is less reliable. GREL's in-house tool does not allow for payments to be split across multiple channels (e.g. paying 20 per cent through a bank and 80 per cent through mobile money), but this functionality is currently under development.

4.3 Farmerline's enterprise tool for last mile digitisation

Ghanaian technology company, Farmerline, has developed an in-house tool that enables agribusinesses to replace manual data gathering with digital data collection, management and analytics for field monitoring, farmer profiling, produce procurement and farm mapping. The digital tool also allows agribusinesses to deliver in-person training to farmers and efficiently audit large numbers of farmers for compliance with certification programmes, such as Fairtrade, Rainforest Alliance and UTZ, while enhancing decision-making with access to survey data and reports. Agribusinesses can conduct voice surveys with farmers in multiple local languages and receive responses in real time as farmers respond by entering responses on their keypad or recording answers on their phone. Alternatively, agribusiness can perform USSD surveys that allow farmers to respond by using a USSD menu. All data is geotagged and accessible from an enterprise app and a web interface. The app also allows users to capture photographs, signatures and fingerprints.

The interface of Farmerline's enterprise solution used by agribusiness agents is a purpose-built Android OS app. The app allows for online and offline data collection while auto-mapping capability helps to pick several GPS coordinates every five seconds. When the user is within mobile coverage, the data is synched with a cloud-based server, repackaged and available on a dashboard. Data can then be exported into several formats, such as Excel and

KML,²³ or quarantined to assess the accuracy of the data or request edits. In this scenario, data is sent back to the agribusiness agent for validation and resubmission before it is synched with the server.

Farmerline works heavily in Ghana's cocoa sector where demand for sustainable, certified cocoa is high.²⁴ Farmerline's subscription business model is based on a recurring monthly fee with complementary services, such as agribusiness analytics offered as an add-on. So far, Farmerline's digital solution for agribusiness has reached over 180,000 farmers in several Sub-Saharan African markets.

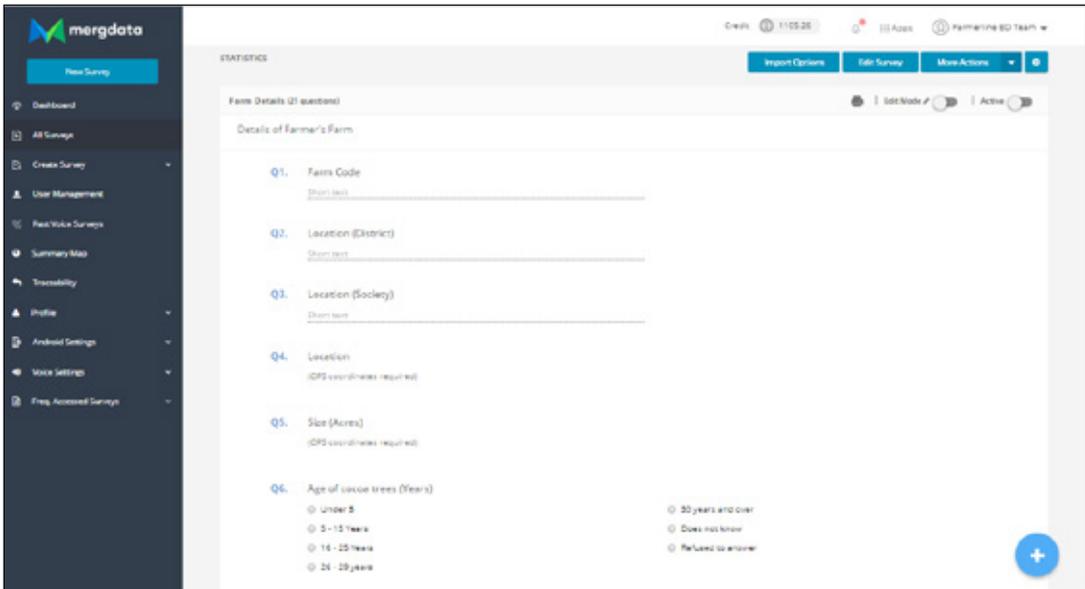
23. KML is a file format used to display geographic data in an Earth browser.

24. Besides cocoa, Farmerline offers support to Ghanaian agribusinesses operating in the following value chains: aquaculture, rice, maize, soya, cassava and vegetables (lettuce, cabbage, spring onions).

FIGURE 10

Farmerline digital enterprise tool

a. Farmer survey



b. Farm profiling



4.4 Insyt's enterprise tool for last mile digitisation

Insyt is a digital enterprise tool launched as a new flagship product of Esoko to replace paper-based data collection systems with mobile and web-based digital solutions. Although Insyt is sector-agnostic and actively marketed to government institutions, NGOs, and businesses operating in a variety of industry verticals, agribusinesses and farmers are among the key beneficiaries of this digital enterprise tool.

Agribusinesses use Insyt to profile farms and farmers, conduct surveys and receive instant analytics reports. The digital tool offers Application Programming Interface (API) integration with a local smartcard issuer for ID cards and identity verification. Insyt also integrates with mobile money and local payment gateways to facilitate procurement payments, and allows real-time monitoring and tracking of field agent activities (e.g. farmer training) and instant survey updates on agents' devices.

Data is collected in either online or offline mode and hosted on a cloud-based server. The app allows

the enterprise user to capture signatures, photos and videos. Data is GPS-tracked and time-stamped and subject to quality assurance and testing before aggregation takes place. Insyt's web interface supports customised reporting dashboards, enables data to be exported and merged with other data formats, and geographic areas to be measured and visualised. Ghanaian agribusinesses deploying Insyt in their last mile operations benefit from reduced costs, time and errors through streamlined data collection and an analytics-driven decision-making culture. Insyt's current business model is based on a one-off fee with plans to roll out a freemium model in 2018.

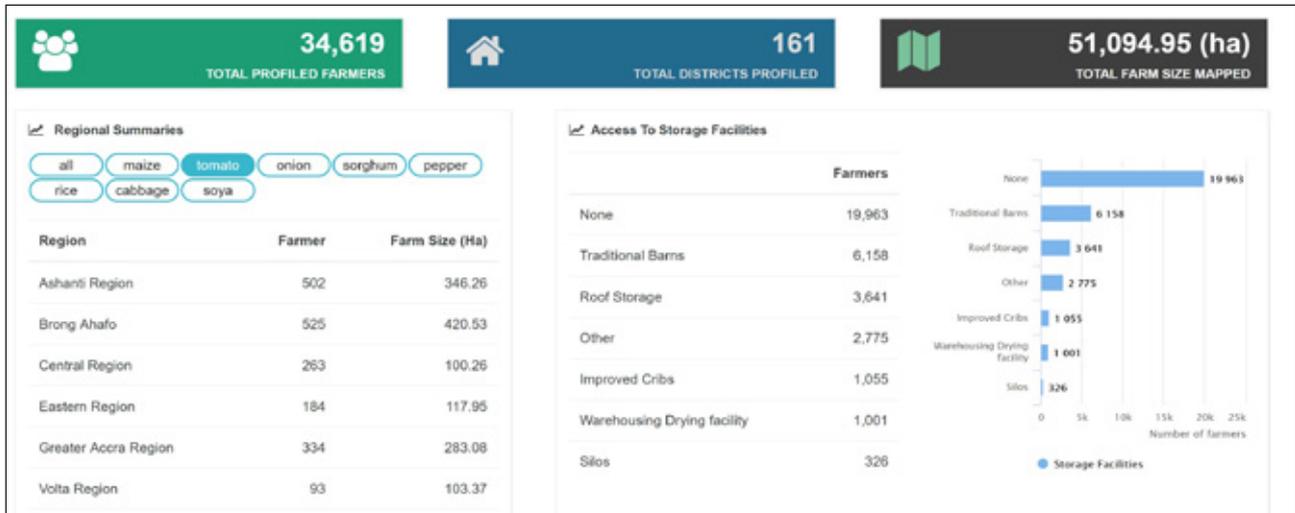
So far, Insyt has been used to profile 34,000 farmers in Ghana on behalf of the Ministry of Food & Agriculture and many more farmers in Ghana, Kenya and Tanzania supplying to private agribusinesses. Additionally, Insyt has been used for profiling 104,000 hectares of farmland in three countries (Ghana, Burkina Faso, Tanzania).



FIGURE 11

Insyrt digital enterprise tool

a. Farm profiling



5. Ownership models

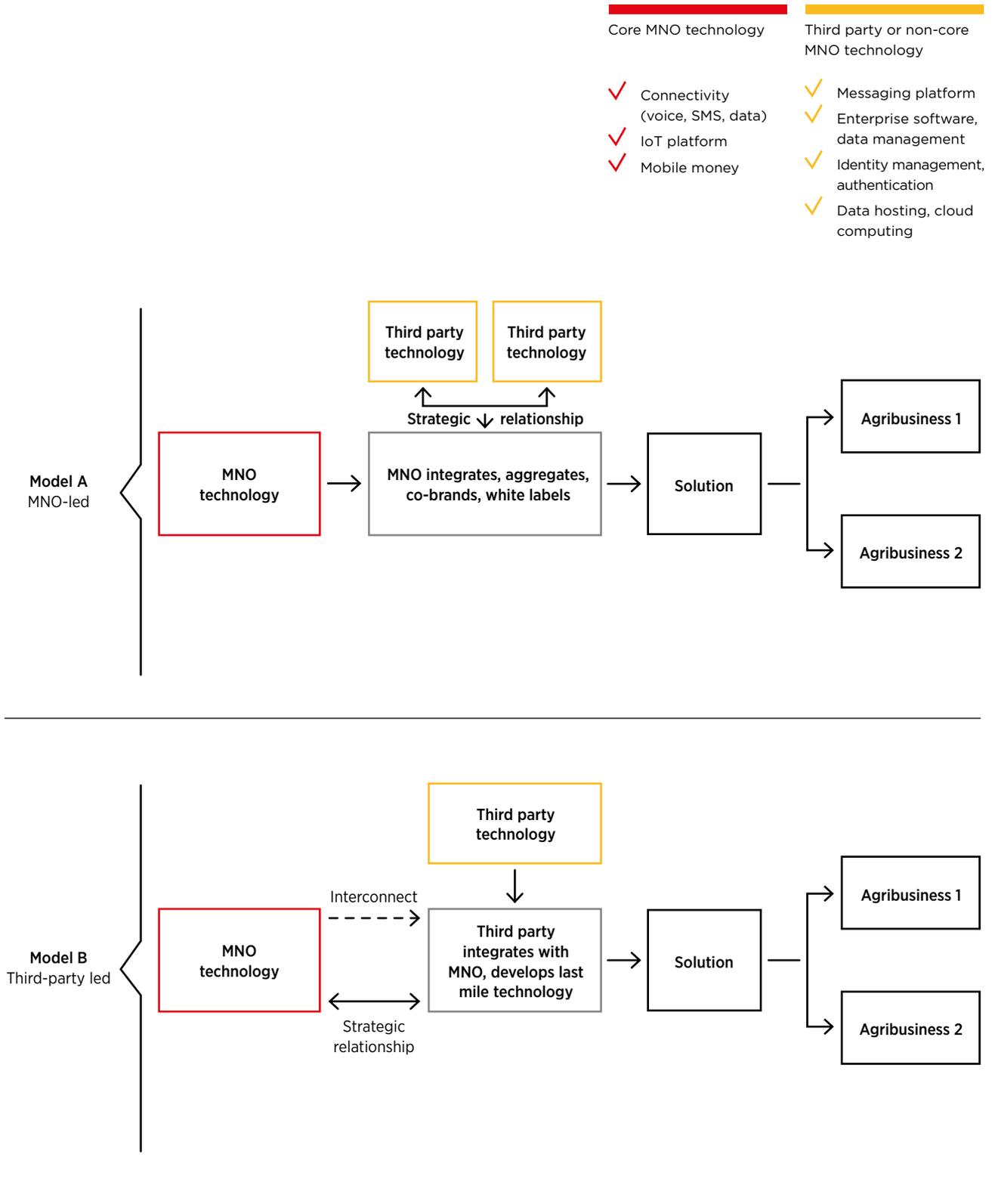
Using the GSMA mAgri framework of ownership models for agricultural last mile digitisation, research in Ghana has identified two models that have made last mile digital solutions available to agribusinesses: one led by mobile money providers and the other by tech providers. Under the first, MNO-led model (Model A in Figure 12 opposite), an MNO uses core proprietary technology, such as mobile money, to offer a last mile digital solution directly to an agribusiness. By focusing on payments from the onset, Ghana's mobile money providers have become key supply chain enablers, playing a pivotal role in extending digital financial services to base-of-the-pyramid users.

An alternative model (Model B in Figure 12 opposite) is led by third-party tech providers with different skillsets and capabilities using core MNO assets, such as connectivity and mobile money, to develop their own digital solutions, which they market directly to agribusiness clients. At the core of this model are last mile digital solutions with a more holistic suite of services that extend beyond digital payments to cover areas as diverse as traceability and certification, among others.



FIGURE 12

Models for agricultural last mile digitisation



5.1 Mobile money provider-led model for payments digitisation

In Ghana, under this model, agribusinesses perform digital B2P transfers to smallholder farmers for the payment of both agricultural produce and quality premiums (see sections 4.1 and 4.2). In this context, a mobile money provider offers an agribusiness a digital enterprise solution that addresses inefficiencies related to handling physical cash. In Ghana, both MTN and Tigo are currently commercialising their

own mobile money service to agribusiness clients. For mobile money providers, agricultural last mile digitisation brings an array of benefits, ranging from higher numbers of mobile money transactions and the build-up of associated revenue pools (e.g. withdrawal fees) to expanding the subscriber base and active mobile money accounts.

FIGURE 13 Considerations of a mobile money provider-led model for payments digitisation

	Mobile money provider-led model
Incentives	<ul style="list-style-type: none"> Expanding the subscriber base and mobile money accounts Growth of mobile money transactions and associated transaction revenues (e.g. withdrawal fees, Person-to-Person (P2P) fees) Upselling opportunities from an upgrade to a solution with a more holistic suite of services for the last mile (e.g. farm management system, traceability)
Mobile money network	<ul style="list-style-type: none"> Maintains the direct management of network and resources (e.g. MNO offers ad-hoc support with redeployment of mobile money agents in cocoa-growing areas targeted for procurement payments digitisation) Directly manages service design and sales
Mobile money pricing	<ul style="list-style-type: none"> Retains flexibility to adjust pricing strategy to align with business objectives
Mobile money service ecosystem	<ul style="list-style-type: none"> Can benefit from farmers adopting new use cases (e.g. utility payments) Opportunity to engage in a mutually beneficial partnership with a financial institution to implement and deliver derivative financial services, such as savings, credit and insurance products

Besides the potential of mobile money to promote financial inclusion, payment digitisation solutions benefit Ghanaian farmers in two fundamental ways.

First, they can increase the speed and accessibility of cocoa or rubber payments to farmers when they sell their crops to agribusinesses. Timely delivery of payments is especially important in emergency

situations that can produce unexpected income shocks, such as a health emergency or natural disaster. By comparison, farmers who opt to receive payments to their bank accounts must travel to the closest bank branch to withdraw cash, which may only be available in a regional capital (e.g. Takoradi, in the case of rubber farmers supplying to GREL). This incurs costs and wastes time that could

otherwise be spent on farming activities. These losses are accentuated by the fact that some bank branches in Ghana may not have sufficient liquidity. Second, research findings from Ghana suggest that digital payments may help to lower the cost of payments for farmers, not only by reducing travel time and expenses, but also by enabling secure and transparent transactions. Farmers receiving cash payments or farmers who cash out their entire payment from their bank account are particularly vulnerable to street crime. Shifting to mobile money allows farmers to cash out smaller amounts at their convenience or transfer funds directly to pay for bills²⁵ or at local merchants. When digital payments are combined with other last mile digital solutions that protect against fraud and leakage (i.e. payments that do not reach the recipient in full), agribusinesses can offer an even more compelling value proposition for farmers. For instance, Cargill's operating model combines digital payments with digital scales to entice farmers to supply to Cargill's own LBC. Fraudulent practices of cocoa purchasing clerks who adjust their analogue scales may result in farmers receiving a payment of up to 10 per cent below

the full price of a bag of cocoa. Comparatively, the withdrawal fee charged by a mobile money provider is less than 2 per cent of the full price of a bag. For agribusinesses, digitising agricultural payments has the potential to increase operational efficiencies through improved traceability of payments and eliminating the high cost of cash payments, which include manual acceptance, record keeping, counting, storage, security and transportation. The cost of digital payments, on the other hand, are the fees for making transactions over a mobile money network.

When considering the costs²⁶ of cash payments, an agribusiness may see a positive value proposition in the form of cost savings while shifting from cash to digital payments. As holistic suites of last mile digital tools that include digital payments emerge, they often help agribusinesses to address challenges with profiling farms and farmers and the traceability of crops. More holistic tools can also support agribusinesses in shifting procurement towards sustainable sourcing of certified crops, the demand for which is steadily growing from downstream supply chain actors.²⁷

5.2 Tech provider-led model for last mile digitisation

In Ghana, under this model, a tech provider typically leads the development of a digital enterprise tool that offers more than just payments and markets it directly to agribusiness clients (see sections 4.3 and 4.4). As many large commercial agribusinesses like Cargill and GREL already operate their own last mile sourcing tools, tech provider-owned digital enterprise tools are likely to be suitable entry points to digitisation for smaller agribusinesses with a local presence or for local units of larger organisations that have not yet embraced digital tools on a global scale.

For agribusinesses, the tool allows them to replace pen and paper with real-time digital data

collection, which is then stored in a cloud-based server. The tech provider-owned tool integrates one or more core MNO technologies, such as connectivity and mobile money, and ties them to digital solutions that address specific agribusiness challenges related to disseminating agricultural information, traceability and certification of crops, and profiling of farms and farmers, among others. In addition to data collection and aggregation, as with Farmerline and Insyte, the digital tool may support data analysis that allows agribusinesses to adopt analytics-driven decision-making, thereby achieving better performance through data.

25. Utility payments enabled by Tigo in Ghana. Available at: <https://www.mobile360series.com/wp-content/uploads/2017/09/2016-State-of-Mobile-Money-in-Western-Africa.pdf>

26. Examples of indirect costs include missed crops (purchasing clerks spend more time per farmer when they could be procuring more crops for the business) and lower quality of crops (purchasing clerks focus on payments rather than grading crops).

27. Cocoa smuggling between Ghana and neighbouring Côte d'Ivoire is quite common, with the direction shifting back and forth depending on the difference in farm gate price. Cross-border trafficking often involves mixing lower quality beans smuggled from Côte d'Ivoire with high-quality beans from Ghana, resulting in non-traceable crops that do not always meet agribusiness (and downstream supply chain actors') demand.

An agribusiness can benefit from digital tools like these in a variety of ways. First, the tool supports the provision of agricultural extension (agronomic advice), which empowers farmers and enhances their knowledge and skills to improve yields, thus generating farmer loyalty and increased procurement volumes to support the growth of the agribusiness. The agility of tech providers and specialisation in agricultural applications can also make their platforms more responsive to enterprise customer needs as tech providers benefit from a flexible product development process.

The rationale for the private sector to provide agricultural extension services is generally based on the assumption that government extension services are scarce, which leads to unequal access to resources. For an agribusiness, greater farmer productivity translates into effective supply chain management, allowing it to meet the forecasted demand for crops in an environmentally and socially sustainable way. To this end, agribusinesses active in Ghana's cocoa sector are increasingly using the digital extension system to build capacity on good agricultural practices that promote sustainable agriculture and help reduce the risk of deforestation, which is a consequence of low yields.²⁸

Importantly, digital enterprise tools marketed by third-party tech providers such as Farmerline have become critical to the roll-out of certification and traceability schemes in Ghana's cash crop value chains. The three major independent certification programmes will continue to play a key role in ensuring traceability, and the functionalities and design of digital enterprise tools (e.g. GPS mapping, built-in checklists for certification audits) can help achieve this goal. For instance, Cargill, after becoming a more vertically integrated agribusiness with the launch of its LBC in 2016, has committed to sourcing cocoa beans through the LBC that are 100 per cent traceable to the

farmer.²⁹ Similar commitments have also been made by other agribusinesses active in the cocoa sector. For farmers, digital enterprise tools like Farmerline or Insy's sister company, Tulaa,³⁰ can help address production issues, such as the distribution of seeds, fertilisers and pesticides. Integration with financial institutions, input suppliers, output buyers and mobile money providers create a virtual marketplace for farmers to access markets, which is helping to transform the livelihoods of Ghana's smallholder farmers. Access to farmer data allows financial institutions to conduct credible risk assessments of farmers and offer input loans to financially excluded farmers with no credit history. In the long term, farmers may benefit from building up an economic identity that helps them to access formal financial services, such as insurance and savings.

28. http://www.mightyearth.org/wp-content/uploads/2017/09/chocolates_dark_secret_english_web.pdf

29. <https://www.cargill.com/2017/cargill-drives-cocoa-buying-transformation-in-ghana>

30. Company website: <https://www.tulaa.io/>

6. Key Learnings

6.1 Cocoa value chain offers a suitable entry for last mile digitisation

Ghana is the world's second-largest producer of cocoa behind Côte d'Ivoire. Multinational agribusinesses such as Cargill purchase all the cocoa produced in Ghana and export it to international markets. In highly formal value chains like cocoa, the demand for sustainability initiatives from downstream actors is high.³¹ The absence of any price competition at the procurement level, due to Ghana's regulatory framework for the cocoa sector, accentuates the need for agribusinesses to optimise their supply chains to become more profitable, and increases pressure on them to implement more efficient operating models, including the use of digital technologies in the last mile.

Close examination of cocoa farming in Ghana reveals that last mile digital solutions have the potential to address several pain points for farmers. This requires

the attention of all value chain actors, including agribusinesses, MNOs, financial institutions, input suppliers and technology providers. Farmers in the cocoa value chain conduct their economic activities in cash, including the production and sale of cocoa. The twice-a-year cocoa harvest is spread over several months and generates a significant amount of transactions. Farmers struggle with unproductive, aging cocoa trees they cannot afford to replace due to their inability to access credit – a result of a poor financial inclusion record and no economic identity. Farmers also need access to inputs, such as pesticides and fertilisers, and training in good agricultural practices, so they can produce more cocoa on the land they have. Digital tools can address the pain points for cocoa farmers in all these areas.

6.2 Digitally literate farmers conduct mobile money transactions beyond cash withdrawals

Insights from rubber farmers who supply GREL indicate that those who are more digitally literate welcome the opportunity to use Tigo Money to pay utility bills and school fees remotely, which remain the biggest cash outflows for a rural household. MTN data on mobile money user behaviour also suggests that, in the absence of a savings account with a formal financial institution, digitally literate farmers are

treating their mobile money account as a savings tool by securely storing cash in it. When first introduced to mobile money payments, farmers cash out most of their funds – however, as they start to use the mobile money for other use cases and develop trust, their cash out volumes decrease and savings increase. Such patterns of consumer behaviour help to build the value proposition for mobile money, reduce pressure

31. Such is the demand for sustainable cocoa in developed markets that some of the largest chocolate manufacturers, such as Mars, Ferrero and Hershey, have committed to sourcing 100 per cent fully certified sustainable cocoa by 2020. Commitments of this type extend to the chocolate manufacturers' suppliers, such as Cargill and Olam, which have a strong presence in West African cocoa-producing markets and grasped the opportunity to replace pen-and-paper data collection with digital tools as an essential step in their commitment to make cocoa more sustainable. Source: GSMA, 2017, "Opportunities in agricultural value chain digitisation: Learnings from Côte d'Ivoire", <https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2017/10/Opportunities-in-agricultural-value-chain-digitisation-Learnings-from-C%C3%B4te-d%E2%80%99Ivoire.pdf>

on agent liquidity and maintain the flow of money in the digital ecosystem. Most farmers, however, lack the digital literacy to engage in alternate use cases and, as a result, cash out immediately after they receive a digital payment.

To drive adoption of mobile money beyond cash withdrawals, MNOs must guide customers on a journey from their first encounter with mobile money to becoming a habitual user.³² First, MNOs' awareness campaigns must help farmers understand how the mobile money service is both relevant and beneficial to them. Below-the-line (BTL) marketing campaigns, visiting villages, plantations and districts to educate farmers on financial services and alternate use cases of mobile money can help achieve this. Once a farmer

understands the benefits of transacting in mobile money, the second step is to learn how to transact, typically from a mobile money agent, a family member or friend. Tigo agents involved in GREL farmer registration teach farmers how to initiate transactions on their phones by crediting their mobile money accounts with GHS 1 (USD 0.22) for test transactions. Clearly, it is also important that MNOs deepen their understanding of the rural economy and expand their product offering with services that are relevant to rural customers. For instance, Vodafone Ghana has recently launched an investment-linked insurance product, delivered by microinsurance specialists BIMA through Vodafone's mobile money platform, which helps fisher folk to save and protect against the financial risks associated with death or permanent disability.³³

6.3 The financial services market for the rural poor is ripe for digital disruption

Providing access to financial services has significant potential to lift the poor out of a perpetual cycle of poverty. As Ghana lacks a traditional brick-and-mortar bank branch network in rural areas, mobile money providers have a key role to play in offering digital financial services, such as savings, loans and insurance products. Despite their interest in penetrating the agriculture segment, Ghana's mobile money providers do not offer any specialised agricultural financial services.

On the demand side, farmers explicitly highlight the need for such services. For instance, in the case of GREL, some of the rubber farmers prefer to receive payments for their crops by bank transfer rather than mobile money so they can develop a transactional records-based economic identity and benefit from access to loans. Farmers apply for loans to cover the costs of purchasing agricultural inputs, to even out irregular cash flows resulting from the seasonal nature of agricultural production, or to cover living expenses at times of income shortfalls (e.g. replacing aging, unproductive cocoa trees with new stock).

An ecosystem supportive of farmers' need for credit is beginning to emerge in Ghana. Agribusinesses are also recognising the benefits of offering farmers access to financial services. For example, Cargill is starting to actively organise farmers into cooperatives, which have a lower risk profile compared to individual farmers, making them key players in offering affordable finance to rural customers.³⁴ Technology provider Landmapp, through its last mile digital solution, provides smallholder farmer families with documentation of their land, which can be used as collateral for agricultural loans. Meanwhile, the digital footprint of services like Farmerline and Insynt offer the potential for farmers to develop an economic identity, providing financial institutions with more data points to assess a farmer's risk and ability to repay.

32. GSMA, 2011, "Driving customer usage of mobile money for the unbanked", <https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2011/03/Driving-Customer-Usage-Final.pdf>

33. <http://www.bimamobile.com/news-and-media/news/fishers-future-plan-launch-ghana>

34. <https://www.cargill.com/doc/1432076281206/ccp-progress.pdf>

6.4 Build an agile mobile money agent network based on principles of trust and efficient liquidity management

With 140,000 active mobile money agents and just 1,300 bank branches,³⁵ Ghana's mobile money providers appear to be well placed as key enablers on the path to an inclusive digital economy. During field research³⁶ in Ghana, trust and efficient liquidity management emerged as extremely important factors in the uptake of mobile money services.

On the demand side, relationships and trust are proving critical in Ghana's rural areas. Farmers are more likely to trust mobile money agents who have strong connections with the local community. Trust is even more important in value chains where the typical transaction size is relatively high (e.g. rubber). In such value chains, given the choice, farmers may pick alternative channels for receiving procurement payments (e.g. by bank transfer) if they believe their

money is safer there. In the initial months of the transition to mobile money payments, cocoa farmers receiving mobile money payments from Cargill for the first time tend to cash out almost their entire payment within three days of disbursement. Over time, data from MTN suggest that these same farmers delay withdrawal of funds and do not withdraw the entire payment in one go.

To mitigate the risk of insufficient float for agents in rural areas, MTN's strong partnership with Cargill allows it to forecast demand and address the liquidity gap with the assistance of master agents. MTN deploys mobile money agents in areas immediately after the disbursement of payments, and for three days after when the bulk of withdrawal activity occurs.

6.5 Cost of mobile money does not emerge as a barrier to the adoption of mobile money

In Ghana, the cost of mobile money to a farmer, such as the fees charged for cash withdrawals or P2P transactions, did not emerge as an important barrier to the adoption of mobile money payments by agribusinesses and farmers. On the contrary, mobile money's value proposition appears compelling compared to other payment methods.

In the case of rubber farmers supplying to GREL, payments made by bank transfer involve a number of charges, including a flat GHS 3 (USD 0.67) fee per incoming transaction deducted from the payment as well as a fee for ordering a chequebook, which varies between banks. Additional costs that reduce the attractiveness of payments by bank transfer include the cost of transportation from the farm to the bank

branch, the time spent waiting to withdraw the funds, and the perceived risk of carrying cash back to the farm. This is consistent with the argument that, for farmers who do not have large sums of money to deposit or otherwise transact with, it is impossible for traditional brick-and-mortar banks to serve them profitably.

GSMA research in several regional markets has revealed that agribusinesses may be willing to absorb the withdrawal fee that mobile money providers charge farmers for cashing out their funds. This is an alternative model for pricing mobile money services for agribusiness clients, and may stimulate adoption in the early phases of digitising last mile procurement payments. For cocoa farmers supplying to Cargill,

35. Sources: <http://blogs.lse.ac.uk/africaatlse/2017/11/01/clarence-blair-ghana-has-140000-mobile-money-agents-versus-1300-bank-branches/> and https://www.bog.gov.gh/privatecontent/Payment%20Systems/PAYMENT%20SYSTEM%20STATISTICS_Sept_2017.pdf

36. Field research involved semi-structured and contextual interviews with MNOs, agribusinesses, tech providers and farmers

agribusiness data suggests that the cash-out fee charged to farmers by the mobile money provider is significantly lower than the monetary impact of fraudulent practices of cocoa purchasing clerks, which farmers are regularly subjected to when they are

paid in cash (see section 5.1). This suggests that the relatively high cost of transacting in cash moderates the impact of the cost of mobile money when digital payments are adopted.

6.6 Promote mobile agriculture to a standalone business vertical to maximise value creation

In Ghana, both MTN's deployment with Cargill and Tigo's deployment with GREL are limited to supporting the digitisation of procurement payments to farmers. However, the ability of MNOs to address the challenges of agribusiness and farmers in a holistic way and maximise value creation from the digitisation of the last mile depends on their ability to fully understand these challenges and become a one-stop shop for the enterprise customer.

This requires a collaborative effort from all parts of the organisation, no matter how different their processes and systems have been in the past, and partnerships with third-party tech providers like Farmerline and Insyt that specialise in agriculture-centred digital solutions. Typically, different functions within an MNO operate in silos. For example, the Value-Added Services (VAS) team of a Ghanaian MNO would look after the delivery of agriculture advisory services while the mobile money team would look after the digitisation of payments, with perhaps limited interaction or data sharing to explore other growth opportunities.

To overcome this barrier and capture emerging opportunities in the agriculture sector, MNOs should act at multiple levels. First, MNOs should consider rethinking their organisation's operating model and prioritise cross-functional capabilities and knowledge sharing in a standalone agriculture vertical. Introducing Key Performance Indicators (KPIs) to agriculture may reduce the risk of treating the sector as an extension of existing use cases, such as mobile money, but as a standalone revenue opportunity in its own right. MNOs should also consider expanding their knowledge and understanding of the agriculture ecosystem, which is made up of farmers, commodity buyers (e.g. agribusinesses, middlemen), input suppliers, rural financial institutions and others. To this end, applying a user-centred design approach³⁷ to the product development process would allow MNOs to better connect their mobile agriculture services with the needs of farmers and other key actors in the ecosystem.

37. GSMA, 2015, "mAgri Design Toolkit: User-centered design for mobile agriculture", <https://www.gsma.com/mobilefordevelopment/magri-design-toolkit>





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