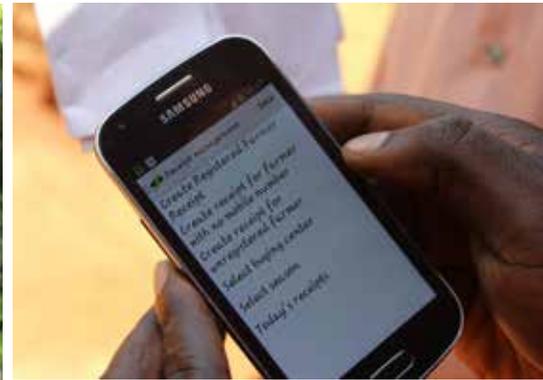




TECHNOSERVE
BUSINESS SOLUTIONS TO POVERTY



Connected Farmer Alliance

Assessing the impact of a commercial mobile agriculture (mAgri) solution



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Executive Summary

The agricultural sector in developing countries is facing the challenge of low labor productivity, which has a detrimental effect across entire agricultural value chains – preventing agribusinesses from realizing their full production potential while contributing to the poverty of smallholder farmers.

The Connected Farmer Alliance (CFA) set out to address these constraints by promoting commercially sustainable mobile solutions. A public-private partnership between the U.S. Agency for International Development (USAID) and Vodafone – with TechnoServe as the implementing partner – CFA sought to increase productivity and revenues for farmers, while improving operations and increasing revenues for agribusinesses. Each of the partners played a crucial role: USAID provided critical funding, with an aim to help smallholder farmers improve their livelihoods; Vodafone helped develop the solutions, using its technology to help improve farmers' lives and business operations, while cultivating new customers and earning revenues for the company from license and payment transaction fees; and as the implementer, TechnoServe analysed the problem and facilitated cooperation and work between different market actors on solution design and implementation.

In 2012, CFA launched a commercial mobile agriculture (mAgri) solution called Connected Farmer in Kenya, Tanzania and Mozambique. The goal of the Connected Farmer was to address the value chain management inefficiencies and increase productivity of both the agribusinesses and the smallholder farmers who supply them.

The Connected Farmer product design process started with the identification of the management challenges in consultation with the agribusinesses piloting the solution. It resulted in Connected Farmer encompassing three main modalities: mobile payments, communications, and data collection/management functionalities.

Despite creating shared value for both businesses and smallholders, agribusinesses are the main paying end-users of the Connected Farmer, with

the farmers only incurring standard mobile banking withdrawal charges. This type of payment structure defines Connected Farmer as an innovative business-to-business-to-customer (B2B2C) mAgri solution model. Because the service does not rely on the low purchasing power of smallholder farmers, its commercial viability is safeguarded across different agricultural value chains.

Coinciding with the end of the Connected Farmer Alliance in March 2016, this study provides an evaluation of the impact of the Connected Farmer mAgri solution and documentation of the lessons learned during its implementation. It focuses on the case of Connected Farmer adoption by Kenya Nut agribusiness in Kenya and is based on qualitative individual and focus group interviews with Kenya Nut's management, staff and the smallholder farmers in its supply chain, carried out in February and March 2016.

The research demonstrates a positive impact on the productivity of both the agribusiness and the smallholder farmers in its supply chain. It shows that by streamlining the value chain management and creating change in processes, Connected Farmer functionalities lead to efficiency outcomes and, thus, greater profitability for multiple market players.

The study also highlights the challenges faced during the adoption of the Connected Farmer solution. In particular, it emphasizes the importance of a holistic approach to product design and adoption implementation, ensuring that both facets are informed by the findings of in-depth farmer behavior research and an analysis of constraints to adoption. Moreover, the study underlines strong partnership between the agribusinesses and the mobile network operator selling the service as key to successful implementation.

The study concludes with the overarching recommendations for overcoming these challenges and ensuring effective adoption of Connected Farmer or similar mAgri mobile solutions across different agricultural value chains.

Background

The global population is expected to rise by one-third in just over three decades.¹ Most of this population growth is happening in developing countries, which, despite producing two-thirds of global agricultural output, suffer from low food availability and undernourishment.² To meet the future global demand and ensure their own food and nutritional security, developing countries need to drastically increase their food production. However, agricultural labor productivity in the least developed countries (LDCs) is just 1.8 percent of that in developed countries.³ This helps explain the stagnant rate of the production yield growth in LDCs, especially in Sub-Saharan Africa, which by 2050 will account for 21 percent of the global population.⁴

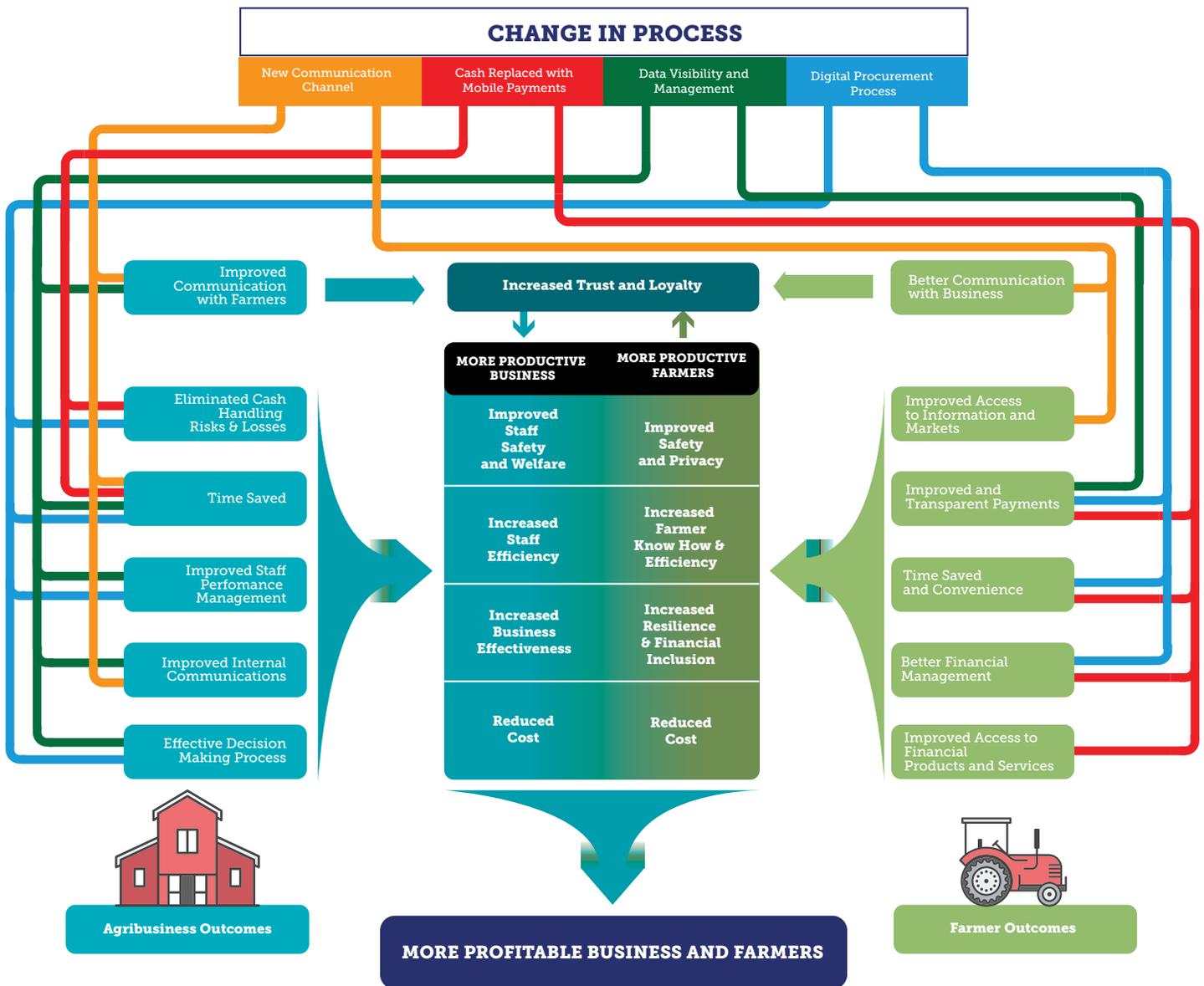
Mobile technology, widely recognized as a positive, market-led enabler of social and economic change, can play a pivotal role in addressing this situation. Mobile phones are ubiquitous in developing countries and as such have become instrumental in reaching underserved rural communities. Commercial mobile services are increasingly filling the provision gap in sectors as diverse as education, health,

disaster response or employment and more.⁵ In this context, mobile agriculture (mAgri) is facilitating an increase in productivity and profitability for smallholder farmers and the wider agricultural industry.

Mobile network operators (MNOs) have saturated the densely populated urban markets and are looking for new revenue streams. According to the GSMA⁶ tracker,⁷ there are currently 148 mAgri solutions deployed worldwide, a 50 percent increase from the previous year. This trend illustrates how MNOs are leveraging the agricultural sector as a gateway for their expansion into rural areas. There are an estimated 500 million smallholder farming families that support over 2 billion unbanked people,⁸ and at least half of them have access to a mobile phone.⁹ In addition, large agribusinesses recognize the potential of mobile technologies to improve their supply chain management while reducing operational costs. This alignment of the needs of MNOs, smallholder farmers and large agribusinesses presents a highly promising value proposition for MNO-led mAgri business model innovations.

1. FAO, 2009. "How to Feed the World 2050 'Global Agriculture towards 2050", High Level Expert Forum, Rome. 12-13 October 2009, http://www.fao.org/fileadmin/templates/wsfs/docs/Issues_papers/HLEF2050_Global_Agriculture.pdf
2. FAO, June 2012. "World Agriculture Towards 2030/2050. The 2012 Revision", ESA Working Paper No.12-03. <http://www.fao.org/docrep/016/ap106e/ap106e.pdf>
3. UNCTAD, 2015. "The Least Developed Countries Report 2015", http://unctad.org/en/PublicationChapters/Ldc2015_ch2_en.pdf
4. FAO, June 2012. "World Agriculture Towards 2030/2050. The 2012 Revision", ESA Working Paper No.12-03. <http://www.fao.org/docrep/016/ap106e/ap106e.pdf>
5. GSMA, March 2015. "Mobile for Development Impact Products and Services Landscape", <http://draft-content.gsmaintelligence.com/AR/assets/6717456/Productspercent20percent26percent20Servicespercent20Annualpercent20Review.pdf>
6. GSMA is an association representing the interests of nearly 800 mobile network operators worldwide.
7. GSMA, mAgri Deployment Tracker, <http://www.gsma.com/mobilefordevelopment/m4d-tracker/magri-deployment-tracker>
8. Anderson, J. Ahmed, W. February 2016. "Financial Diaries of Smallholder Families", CGAP. http://www.cgap.org/sites/default/files/CGAP_Per-sp2_full.pdf
9. IFAD 2011. "IFAD Conference on New Directions for Smallholder Agriculture: Introduction and Conference Overview", <http://www.ifad.org/events/agriculture/background.htm#1>

Understanding the Impact of Connected Farmer



Connected Farmer enables mobile payments, direct communication between an agribusiness and its small-holder farmers, and business data collation and analysis. This in turn creates changes in the agribusiness's operations spurring multi-faceted outcomes for both the agribusiness and the farmers – leading to increase in productivity and profitability for both.

Connected Farmer Alliance

Connected Farmer is an mAgri solution developed by the Connected Farmer Alliance (CFA), a public-private partnership between USAID, Vodafone and TechnoServe.

CFA was launched in September 2012 to provide a “proof of concept” for a commercially viable mAgri service that would improve operations, cut costs and increase the profitability of agribusinesses in Kenya, Tanzania and Mozambique. Within the CFA partnership, TechnoServe acts as a mediator between farmers, participating agribusinesses, Vodafone’s local MNOs¹⁰ and software developers. TechnoServe plays a key role in facilitating two-way knowledge transfer. It assists MNOs in getting to know their new customer segments and establishing relationships with them, and it also leads a crucial awareness-raising campaign for farmers, educating them about the features and benefits of Connected Farmer. This approach, combined with mapping out individual business processes and identifying challenges, ensures that the product is developed so as to be relevant and adaptable to customer needs.

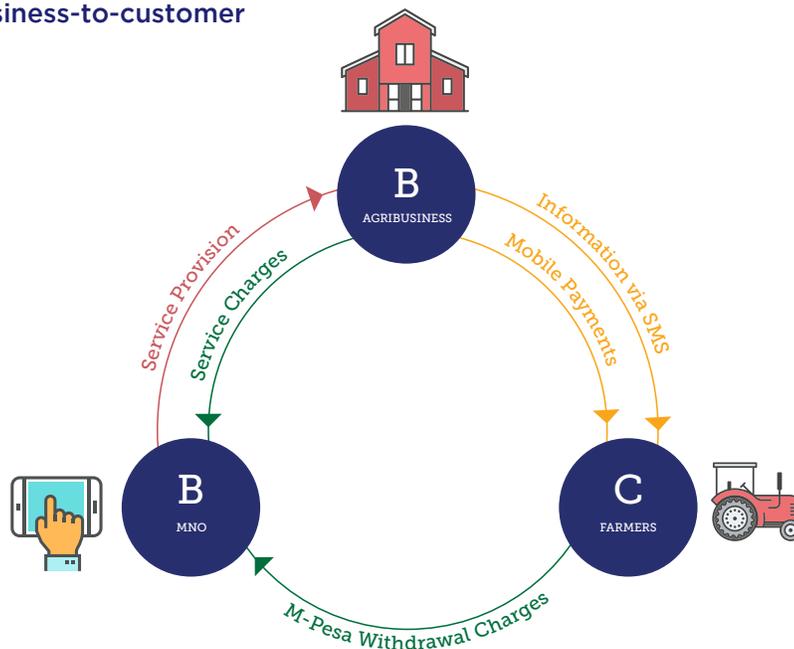
The Connected Farmer platform is a multifunctional, mobile- and web-based supply-chain management system that integrates Vodafone’s M-Pesa mobile money solution. It offers three key modules that

provide transaction, communication and data collection/management capabilities. The modules can be configured into a solution set specific to the needs of a particular agribusiness.

Connected Farmer uses an innovative business-to-business-to-customer (B2B2C) model,¹¹ in which agribusinesses pay the MNO a monthly service fee for each active registered farmer and for transaction charges, while farmers are only subject to the standard M-Pesa withdrawal charges. The benefit of this pricing model is that it does not rely on the low purchasing power of farmers. While Connected Farmer is primarily paid for by agribusinesses, and is therefore significantly driven by their needs, it also boosts the productivity and income of smallholder farmers by facilitating their engagement and improving access to information, markets and finance.

Since its launch in September 2012, eight agribusinesses across Kenya, Tanzania and Mozambique have tested Connected Farmer’s mobile solution. Four of those agribusinesses¹² have transitioned to a full or partial commercial adoption after successful pilot projects. This case study focuses on the impact of a full commercial adoption of Connected Farmer by Kenya Nut.

Business-to-business-to-customer (B2B2C) Model



10. Safaricom in Kenya, Vodacom in Tanzania and Vodacom in Mozambique

11. GSMA. February 2015. 'Agricultural value-added services (Agri VAS): market opportunity and emerging business models'. <http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2015/02/Agricultural-value-added-services-market-opportunity-and-emerging-business-models.pdf>

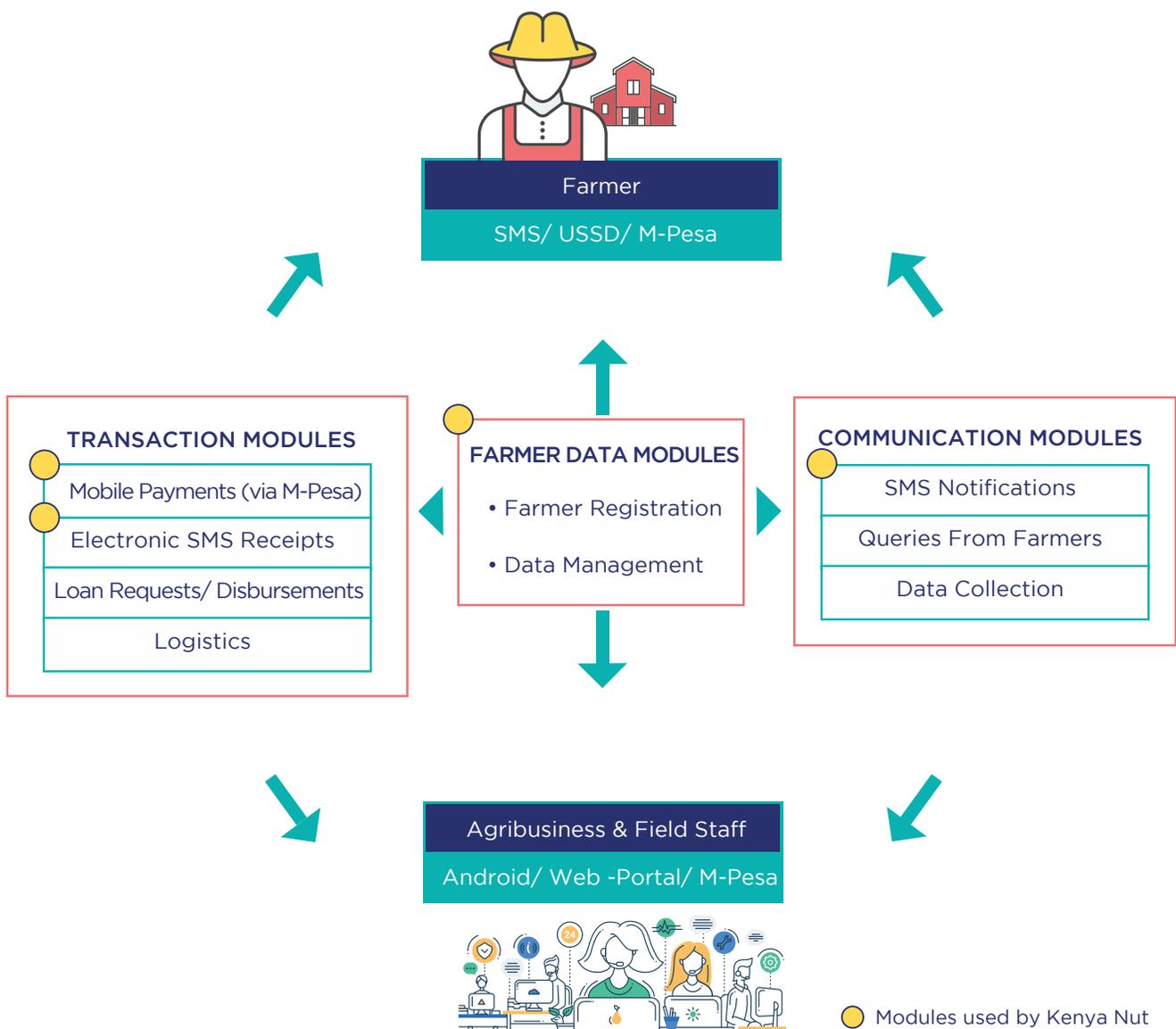
12. Olam and Tanga Fresh in Tanzania; Ndumberi Dairy and Kenya Nut in Kenya

Methodology

Qualitative research to inform this case study was carried out in Kenya during four weeks in February and March 2016. It consisted of semi-structured face-to-face interviews and focus groups, reaching 56 farmers, 5 agents, 14 field staff and 3 senior management members. The open-ended questions used in both interviews and focus groups were designed to evaluate different aspects of the far-reaching three-fold impact of the program as seen and felt by the farmers, field staff and the senior manage-

ment of the business. It also aimed to identify the pertinent challenges and obstacles faced during the implementation process to fully understand and form recommendations for a successful adoption or replication of the system. Qualitative findings were complemented with the quantitative analysis of the available system-usage and cost-benefit data provided by Kenya Nut.

The Connected Farmer mAgri Solution



Case of Kenya Nut

COMPANY BACKGROUND

Founded in 1974 and based in the industrial town of Thika, Kenya Nut Company has established itself as an industry leader and is ranked among the top five macadamia processors worldwide. It employs 182 field staff and sources from approximately 100,000 farmers across five company branches in Central, Eastern and Coastal regions of Kenya. In 2015, Kenya Nut purchased 6,800 metric tons of nuts worth over \$6.6 million. As part of a holistic approach to nurturing the nut industry and providing a quality product, Kenya Nut also grows and distributes an average of 85,000 macadamia seedlings every year, providing them to smallholder farmers at a subsidized rate.

Kenya Nut purchases macadamia through its 154 buying centers in Central and Eastern Kenya. These buying centers are located in close proximity to areas densely populated by farmers and are operated by Kenya Nut field officers and buyers. In the case of the cashew procurement, however, Kenya Nut relies on a local network of agents who buy nuts from farmers and then sell to Kenya Nut. The difference in the procurement process of the two crops reflects the local market and the wider dynamics of the national nut sector, contributing significantly to

the supply chain management challenges faced by Kenya Nut.

KEY VALUE CHAIN MANAGEMENT CHALLENGES

ESTABLISHING DIRECT LINK WITH FARMERS

Farmer engagement and direct communication is one of Kenya Nut's biggest challenges. Relying on the field staff to disseminate information to the farmers is costly, time-consuming and unreliable, and it leads to distorted messages. This results in an information gap about pricing, good farming practices and seedling availability, which has a far-reaching negative impact on nut quality and production levels. The absence of a direct link between the company and the farmers is instrumental in sustaining the current dominance of the brokers in the cashew nut industry, contributing to farmer marginalization and an overall industry decline.

LOSS OF MONEY DUE TO CASH PAYMENTS

Kenya Nut pays suppliers upon delivery at the buying or collection centers. During a peak buying season,¹³ these payments can amount to over \$130,000 per day. Operating a cash-based system with such



Kenya Nut is one of the leading macadamia nut processors worldwide. The company purchases raw macadamia nuts from smallholder farmers in central Kenya.

¹³ Macadamia peak buying season is February to May; cashew nut peak buying season is October to February.

CASHEW NUT INDUSTRY IN THE COAST PROVINCE

The cashew nut is the leading cash crop in the Coast Province of Kenya, an area with few cash crop alternatives. However, despite a recent increase in yields, the cashew nut industry meets only 60 percent of the demand from domestic processors. As a result, Kenya imports raw cashews from neighboring Tanzania at a higher price. The main reason for the low yields is the age of the cashew trees. The low prices for cashews offered by the brokers also demotivates smallholder farmers. Consequently, farmers often do not take care of their trees and instead cut them down for sale as timber. According to Kenya Nut personnel, if this trend continues, there will be no future for the Kenyan cashew nut industry. Various industry-wide initiatives have been employed to rehabilitate the cashew sector, including a ban on raw nut exports, introduced in 2009. In addition to creating added value for domestic processors, this controversial government initiative was meant to protect farmers from exploitation by middlemen by allowing only the National Cereals and Produce Association to purchase from farmers. Opponents, however, believe that the ban has exacerbated the situation for the farmers, by depressing prices even further.

Additionally, in some areas of the Coast Province, farmer incentives are muted by communal land ownership. Without clearly defined land tenure rights, there is little motivation for the farmer to invest in growing crops. As a result, children are often the ones that collect and sell nuts to brokers. The Kenyan government has recently begun to issue title deeds in an attempt to address this situation.

Kenya Nut's senior management believe the key to reviving farmer interest in cashews as a commercial crop is to provide them with higher incomes through increased production quantity and quality. This requires a structural change in which a direct link is established between the farmer and the processor. Kenya Nut personnel see Connected Farmer as being



Cashew nuts being weighed at the Kenya Nut collection center in South Coast.

instrumental in forging this link and bypassing brokers. In the words of Gibson Ndembo, field officer for South Coast branch: "When farmers get registered on the system, they become involved and ready to work together. They feel more motivated." It also creates an efficient channel for communication about the importance of good tree husbandry and market prices. Kenya Nut personnel believe the elimination of brokers will also make it easier for the farmers to co-operate and strengthen their bargaining power, which, coupled with the increase in nut production and quality, will further contribute to higher prices and incomes.

large sums presents a number of risks, including threat of robbery and misappropriation by staff. It also incurs significant operational costs, including bank charges on cash withdrawals, security fees, fuel used for cash distribution and staff time spent on these activities.

INEFFICIENT AND NON-TRANSPARENT PROCUREMENT PROCESS

Another labor-intensive part of Kenya Nut's operations is the procurement process. During each transaction the buyer weighs nuts on manual scales, performs a sample quality check, writes a manual receipt and pays cash. The buyer then records each purchase in the log book and writes a manual delivery note for volume reconciliation upon collection and delivery at the branch. On a regular day during a peak buying season, this laborious and lengthy process leads to farmers queueing for the whole day or possibly having to return the next morning. Consequently, it constrains Kenya Nut's capacity to procure the quantity of nuts it needs.

In addition to the potential for human error in record-keeping, the non-digitized process also provides opportunity for corrupt employee behavior, leading to an estimated 1.25 percent loss based on the difference between purchased and collected weight of nuts. Moreover, the use of manual scales accounts for another 1.25 percent of so called 'moisture' loss, which, according to Stanley Maina, Kenya Nut Operations Manager, can be reduced to 0.01 percent by introducing digital scales.

BUSINESS DATA VISIBILITY AND MANAGEMENT

The aforementioned efficiency gaps mean that managers receive poor information about company operations and production, weakening business decision-making. Kenya Nut management does not have a farmer database and cannot access real-time production and field staff activity data. This impacts heavily on Kenya Nut's staff performance management and hinders the development and implementation of its strategic goals.

IMPLEMENTING CONNECTED FARMER

Kenya Nut decided to pilot Connected Farmer to address these value chain management challenges. Company management believed that by doing so, they could reduce operational costs and increase revenue. The initial discussions between Kenya Nut, TechnoServe and Safaricom — which is partially

owned by Vodafone — began at the start of the program in 2012. After a careful mapping process, it led to the development of the Kenya Nut business requirement specifications. Beginning with a module for the first-time farmer registration — which created a farmer database — it also included a direct company-to-farmer SMS communications channel, a mobile payments system, digital weighing, electronic record-keeping and an SMS receipt functionality. Electronic receipts, triggering mobile payments, also allow Kenya Nut to capture and access purchasing data in real time, contributing to the management team's decision-making.

Kenya Nut's Karatina branch piloted an early version of the system during the 2014 macadamia buying season, adopting registration, communications and SMS-receipt functionalities. During this pilot phase, TechnoServe delivered training activities to both the field staff and farmers to raise awareness and ensure understanding of the features and benefits of the system. The training was particularly focused on mobile payments, which were subsequently tested at the end of the 2014 buying season. At the beginning of 2015, Kenya Nut also launched a full Connected Farmer deployment to Thika and partially introduced the system to other branches. Combined with additional training, this spurred a steep increase in farmer uptake. It led to the registration of over 20,000 farmers and resulted in more active usage of mobile payments in the second half of 2015. According to Stephen Adewole, Head of ICT at Kenya Nut, this provided a proof of its viability. Despite the pilot implementation challenges, it motivated Kenya Nut to fully implement the system during the macadamia buying season of 2016 in the four branches of Karatina, Thika, Embu and Meru. The season started with the refresher training sessions, delivered to farmers and the field staff.

IMPLEMENTATION CHALLENGES

Company-wide adoption of the system has faced and overcome a few crucial challenges during the implementation of the system.

FARMER RESISTANCE

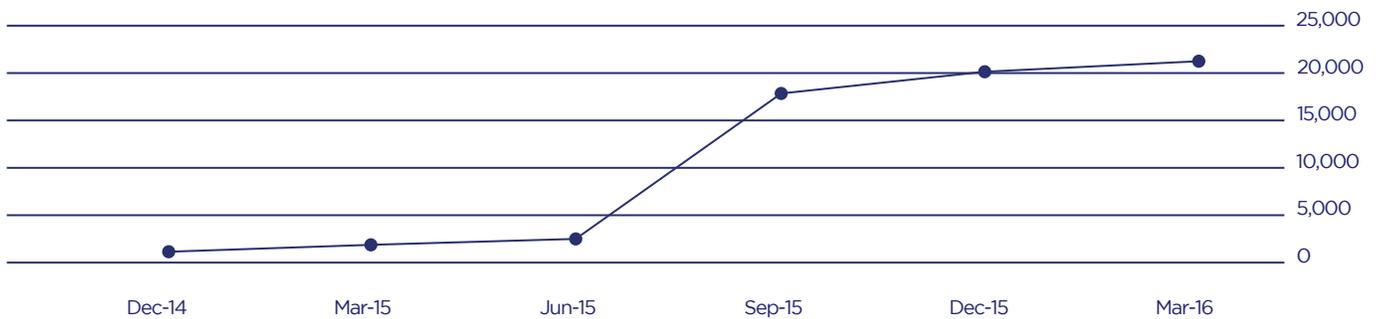
Lack of awareness. Farmer resistance to mobile payments was a main barrier. In this respect, the Kenya Nut case demonstrates the importance of market research into the cash usage and other behavior patterns of farmers,¹⁴ as well as the need

14. Babcock, L. August 2014. "Three Steps to Jumpstart Mobile Finance: Step 1 – Researching smallholders' financial behavior to help them transition to mobile payments," <http://nextbillion.net/three-steps-to-jumpstart-mobile-finance>



Gladys Wanjiru, Kenya Nut Thika Branch Accountant, believes that there should have been more focus on farmers' awareness raising and education about the features and benefits of the system even before its implementation.

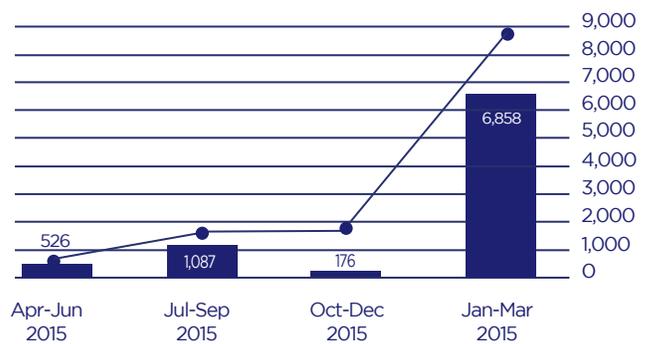
Number of Farmers Registered on the Connected Farmer



Total of Mobile Payments



Number of Mobile Payment Transactions



M-Pesa Receipts

M-Pesa Receipts Cumulative

M-Pesa Receipts

M-Pesa Receipts Cumulative

to promote awareness of, and education about, the features and benefits of mobile money for farmers.¹⁵ A fear of the unknown, a characteristic reluctance to accept change, and a lack of awareness are the main reasons for the initial farmer resistance. Most of the interviewed Kenya Nut staff thought that the approach of introducing the system to the farmers should have been more inclusive and focused on farmer training even before putting the system in place. As observed by Mark Muriithi, Field Procurement Manager at Kenya Nut, farmer uptake in Karatina improved dramatically in mid-2015 after a series of trainings held by Kenya Nut and TechnoServe. Delivered via farmer forums, they addressed the associated fears and distrust and reinforced the message about the benefits of the system to the farmers. Kenya Nut staff now feel that the farmers have come to accept and welcome the system, and the farmers met at Karatina, Thika and Coastal branches did indeed demonstrate enthusiasm for and understanding of the benefits of the system. In the words of Stephen Muthui, Field Officer in Kilifi, “When you educate someone about the importance of the change, they start working with the challenges”.

Phone Ownership. Even though all of the interviewed farmers owned a mobile phone, some Kenya Nut staff identified a lack of phone ownership by farmers as contributing to farmer resistance. Milka W. Kiama, a Kenya Nut buyer in Karatina area, said that around 20 percent of the 300 farmers supplying her with nuts still do not own a phone. In her opinion, however, around 10 percent of those who now own phones bought them as a result of Kenya Nut introducing the system, and this is a development widely seen as a positive contribution towards the modernization of rural areas. Kenya Nut staff believe that mobile payments will eventually replace cash completely, but in the meantime, a cash payment option must remain available in order to accommodate the needs of farmers during the transition. Connected Farmer’s digital procurement system does, in fact, accommodate cash payments and allows for them to be captured on the system.

M-Pesa Withdrawal Charges. Using mobile payments means that farmers incur M-Pesa charges when withdrawing cash from a commissioned agent.¹⁶ Some interviewed farmers, and especially those selling

in smaller quantities, did identify this as one of the obstacles to accepting mobile payments. Kenya Nut management is investigating ways of potentially absorbing or subsidizing the withdrawal fee incurred by farmers.

FIELD STAFF RESISTANCE

Lack of internal capacity management. Kenya Nut field staff are vital to the successful adoption of the system, both in terms of putting it into practice and simultaneously facilitating farmers’ transition. It is therefore crucial to ensure their engagement and understanding. It is a shared opinion among the interviewed field staff and senior management that there was a lack of change management to ensure internal capacity for a successful adoption. Field staff also pointed out that there was not enough clear communication from senior management on the goals and progress of the system adoption. Consequently, it contributed to the lack of understanding and motivation among the field staff, fuelling their resistance to change. However, Operations Manager Stanley Maina is confident that the needed transformation in the staff’s approach to the system has finally happened and they are now accepting of the system.

Staff Dishonesty. Cash payments, manual record-keeping and lack of farmer access to price information impede transparency and create fertile ground for staff corruption. Both senior management and field staff provided anecdotal evidence of buyers cheating farmers on the market pricing and pocketing the difference, thereby damaging the relationship between the farmer and Kenya Nut. Adoption of the Connected Farmer platform provides transparency and thus eliminates opportunity for staff fraud. This partly explains some of the field staff resistance to adopting the system.

INFRASTRUCTURE

In spite of Safaricom’s notable success with M-Pesa, the issue of limited rural network coverage still needs to be monitored, as it was one of the issues most frequently cited by the farmers and field staff. As a result, in some more remote areas, both buyers and farmers have to move around in search of a network signal, and some farmers have to travel to neighboring villages or towns to find the nearest M-Pesa agent. There is, however, widespread agree-

15. Babcock, L. August 2014. “Three Steps to Jumpstart Mobile Finance: Step 3 – Overcoming farmer’s illiteracy, financial illiteracy and lack of trust,” <http://nextbillion.net/three-steps-to-jumpstart-agriculture-mobile-payments-pt3>

16. M-Pesa withdrawals incur charges that are on a sliding scale depending on the amount being withdrawn; the smaller the amount, the lower the fee, but the higher the percentage being paid. For example, fees range from 20 percent to 0.047 percent when withdrawing KES 50 (\$0.49) or KES 70,000 (\$686) respectively.

ment that both the network coverage and associated speed of payments, as well as M-Pesa agent presence, are steadily improving. Indeed, in 2015, Safaricom’s 2G landmass coverage increased from 70 percent to 72 percent, reaching 92 percent of the population. Moreover, the network’s energy failure rate, which Safaricom identifies as the main factor affecting network availability and leading to service delays, dropped from 70 percent in 2014 to 49 percent in 2015.¹⁷ There was also 14 percent annual growth in the number of M-Pesa agents, bringing the total to 91,249 by the end of 2015.¹⁸

CONNECTED FARMER IMPACT

Despite these identified challenges, focus group discussions and interviews revealed an appreciation of the observed and anticipated benefits of the system as seen by both farmers and staff. Interviewees expressed the opinion that the cost or temporary difficulties presented by the system are outweighed by the positive multifaceted impact it has on increasing farmers’ and Kenya Nut’s productivity, incomes and revenues, as well as other intangible benefits.

1. SAVED COSTS

Because Kenya Nut has only just fully adopted the system at four of its branches at the time of this case study, it has not yet fully experienced the actual cost savings the system can offer. However, below is a summary of the estimated potential figures. It is based on the cost, production and transaction data from 2015, provided by Kenya Nut management. The figures indicate that by using Connected Farmer fully, Kenya Nut could reduce other costs by \$228,481 per year. Depending on commercial costs for the system, it is anticipated that Kenya Nut would enjoy net savings of more than \$37,000 in year one, and potentially more than \$150,000 per year thereafter.

2. INCREASED STAFF SAFETY AND WELFARE

While difficult to quantify, the increased safety and security of the cash-carrying and disbursing personnel must be considered. Mobile payments significantly reduce the risk to staff of physical harm, psychological stress and trauma, and death resulting from robbery. Not surprisingly, security was the first aspect identified by all the interviewed field staff. Jared Owuor, field officer at Karatina, referred to mobile payments as a “life-saver.”

3. IMPROVED STAFF EFFICIENCY

Connected Farmer improves staff efficiency by allowing workers to fulfil their responsibilities in less time. Combined with the better staff performance management and improved internal communication, it leads to increased operational performance.

Saved time. Kenya Nut personnel described the following ways in which the system saves time:

- Using mobile payments instead of cash eliminates travel time to collect and distribute cash or arrange security protocols. Buyers also do not need to laboriously search for different denominations to give correct payment amount to the farmer.
- Using SMS receipts and digital scales — instead of manual receipts, purchase logbooks and scales

Cost-benefit Analysis (estimation based on 2015 data)

YEARLY COST SAVINGS	
CASH HANDLING SAVINGS	
Cash withdrawal charges	\$21,202
Security and fuel for cash in transit	\$2,353
Money loss due to robbery	\$6,863
Insurance premium to cover cash in transit	\$15,196
PROCUREMENT PROCESS SAVINGS	
Stationary Cost	\$3,606
Value of weight loss due to manual scales (at 1.24% of purchased weight)	\$81,244
Value of Weight Loss due to Manual Scales (at 1.24% of purchased weight)	\$81,899
COMMUNICATIONS SAVINGS	
Fuel Cost of Field Staff Traveling to Disseminate Information	\$6,118
TOTAL	\$228,481

Yearly Cost Savings is an estimation of Kenya Nut savings that would have occurred in 2015 if the system had been fully adopted.

17. Safaricom, 2015. “Sustainability Report 2015,” https://www.safaricom.co.ke/sustainabilityreport_2015/public/uploads/Networkpercent20quality.pdf

18. Safaricom, 2016. “H1 FY16 Presentation,” http://www.safaricom.co.ke/images/Downloads/Resources_Downloads/Half_Year_2015-2016_Results_Presentation.pdf

— reduces the time a buyer needs to spend on record-keeping and paperwork by around 30 percent, according to Anthony Maryene Thuku, Karatina Branch Manager. The interviewed field officers and buyers believe the time savings to be closer to 50 percent. The digitized procurement process, enabling the real-time capture of purchase volume, quality and cost, also allows for a more efficient reconciliation done by the Kenya Nut accountants.

- The communications module has cut down on the amount of time the staff must spend on travel to disseminate information to farmers. For example, the Thika branch has four field officers that manage ten buying centers, spread over 35,000 square kilometers, making it difficult to cover. In the words of Benson Munguli, Field Officer at Karatina branch: “We used to waste so much time moving from point A to point B, and therefore not achieving our purchase targets for the day.”
- Use of the system also leads to a decreased number of farmer complaints about being cheated on price by buyers and agents or faulty weigh scales. According to Stephen Adewole, not having to deal with farmers’ complaints saves a lot of staff time.
- Readily available procurement and farmer data saves time on data collation and analysis. Mark Muriithi explains: “I used to have to call staff every day, asking for reports and information. Now, I get it at the click of a button.” Stanley Maina concurs: “I don’t need to travel anywhere to gather information. I can get it from the comfort of my desk.”

Improved staff performance management. Readily available, digitized data also enables better management decision-making regarding allocation and monitoring of limited personnel resources. In the words of Stephen Adewole, “There is a performance improvement, because we know who works and who does not, and what they do.” Moreover, field officers now have more time to supervise the buyers.

Improved internal communication. Staff also spoke about Android phones creating a platform for effective and fast communication, facilitating problem-solving and efficient coordination. Benson Munguli said, “We are able to work more efficiently as a remote team. Having smartphones means we can communicate quicker as a group whenever problems arise, and we can solve them quicker and more efficiently. Therefore, I can coordinate the team of



Stanley Maina, Kenya Nut Operations Manager

buyers productively.”

4. IMPROVED DECISION-MAKING LEADING TO HIGHER PRODUCTIVITY

Digitized procurement and farmer data can be easily aggregated and is a potent tool for effective decision-making. This data informs post-seasonal production analysis and forecasting and helps to capture lessons learned and best practices. Farmer data (i.e., number of trees, their age and production quantity/quality history) helps to formulate strategic planning, including — but not limited to — determining the optimal locations for new buying centers. In the words of Stanley Maina, “Data is very important — especially data that is not collected from pieces of paper.” In support of this statement, Stephen Adewole said that farmer details gathered during the Connected Farmer registration have improved Kenya Nut’s farmer database content and accuracy by 90 percent.

5. HIGHER PRODUCTION QUANTITY AND QUALITY

Direct communication using Connected Farmer significantly improves Kenya Nut’s ability to engage with farmers, resulting in higher production quantity and quality. This is achieved in the following ways:

IMPROVED FARMER KNOW-HOW

SMS functionality provides a direct communication channel for delivery of extension information on good farming practices and the availability of seedlings. Moreover, digitized farmer data allows Kenya Nut management to strategically target individual

farmers with tailored extension advice and support. As explained by Stanley Maina, the company can advise farmers about replacing trees with new, more suitable varieties based on the data about the number and age of trees and production levels. Mark Muriithi added that the system also allows Kenya Nut to identify farmers eligible for specific initiatives. He described Kenya Nut's intention to implement organic farming standards and said that the system will help to build a database of eligible farmers.

INCREASED FARMER INCENTIVES

Enabled Bonus System. Kenya Nut management would like to design an incentive program for farmers and plans to use digitized data about production quantity and quality to establish a bonus system. This will not only increase an individual farmer's motivation and income, but will also encourage competition among farmers, which Stanley Maina believes would benefit both the farmers and the industry.

Elimination of Brokers. The drive to bypass brokers reflects Kenya Nut's wider vision, which sees farmers as the company's business partners. One of the largest structural obstacles to achieving this vision is the current dominance of the brokers. Brokers not only pay farmers up to 50 percent less than the prevailing market price, but also encourage early harvesting and other bad farming practices, which lead to reduced production quantity and quality. These broker practices exploit and disincentivize farmers. Nowhere is this more apparent than in the Coastal Province, where most of Kenya Nut's cashews are sourced from brokers and the industry is declining rapidly. Maina believes that by communicating directly with farmers and facilitating their access to the market, Kenya Nut will contribute significantly to industry-wide, government-led efforts to revive cashews as a viable cash crop. When farmers receive pricing information directly to their phones, they know the actual value of their nuts and have more incentive to produce, care for their trees and sell directly to Kenya Nut. This, combined with extension services, will reawaken farmers' interest and motivation for commercial cashew farming and help to increase productivity, quality and incomes.

INCREASED FARMER LOYALTY

Although many farmers stated that the price is the deciding factor when choosing to whom they sell nuts, they also said that benefits they have received from the system have increased their loyalty to Kenya Nut. Farmers appreciate the transparent procurement process that protects them from being cheated by buyers or others who might deliver nuts

to the buying center on their behalf. For this reason alone, they are more likely to sell to Kenya Nut. They also value the convenience of the system. A macadamia farmer in Karatina region named Symon Ngari Wangai said, "A combination of easier procurement process, payment and getting information makes the relationship stronger. I cannot leave Kenya Nut." Anthony Marenye Thuku said, "Price information delivered directly from Kenya Nut senior management to farmers' phones, alongside electronic SMS receipts, brings the concepts of accountability and transparency into Kenya Nut operations and, as such, increases farmers' trust, confidence and loyalty to the company."

SMALLHOLDER MACADAMIA FARMER



Richard Gathogo Mutahi farms two acres of land in Karatina region together with his brother. He grows coffee and avocados, but macadamia provides him with more income and is easier to attend to. He has 18 macadamia trees and earns \$500-700 a year from them. He plans to increase his production by planting 12 more seedlings this year. He sells his nuts to Kenya Nut, where he also acquires his seedlings. Richard's sales to Kenya Nut are his main livelihood. Richard appreciates Kenya Nut's adoption of the Connected Farmer solution because of the improved safety and access to information, and he is particularly happy that Kenya Nut has introduced mobile payments. He says that the timely, secure payments offered by M-Pesa make it easier for him to access farming inputs whenever needed.

Farmer Level Impact

While the deployment of Connected Farmer was driven by the needs of agribusiness, the Kenya Nut case study revealed a number of benefits that also accrue to farmers. Farmers that were interviewed expect the system to contribute to their productivity and profitability increase.

Increased Productivity and Incomes. Increased access to extension information leads to improved farming practices and allows for the increase in farmer profitability. Samuel Rugiri Mugo, a farmer in Mpeketoni, Coastal Kenya, counts on cashews he sells to Kenya Nut as a major source of income. He said that extension information delivered to his mobile phone would help him to improve his productivity and earn more from his cashews. Access to price information and increased transparency in the sales process is also an incentive to produce. Grace Atieno Otieno, a farmer from the neighboring village, said, “It will give me energy to produce more quality nuts, because I’ll know I’m getting the right price and make more money.” Florence Wambui Njoroge, a macadamia nut farmer in Karatina area, demonstrated her business acumen and added yet another example of how price information empowers the farmers: “Price information from Kenya Nut helps me to compare the prices with competition, so I can sell for the highest price”.

Enhanced Efficiency. Mobile payments, digital procurement and direct communication saves farmers a considerable amount of time. Farmers value the fact that mobile money is accessible at all times and saves them from having to travel to the bank. Many interviewed farmers are also making the most of the M-Pesa ability to link their mobile wallets with bank accounts and pay bills, school fees, etc. Farmers also save time by reduced queueing when selling nuts and do not have to waste time looking around for field staff to obtain information. This, combined with an SMS-receipt, facilitated a more accurate record-keeping process, helping farmers to plan their production and assess profitability, and leading to greater efficiency and productivity. In the words of Florence: “Accurate record-keeping is very important, it enables me to plan better. I can go back to my records from the previous year and estimate the price fluctuation for this year.”

Increased Resilience and Financial Inclusion. All interviewed farmers said that using M-Pesa helps them save money by reducing the temptation to spend, and thus fostering greater fiscal discipline and financial management. The unique seasonal cash-flow pattern of smallholder farmers makes the role M-Pesa plays in smoothing out their consumption vital.¹⁹

M-Pesa also paves the way for a greater rural financial inclusion, allowing unbanked farmers to create a financial identity for the first time. Combined with the facilitated process of saving, it leads to greater farmer resilience in the face of emergency expenses, and better supports the farmers’ expansion plans.

Improved Safety and Privacy. Farmers were particularly pleased with the safety and privacy offered by mobile payments. Nearly 80 percent of interviewed farmers (both those paid in cash and mobile payments) favored mobile payments to cash and over 50 percent of them mentioned security as a main deciding factor. In addition to the reduced risk of robbery with mobile money, the privacy conveyed by mobile payments and digitized procurement process is also widely appreciated by farmers. Often farmers feel societal pressure to share their incomes by lending or gifting money to family or relatives, and the privacy offered by mobile payments alleviates that.

Created Feeling of Recognition and Stronger Relationship. Farmers stated that they feel recognized and cared for when they receive direct communication from the agribusiness. Together with the convenience, security and transparency offered by the system, this communication has increased farmers’ confidence and trust, and makes their relationship with the agribusiness stronger. Simon P. Mutahi, a Kenya Nut macadamia farmer in Karatina, said, “It shows recognition of me as a valued customer. Kenya Nut has reduced the distance between me and their management. If there’s an issue, it is now easier to communicate with them directly and get it solved.”

19. Okonjo_Iweala, N. February 2016. ‘Shine a Light on the Gaps: How Access to Digital Financial Services Changes the Future for Smallholder Farmers in Africa’. African Farmers in Digital Age: Overcoming isolation, speeding up change, and taking success to scale. Foreign Affairs, Special Edition. <https://www.gatesnotes.com/-/media/Files/Development/African-Farmers-in-the-Digital-Age.pdf?la=en>

Lessons Learned

The Kenya Nut case offers three key lessons on ensuring that an mAgri solution using mobile payments can be scaled and continue to deliver positive impact.

LESSON 1: Product design and implementation, including education and awareness-raising campaigns, must be informed by the research of farmers' cash usage and other behavioral patterns and contextual enablers and constraints.

The Kenya Nut case highlights the need for the product design and implementation strategy to be informed by a solid understanding of farmer perceptions and behavior. Personnel at the business identified farmers' lack of awareness of the system functionalities and potential benefits as the main reason for slower-than-expected system uptake from the farmers. Although awareness-raising trainings eventually helped to diminish the trepidation associated with the introduction of the mobile payments, the personnel at both companies agreed that the trainings would have been more effective if they had been done earlier. Similarly, a training shortfall was revealed by the farmers who were not aware of the potential to leverage their M-Pesa mobile wallet into access to other financial products and services. This demonstrates that more education was needed to ensure that the introduction of mobile payments delivers impactful rural financial inclusion.

A lack of behavioral research also contributed to Connected Farmer not achieving its gender-balance target of 30 percent women farmers. A product, informed by a thorough understanding, and thus more reflective, of the household and community dynamics would lead to higher rates of women's financial inclusion.

Lesson 2: Change management, grounded in risk analysis and focused on internal goal alignment and capacity building, must be an integral part of the agribusiness's system implementation strategy.

The adoption of Connected Farmer causes changes in internal policies, processes and procedures, often provoking staff resistance. It is essential to understand the roots of such resistance and ensure effective change management to mitigate it. This is a two-fold process. First, it entails identification and clear internal communication on short and long-term system adoption goals and progress, as well as internal knowledge transfer and capacity building. When executed properly, it promotes the staff's technical understanding of the way the system operates and awareness of the benefits it provides. It also rais-

es their motivation and enthusiasm, increasing the probability of the system being successfully adopted. Second, it encompasses development of the risk management strategy, recognizing that the transactional transparency, offered by the system, might create staff disincentives to adopt it, as it curtails a possibility of dishonest behavior.

Lesson 3: Successful implementation requires a strong partnership between the agribusiness and mobile network operator (MNO).

TechnoServe played a key mediation role between the agribusinesses and MNOs. However, the case study indicates a need for a stronger and more direct partnership between the two. With the close of CFA and the exit of TechnoServe in March 2016, this need becomes even more pressing. In order to safeguard Connected Farmer's scalability and sustainability, senior management of both MNOs and agribusinesses must take even more ownership of the process and ensure the continued internal and infrastructural capacity to deliver. For example, both entities must navigate the infrastructural challenges of network coverage and lack of M-Pesa agent presence to enable Connected Farmer's scalability plans.



Grace Atieno Otieno, cashew nut farmer from Mpeketoni, Kenya

Concluding Remarks

Connected Farmer is an mAgri solution that benefits agribusinesses and farmers. It enables agribusinesses to streamline their supply chain management and increase their profitability. It also increases production quantity and quality and therefore household income for the farmers. The Kenya Nut case portrays the commercial viability of the Connected Farmer as a B2B2C mAgri business model innovation. It also highlights a number of lessons learned and best practices for a sustainable and scalable adoption of the Connected Farmer or similar mAgri solutions elsewhere.

While the Connected Farmer service is paid for by the agribusiness, and therefore driven by its needs, farmer acceptance remains crucial for the scalability and viability of the model. In this respect, implementing an mAgri solution unavoidably means facing a widely known challenge: how to best bring about behavioral change amongst the beneficiaries of development interventions. To mitigate farmers' resistance and promote their behavior change, it is vital to first conduct research to understand their perceptions, needs, and contextual enablers and constraints. This research will inform the product design as well as the pre- and post-launch awareness-raising and educational campaigns and ensure farmer uptake, leading to greater farmer-level impact.

It is also important to recognize that behavioral change takes time and might cause short term loss-

es. Kenya Nut management experienced slow farmer uptake as well as increased farmer side-selling and staff turnover as a result of the system integration. In spite of these difficulties, however, they maintained their commitment. Eventually, the perception of farmers as well as field staff began to shift after a few years. As Bill Gates said, "Innovation tends to take longer than many people expect, but it also tends to be more revolutionary than they imagine."²⁰

Farmers, who have experienced the benefit of improved access to information, markets and finance, are embracing and welcoming the change brought about by this mAgri solution. At the same time, Kenya Nut is at the forefront of the rural digital revolution, deriving the benefit of greater overall agricultural productivity. The management's vision and leadership in exploring this opportunity was rewarded with a healthy return on investment.

The Connected Farmer Alliance ended in March 2016. With TechnoServe no longer providing training to farmers and staff, or mediating between agribusinesses and MNOs, scaling the approach will require MNOs to take a lead on further development and delivery of the service. As a replicable mAgri solution, Connected Farmer can be applied across different agricultural value chains that source from smallholder farmers. CFA's success has provided an impetus to Vodafone to continue the service in Tanzania, Kenya and Mozambique, as well as consider rolling it out in other countries in Africa, Asia and Europe.

20. Gates, B. February 2016. 'The Secret Decoder Ring: How Cell Phones Let Farmers, Governments, and Markets Talk to Each Other'. African Farmers in Digital Age: Overcoming isolation, speeding up change, and taking success to scale. Foreign Affairs, Special Edition. <https://www.gatesnotes.com/-/media/Files/Development/African-Farmers-in-the-Digital-Age.pdf?la=en>

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TechnoServe works with enterprising people in the developing world to build competitive farms, businesses and industries. We are a nonprofit organization that develops business solutions to poverty by linking people to information, capital and markets. Our work is rooted in the idea that given the opportunity, hardworking men and women in even the poorest places can generate income, jobs, and wealth for their families and communities. With more than four decades of proven results, we believe in the power of private enterprise to transform lives.

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