CTA

GOING TO SCALE WITH ICTS FOR AGRICULTURE

ABOUT CTA

The Technical Centre for Agricultural and Rural Cooperation (CTA) is a joint international institution of the African, Caribbean and Pacific (ACP) Group of States and the European Union (EU). Its mission is to advance food security, resilience and inclusive economic growth in Africa, the Caribbean and the Pacific through innovations in sustainable agriculture.

CTA operates under the framework of the Cotonou Agreement and is funded by the EU.

For more information on CTA, visit www.cta.int

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GOING TO SCALE WITH ICTS FOR AGRICULTURE
STORIES FROM THE FIELD

*Building viable delivery models for
ICT for agriculture in African, Caribbean
and Pacific countries*

Agriculture is the mainstay of national economies and household incomes in many African, Caribbean and Pacific countries. As we build towards a healthier and more equitable world for people and planet, through the new Sustainable Development Goals (SDGs), the role of information and communication technologies (ICTs) in agriculture is truly significant in everything, from conserving water use to helping secure the livelihoods of rural women.

The huge potential of ICT for agriculture (ICT4Ag), from increasing agricultural yields to helping farmers get a fairer price for their produce, is well documented. Technologies such as SMS applications, mobile banking and satellite data have been used successfully to give agricultural stakeholders access to farm mapping, weather data, marketing tools, financial credit, advice from extension workers, and social networks, among other things.

These technological applications are capable of reaching hundreds of millions of smallholder farmers and stakeholders in rural areas, acting as a catalyst for positive change and in achieving the SDGs. However, limits on their reach include poor internet connectivity in the rural areas of developing nations, high illiteracy rates among smallholder farmers and fishers, and the inability of pilot projects to go to scale due to lack of long-term funding or not having measures for their sustainability built into the programme design.

The Technical Centre for Agricultural and Rural Cooperation (CTA) therefore decided to take practical steps to overcome these barriers and apply ICTs to advance food security alongside sustainable natural resource management. The result is a range of projects which in different ways highlight the potential for the long term and scaled use of ICT4Ag.

It is my hope that this booklet will inspire agricultural stakeholders around the world – from the smallholder farmer to governments and their international trading partners – to further realise the remarkable change that ICTs can effect in the lives of rural and farming communities.

Michael Hailu
Director, CTA

INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTS) HAVE A HUGE POTENTIAL TO BOOST AGRICULTURAL PRODUCTION AND IMPROVE RURAL LIVELIHOODS, BUT PROMISING PROJECTS HAVE OFTEN FAILED TO SCALE BEYOND THEIR INITIAL PILOTS OR TO SURVIVE ONCE DONOR FUNDING ENDS.

To address this shortcoming, in 2014 the Technical Centre for Agricultural and Rural Cooperation (CTA) launched a 14-month, €400,000 project, 'Building Viable Delivery Models for ICTs for Agriculture in ACP Countries.' The project sought to explore the role of ICTs such as mobile phones and satellite data in enhancing agricultural productivity at the level of the individual farmer. It also sought to support the efficiency and accountability of the system within which the farmer operates. Subsequently, a new training project was developed, called 'Apps4Ag Learning Opportunities.'

The two projects invested in seven promising ICT interventions in Burkina Faso, Côte d'Ivoire, Ghana, Mali, Sudan, Trinidad and Tobago and Uganda. This took the form of developing a business model around the ICTs that would ultimately be self-funding, building national capacity around training-of-trainer models, or both.
Ben Addom, CTA programme coordinator, notes:

"Most of the projects we chose were looking at proof of concept. In other words: this is a great idea but will it work in principle and can it be made to go to scale? The results are varied and exciting! Some projects, for example using satellite imagery and SMS to improve irrigation patterns in Sudan, have proved beyond doubt that we can use technology to help farmers increase their yields, and that sustainability is assured because farmers are willing to pay for this service because of the dramatic improvements in their income."

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Learning what works

In the case of the mFisheries project, which supports small-scale fishers in Trinidad and Tobago, the value of the project was in revealing the complex bottlenecks to implementation and in establishing a sophisticated but adaptable smartphone platform and a cooperative network of regional and global partnerships. Based on these core components, stakeholders can now collaborate to move a complicated concept forward – not just in Trinidad and Tobago, but in other island states and beyond. Kim Mallalieu, senior lecturer and head of the Department of Electrical and Computer Engineering, University of the West Indies, says of her experience:

"The mFisheries project was aimed at providing information to family fishers through a mobile phone. However, the main benefit of the project was not the end-user impact, but in informing the framework needed for a sustainable next phase. The project enriched our understanding of the definition and needs of multiple stakeholders, from the fisher to crime agencies tackling drug trafficking. This led to a much stronger foundation being laid, with interest and commitment being generated at national, regional and international levels. This has dramatically broadened the scope of what we first thought to be a national programme for fishers, allowing it to be scaled within the Caribbean."

"However, the main benefit of the project was not the end-user impact, but in informing the framework needed for a sustainable next phase.

Giving a voice to farmers

The CTA project contributes to many Sustainable Development Goals.

Meanwhile, in Burkina Faso the selected project has given a voice to farmers, with ICTs such as blogs, web portals and SMS being used to advocate farmer interests in agricultural policy-making. In several projects, women farmers are the focus of assistance and advocacy work. The resulting increase in income has a direct impact on families and children, with benefits such as mothers being able to invest in their children's education.

In this way, the CTA project contributes to many Sustainable Development Goals; not just those concerned with increasing the agricultural productivity and incomes of small-scale food producers (Goal 2 End Hunger) but also goals and targets concerned with, for example, education (Goal 4), gender equality (Goal 5) and youth entrepreneurship (Goal 8).

The seven ICT projects run across various agricultural sectors, from fisheries to organic pineapple growing. They benefit small-scale fishers and farmers, who in every country context are notoriously hardworking but poor and marginalised, often lacking access to basic services due to their rural location.

Diverse stakeholders

However, a key thrust of many of the projects is a focus on the whole agricultural value chain, so that all actors are served, be they in production, processing or selling of the final product. Ben explains:

"While it is important to build the capacity and livelihood of the smallholder farmer or fisher, what is really clear from these projects is the need to create transparent, accessible systems of information that can support the whole value chain. Where there is transparency of information, for example on pricing, there is more stability in the market, which benefits everyone in the long term. Many of these projects are holistic in that they do not just say that we must benefit the farmer, but recognise that we must also benefit the system so that the farmer's livelihood is assured in a much more resilient way."

Stakeholders are diverse, including government farm extension workers, farmer cooperatives, processors and vendors, ministries of agriculture and water resources, academia and the European Space Agency. The use of ICTs is the common theme; however – recognising the diversity of stakeholders – projects use a range of strategies.

> **We must also benefit the system so that the farmer's livelihood is assured in a much more resilient way.**

These include:

- The provision of market prices via SMS and weekly bulletins, so that buyers and farmers in Côte d'Ivoire know when and where to trade
- Developing a bespoke management information system for savings and credit cooperatives (SACCOs) so that rural farmers in Uganda can manage their finances remotely instead of making a costly and time-consuming trip to their local SACCO branch, or waiting days or weeks for the outreach worker to come to them
- A global positioning system in Ghana for mapping farms that facilitates organic certification.

Looking to the future

As well as successes in individual countries, the project has spurred collaborations between project implementers.
For example, Syecomp in Ghana, which has developed a geospatial farm-mapping service, is looking at two partnerships: with Farmerline in northern Ghana, which offers a subscription service to farmers for agricultural data aimed at increasing their yields, and with eLEAF in the Netherlands, which has used satellite imagery to inform irrigation routines in Sudan.

Individual project successes have led to further CTA projects, again uniting project partners. Ben comments:

"We are implementing a 3-year project with Ensibuuko in 50 districts of Uganda using the eLEAF model of delivering SMSs to provide farmers with weather alerts, tips on when and what to plant and the like, based on satellite data. In all, over 350,000 farmers will be profiled and ICTs used to deliver precise information, with

individual farmers getting advice based on their exact circumstances and location. Public-sector involvement is vital. We are not bypassing government farm extension officers; rather, we are training them and building their capacity. For example, we are providing smartphones to extension workers and farmer leaders, who are then trained in communicating information and advice to farmers."

Youth entrepreneurship is a key part of the 'Building Viable Delivery Models for ICTs for Agriculture in ACP Countries' project. Ben observes:

"Building national capacity in developing ICTs is very much part of the CTA ethos and is a way to support young people's career paths, their contribution to the economy and to agriculture."

To encourage uptake of ICTs in agriculture, CTA will be promoting existing apps through a new database of hundreds of ICT for agriculture (ICT4Ag) apps (http://apps4ag.org/). The apps are mapped along the agricultural value chain (pre-production, production, post-production) and by country, with themes such as harvesting, access to finance and climate issues. Ben concludes:

"What began as a commitment to making progress in seven projects is becoming something really significant! We are really proud of all that our partners have achieved, and for the inspiration and evidence base they have built. This will allow us and others to transform the impact of ICT4Ag in the coming years."

CASE STUDIES

HAND-HELD TECHNOLOGY FOR SURVEYING FARMS TRANSFORMS THE LIVES OF GHANA'S FARMERS

GEOSPATIAL TECHNOLOGY AND AGROCLIMATIC INFORMATION SERVICE FOR SMALLHOLDER FARMERS IN GHANA

Ali Morrison tends his pineapple field. Syecomp's eFarms mapping service has helped him gain organic certification for his farm, and bring health and prosperity to his family.

Ali Morrison, aged 39, his wife and three children were regularly in the local health clinic with complaints associated with the chemicals used on his 4 hectares of farmland. Ali, a pineapple farmer in the Volta region of Ghana, says of the situation:

"Sometimes I cannot work for 1, 2 or even 3 weeks due to stomach complaints and weakness from the pesticides. The whole family is affected. Our farm productivity goes down and it is hard to make ends meet, and the children miss their schooling."

To solve his family's health issues, Ali sought advice from Mary Coleman, an agricultural extension officer for the Ministry of Food and Agriculture. Mary visits 12 farms a week and meets with community groups of up to 200 people to offer farming advice. She also represents the Volta Value Chain Cooperative Union, of which Ali is a member.

Mary explains the many benefits of organic farming:

"As well as protecting Ali and his family from harm by being completely chemical free, organic farming produces fruit with over three times the shelf life – 11 days rather than just 3 days – making them more marketable. Ali will have access to organic fruit buyers in Ghana and internationally, with premium rates of up to twice the price offered for the fruit."

The need for professional mapping
As part of the organic certification process, he needed his farm boundaries and land area to be professionally surveyed. However, this has historically been an inaccurate and time-consuming process conducted by farm extension workers such as Mary with the use of rope and pegs and word-of-mouth testimony.

Certification bodies are increasingly demanding that farms be mapped using technologies that give accurate results, such as a hand-held global positioning

system (GPS) unit, to improve farm records and the traceability of farm produce. Geographic information system (GIS) software is then used to produce a map of the property.

Realising the potential of new technologies in the use of farm mapping, a private company in Ghana called Syecomp developed eFarms, a geospatial mapping service, with funding from a CTA project – 'Building Viable Delivery Models for ICT for Agriculture in ACP Countries' – during 2014 and 2015.

Ben Addom, CTA programme coordinator, comments:

"The CTA project allowed Syecomp to develop a proof-of-concept project to explore business models based on the adoption of GIS/GPS applications on farms and dissemination of agroclimatic information, so farmers can keep abreast of changes needed to farming practices to respond to weather trends or shocks. The idea was to conduct a small pilot and ask: will this great idea work in principle? The answer is: it has been a huge success and has changed the lives of the farmers involved."

Solomon Elorm Allavi, founder and manager of Syecomp Ghana, adds:

"Our role, as well as providing the geospatial data technology, has been to train agricultural extension officers in

Patrick Sakyi of Farmerline and Mohammed Abdul-Fatawu of MEDA Ghana with women farmers from the GROW programme.

the use of GPS and the mapping process. We have developed farm-mapping training manuals for use by various actors in the agricultural sector in Ghana. We have also conducted outreach to farms and communities in order to build trust in our service, which is essential as we are a private corporation and so are not known by individual farmers."

Mary, trained by Syecomp, mapped Ali's farm using GPS and emailed the data to the Syecomp office in Ghana's capital, Accra, where specialists processed the data into maps. Electronic copies of the maps were emailed back to Mary within a couple of hours, and a hard copy followed by courier. The cost of mapping can be as little as €4.50 for a farmer who belongs to a cooperative, or €12.60 for an individual.

Multiple benefits

Most of Syecomp's smallholder farming clients grow cocoa, maize, rice, mangoes and vegetables and live in rural farming communities with very limited access to finance. However, this is now changing, as banks can use the professional farm maps provided by Syecomp to assess a farm's collateral. The funding can be vital to a farmer in buying inputs, such as plastic sheeting to use as mulch.

The extent and volume of such inputs and the subsequent labour required are calculated from the map, as it reveals the true land area and likely plant numbers and yield. In addition, accurate mapping assists in determining the rental cost of a plot. As well as plot size and boundaries, the mapping reveals the locations of properties, boreholes and other points of interest.

The eFarms application means that, for a small fee, the farmer can get access to an electronic copy of the map at any time on his or her mobile phone. The eFarms app overlays the map onto the latest satellite imagery so both the farmer and the farm extension worker can see the current state of vegetation and whether the crop is healthy or needs attention. Farmers can claim insurance compensation if there is a drought in their area by using the eFarms imagery and the farm map as evidence.

Solomon explains:

"We use satellite imagery for vegetation monitoring for both smallholder and large commercial farms. This is where eFarms is a really practical application, as the mapping helps make sense of the satellite imagery by delineating farm boundaries

within an otherwise largely unquantifiable photograph taken from great distances."

Enhancing food security

Geospatial technology can also help maximise productivity of the agricultural sector, which makes up 22% of Ghana's gross domestic product (GDP). Increased domestic food production is vital due to the high cost of food imports.

Ben notes:

"The CTA/Syecomp pilot has implications not just for individual farmers like Ali but for the country as a whole. The use of geographic information in agriculture is critical in promoting social and economic development in Ghana and protecting food security and the environment."

This is reflected in Ghana's Growth and Poverty Reduction Strategy, which recognises that long-term increase in farm productivity will depend upon the application of research, science and technology to agriculture.

Value-chain stakeholders

So far, 440 farms have been mapped in the Central, Eastern and Volta regions, allowing numerous farmers to transform their livelihoods through organic

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> ### *We give information to agricultural input firms on market opportunities by providing them with cluster maps of their potential farm customers.*
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certification. This certification has allowed individual producers to expand their production, creating employment for rural women and youth in particular.

After the success of the pilot, there is now the potential to target 120,000 farmers across the country, based on the use of the eFarms technology platform by agricultural extension workers and farmer leaders who are selected to represent their communities.

Solomon notes that Syecomp also works with other stakeholders in the agricultural value chain:

"We give information to agricultural input firms on market opportunities by providing them with cluster maps of their potential farm customers, for which they pay a fee. The eFarms app is able to connect 3,400 input dealers with our farmer clients. We also use eFarms to disseminate produce prices, which is of

use to many different actors in buying and selling farm products."

Building trust with the government has been key for Syecomp, and indeed the Government of Ghana has been inspired to develop a Geospatial Data Infrastructure Policy with input from Syecomp. Solomon says of Syecomp's contribution:

"We have valuable expertise we can offer based on using a combination of tools, including GPS, data from remotely piloted aircraft, commonly known as drones, and a user-friendly computer-based application for the end user. And, of course, we have all our experience gained on the ground through feedback from trainings, farm extension workers and farmers themselves."

Future plans
One of the direct outcomes from the proof-of-concept project is creating awareness and changing attitudes on the use of geo-information products to improve farm productivity among smallholder farmers. Farmer cooperatives in Ghana have expressed interest in collaborating with Syecomp to improve production planning.

Syecomp will provide them with regular farm-mapping services and data that can be used to determine, for example, the yield potential of producing farms, which will help them in negotiating with produce aggregators and buyers.

Solomon continues:

"Easy-to-use hand-held GPS units, continuous training opportunities and scaling up the deployment of Earth-observation technologies for vegetation monitoring will have an impact on the development of the agricultural sector in Ghana. We are developing the use of remote-sensing technologies to provide vegetation monitoring and generate historical and forecast data for crop yield, water availability and weather modelling. This will directly benefit commercial farmers, with a trickle-down impact on smallholder farmer cooperatives."

Meanwhile, 6 months on from Ali's decision to farm organically, the mapping process is complete and he has received his organic certification. "We have abundant, high-quality pineapples that always sell and a better standard of living. Best of all, my family is healthy and well".

After the farm was mapped by Syecomp, a mango farmer receives real-time field information about her farm from Solomon Elorm Allavi, founder and manager of Syecomp Ghana.

SAVING WATER AND QUADRUPLING CROP YIELDS IN SUDAN VIA AN SMS SUBSCRIPTION

SATELLITE-BASED ICT FOR IMPROVED CROP PRODUCTION IN THE GEZIRA IRRIGATION SCHEME IN SUDAN

Ahmed Ibrahim Wakea Allaj, age 76, is a farmer in Sudan, the "bread basket of Africa", so-called because of its extensive land mass and water resources. With a smallholding of 8 feddans (3.4 hectares), Ahmed is one of 130,000 farmers with land in the Gezira Irrigation Scheme in the east of the country. This is one of the largest irrigation projects in the world, at almost 1 million hectares. Farms benefit from water that is gravity fed along canals from the Blue Nile River down the rich soil slopes.

In recent years, the productivity of the Gezira farms has declined, partly due to poor irrigation management. The 2013/14 season, running from November to March, was one of the worst Ahmed has encountered. He harvested just 23 sacks of wheat (about 2 tonnes), which cost him more to produce than he could sell them for. The result was a loss of 9,000 Sudanese pounds (€1,350).

Fortunately for Ahmed, he was one of 44 farmers recruited for a pilot project funded by the CTA project, 'Building Viable Delivery Models for ICT for Agriculture in ACP Countries.' The project was implemented by eLEAF, based in the Netherlands, and the Hydraulic Research Centre (HRC) in Sudan, a directorate of the Ministry of Water Resources and Electricity Remco Dost, senior project manager and hydrologist at eLEAF, comments:

"The director general of HRC, Yasir Mohamed, is also associate professor of water resources management at the UNESCO-IHE Institute for Water Education in the Netherlands. I had met him on several occasions and we had talked about collaborating on a joint project in Gezira. The CTA project provided us with the perfect opportunity and we got more dramatic results in a much shorter time than we ever anticipated."

SMS messages give irrigation instructions

The area of each of the 44 farms was first determined in an initial assessment. eLEAF monitored satellite imagery of Ahmed's farm and the surrounding areas. They combined this with meteorological data from local weather stations and field-level data collected by staff from the HRC and the Gezira Scheme's agricultural inspectors (extension service officers).

The information is used to produce irrigation advice in the form of a clearly worded SMS instruction in Arabic such as "You need to irrigate in 5 days from now" (most farmers in the Gezira Scheme are literate). Information on crop development helps farmers to monitor their fields and informs farm management decisions. This and further information is available through the project web portal, which is used by government farm extension agents to

> ## We got more dramatic results in a much shorter time than we ever anticipated.

identify potential problems and advise farmers. The farmers are visited weekly to help answer any queries about the SMS service.

Where previously farmers had chosen to irrigate their land every 15–20 days, the project advised watering more frequently: every 8–17 days. To irrigate, farmers open small gaps in the canal bunds (earthen dams) adjacent to their field, allowing the water to flow onto the land. They close them after the soil is soaked. Remco notes:

"Satellite images allow us to assess water use in large areas and how productive that water is in producing biomass (kg of crop dry matter production per week).

We use over 40 images a day to monitor irrigation schemes at a national level and ask how much has the crop grown per drop and do we have maximum production?

"We can tell if the crop is stressed and, combined with the weather forecast, we can evaluate increased crop stress caused by upcoming drought. Or if there is water present and the plant is still stressed, then you know that you should inspect your crops to assess if there is a pest or disease, or soil- or nutrient-related issues. The objective is to stop the crop from getting stressed and to produce the maximum with the resources available and within the boundary conditions of the climate and soil conditions. What we found with Ahmed's farm is that he was irrigating too infrequently, the plants were getting too dry, then they would become wet-stressed from the sudden watering. We therefore sent him and his fellow farmers an SMS telling them when to irrigate."

Surprising results
Although the farmers were irrigating more often, a surprise finding was that, overall, farmers were using less water. Because they irrigated more often, the farmers instinctively reduced the irrigation time.

After a year of following eLEAF's SMS advice, Ahmed's production had increased almost fourfold. In the 2014/15 season, Ahmed harvested 96 sacks of wheat, generating an income of SDG38,400 (€5,700) and a net profit of SDG22,400 (€3,360). Amgad Khalifa, research assistant at HRC, adds:

"What's more, by continuing with the same irrigation pattern, there were

One of the major canals in the Gezira Irrigation Scheme in the east of Sudan.

cumulative gains for the 2015/16 season. The crop gets stronger and gives more, so the impacts really are far reaching."

Global trends in Earth observation
The project in Sudan is an example of the enormous uptake of Earth-observation services in recent years, with governments, businesses and other actors understanding the value of the data generated. Remco elaborates:

"In 15 years, there will be more than 9 billion people on the planet, and proper water and crop management are key to providing food security for everyone. We need high crop productivity using the resources available, and monitoring and management are essential to achieving this. Earth observation can provide timely, unbiased and quantified information on crop productivity globally."

While the project in Sudan has focused on the national government and smallholder farmers as the key partners, other eLEAF customers include international financial institutes for the evaluation of large irrigation schemes and commercial clients such as breweries, wineries and sugar farms.

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Satellite images allow us to assess water use in large areas and how productive that water is in producing biomass.

"

Farmers with land in the Gezira Irrigation Scheme in the east of Sudan are shown how satellite images can provide vital information on irrigation patterns for their farms, via eLEAF's SMS service.

eLEAF also works with the European Space Agency doing demonstration projects to raise awareness of Earth-observation services. Remco adds:

"We started life as a consultancy firm specialising in the provision of technology, but our focus now has turned to provision of high-quality information services to support sustainable water use, increase food production and protect environmental systems. We aim to become a global reference point."

Scaling up from 44 to 1,000 farmers
The Sudan pilot worked so well that neighbouring farmers who were not part of the project replicated the practices. The next step is to scale up the project with many more farmers, this time charging farmers a fee, albeit less than 2% of their crop income.

Amgad comments:

"Farmers are very enthusiastic. They are the validators of the project, and see the SMS service as paying for an input that is as important as the seeds themselves."

A key learning has been the importance of establishing an integrated approach with the government to ensure the project's success.

Remco explains:

"Doing the project institutionally and involving partners such as HRC has been really important because once the pilot is proved to be successful you already have interest and buy-in from the government, and ultimately it is the actor that can make a large-scale programme happen. You have to include local value-adding partners – only they can educate local stakeholders and understand local markets and local conditions. That is vital in explaining the benefits of the service to local people."

The next phase of the project will focus on 1,000 farmers in an area of 40,000 hectares which is fed by one major canal. Yasir says of the start-up phase:

"Initially, we want to know how much water is supplied versus how much is consumed. We will select 10–20 minor canals, and sample the water supply and use at the head of the canal, at its middle and at its tail. And then we will sample

the tertiary canals running off each minor canal. Again head, middle, tail. That will give us a good idea of water delivery and use."

However, there are important questions to be answered as part of the research for the next phase.

Yasir explains:

"In year 2 we will deliver the ICT services to farmers, but if 1,000 farmers all irrigate at the same time as a result of receiving an SMS, how do we control the water supply? There are critical questions concerning the challenges and opportunities of such an expansion. Would the canal capacity cope? We would need to establish forms of water rotation and supply/demand scheduling, which will be a vital part of the planning."

If all goes well there is the potential for a third phase in year 3, which will see use of the technology scaled up even further, with up to 10,000 farmers.

Yasir adds:

"If we do this successfully and to scale, it could bring major changes to the region, with improved water management, reduced water consumption, increased production for farmers and a huge impact for the region in terms of food security and environmental management."

Remco agrees:

"We are basically taking 1 million hectares with a productivity problem and showing what you can do with ICTs to make a significant impact in the right direction".

For further information:
eLEAF: http://www.eleaf.com/
Hydraulic Research Centre Sudan:
http://hrc-sudan.sd/

USING DIGITAL DATA TO CREATE A FAIR TRADE ETHOS FOR FOOD PRODUCERS IN WEST AND CENTRAL AFRICA

ECONOMIC INTELLIGENCE TO IMPROVE PERFORMANCE OF THE AGRICULTURAL SECTOR IN BURKINA FASO, CÔTE D'IVOIRE AND MALI

In 2008, Julien Gonnet, a geographer and information and communication technology (ICT) expert, conceived a project to offer market information services to agri-food chains in West and Central Africa.

Eight years later, Julien's dream is reality and he is spearheading the project at the non-governmental organisation (NGO) RONGEAD, with support from the CTA project, 'Building Viable Delivery Models for ICT for Agriculture in ACP Countries.' The CTA funding allowed Julien to develop a secure business model that does not require development aid for its sustainability but offers the possibility of attracting investors for a profitable venture.

The SMS and information service provides market data and other information to farmers and agricultural stakeholders, primarily in Burkina Faso, Côte d'Ivoire and Mali. For example, a producer in Côte d'Ivoire may receive an SMS that reads "Buyers are leaving the country, the end of the sales period is approaching. You are advised to sell the rest of your cashew. Price: 500–550 CFA/kg, trend downward."

Julien cites two examples that clearly illustrate the benefits of the service:

"In Burkina Faso we would go out into the field and ask producers if they wanted to subscribe to our SMS service or weekly e-bulletin. I remember one producer who was adamant he did not need the service. However, he later found out that he had lost nearly €180 as a result of selling his sesame at a low price, instead of storing it until the price went up, as we had advised. The cost of a subscription was just €0.07 a month and he subscribed after that.

"We had another case in Ferké in the north of Côte d'Ivoire where a producer, Eugène Coulibaly, was regularly selling his cashew nuts through a middleman. The merchant was saying the price was going to drop and that Coulibaly needed to sell to him immediately. Meanwhile a friend of the farmer, who subscribed to the SMS service, said, 'No, he is wrong, the price is due to go up, wait and you can sell at a better price.' But Coulibaly did not listen and was furious with the middleman (and, of course, with himself!) when our bulletin was proved correct."

Predicting market prices
RONGEAD works in West Africa with its sister NGO N'Kalô Agricultural Information Services. N'Kalô collects data using a network of over 300 informants in West Africa who work at multiple nodes of the agriculture value chain, from the farmer to the international level. The aim is to predict market prices within the next 1–12 months to allow farmers and other stakeholders to plan the buying, selling and storing of stock.

Sékongo Soungari, N'Kalô market analyst, notes:

"Three country analysts based in Burkina Faso, Côte d'Ivoire and Mali were funded by CTA to collect and process data on a weekly basis. The cost of collecting quantitative and qualitative information from the informants is very low – they give us relevant information in exchange for information that is of interest to them. For example, a trader will give us their prices and volumes in exchange for information on international produce markets.

"We then issue a bulletin to buyers, processors, exporters and international buyers about various agricultural value chains and use the data for the SMS service. The bulletin is approved each time by an international market analyst and its predictions consistently help stakeholders to make better business decisions. This stabilises the value chain, so prices are not as volatile."

The data N'Kalô acquires are verified in two ways: horizontally – by asking the same question of the same type of stakeholder, such as growers – and vertically – by verifying data across members of the value chain, for example, by asking a farmer how much cashews were sold for and a vendor how much they were bought for.

Julien comments:

"This transparency and verification of data is the first level of accountability to all actors in the value chain and underpins the philosophy of fair trade, which ensures prices are not being inflated and that the famer is getting a fair price. Both farmers and buyers benefit because we can predict prices and tell a famer to sell now as prices are falling, and we can tell a buyer that prices are rising and they should seek out stock now."

Collaboration with Orange
In Côte d'Ivoire, the telecoms company Orange has created an agricultural service for farmers that uses the information that N'Kalô researches and supplies. The daily message service costs 103 CFA Francs (€0.16) per month, which is cost effective based on an averageannual income of around

> **Both farmers and buyers benefit because we can predict prices and tell a famer to sell now as prices are falling.**

Cartoons are used to educate farmers about the benefits of the N'Kalô service

320,000 CFA Francs (€488) for a 2-hectare cashew farm.

While at first it proved difficult to get producers to subscribe to paid services, the market price predictions have proved so accurate than an unforeseen loss or gain has precipitated many new customers.

Julien observes:

"With CTA support we were able to make the initial subscription free of charge as we needed to prove the value of the service. But now subscribers have first-hand experience of the accuracy of the predictions on market prices, and so are happy to pay to subscribe."

The OCPV (l'Office de Commercialisation des Produits Vivriers or Office for Marketing Food Produce) in Côte d'Ivoire promotes the SMS service to its members.

Julien comments

"It is in the interests of the OCPV to promote our service as it wants its producers to

succeed and do better, and it has confidence in the quality and timely nature of our information to help achieve that."

Meanwhile in Burkina Faso, N'Kalô has independently established the SMS service rather than it being provided as a subcontracted service of a phone operator, as is the case in Côte d'Ivoire. The Burkina Faso service produces 30 SMSs a year for a paid subscription of €0.88 a year.

Training and communications
N'Kalô trains stakeholders on knowledge of agricultural markets, operational issues, factors influencing market prices and how to take best advantage of price fluctuations. In all, eight training modules were funded by CTA. N'Kalô has so far trained 400 train-ers of trainers in Côte d'Ivoire, promoting the benefits of the SMS service, and how to access it, to 20,000 smallholder farmers. The training uses a series of cartoons, providing accessible training for farmers, some of whom are illiterate. Each training module focuses on two or three value chains, including cashew, maize, onion, sesame and shea.

The project uses a variety of communications techniques for both dissemination of data and advocacy, including SMS, radio advertisements, newspaper articles, weekly e-newsletters and traditional griot singers in rural markets.

Across the three project countries (Burkina Faso, Côte d'Ivoire and Mali), CTA has supported the training of nearly 8,000 producers and has disseminated information on the service to almost 50,000 stakeholders. The marketing of the service was also funded by CTA, with the aim of helping the service become self-financing.

The service is now being expanded into new territories, such as Chad, Gambia, Senegal and Sudan, and now has 67,000 SMS customers in West and Cen-tral Africa. In addition, N'Kalô has over 1,000 subscribers to its weekly market newsletters, including sub-scribers from Europe.

A holistic approach to the value chain
RONGEAD is unusual in that its conception of a value chain goes beyond the narrow focus adopted by some NGOs.

Julien explains:

"Exporters are often forgotten in the value chain, especially by NGOs working in this field. This is a huge mistake. NGOs will take an ideological stance to defend producers, on the basis that small-scale farmers are often poverty stricken and have little access to education and healthcare, for example. However, this puts their needs in conflict with other actors in the value chain and there is an adversarial stance taken with actors such as exporters. At RONGEAD, we believe that, for a value chain to function well, everyone has to work hand in hand and everyone has to benefit.

"Whereas before there was information asymmetry between seller and buyer, there is now transparency of information right across the board and accountability to each other. In that way, the system is forced to be more ethical and fair in terms of pricing and the movement of stock. Ultimately, everyone benefits as the system is more predictable and sustainable."

Sékongo agrees:

"If one single actor has information and no one else, then it means that other actors in the chain are not functioning as well as they could. What we want to see is that all are empowered and have ownership of the success of the sector."

International impact
RONGEAD is contributing to national strategies and policy submissions on products it deals with. For example, the Government of Côte d'Ivoire recently asked the NGO for input into a new strategy for growing and marketing cashew nuts.

There are around half a million producers of cashew in Côte d'Ivoire, mostly family farmers, with cashew hedges on plots from as small as half a hectare up to 20–30 hectares. An incredible 95% of cashew nuts are sent for processing overseas to countries such as India and Vietnam, and the government is therefore keen to move this business to within its borders.

The African Cashew Alliance (ACA) estimates that a 25% increase in cashew nut processing within Africa would generate more than €88 million in household income, improving the lives of the rural poor. Côte d'Ivoire alone could gain up to €112 million in export revenue if it boosts its annual processing capacity to 100,000 tonnes of cashews by 2020 (currently, 500,000 tonnes of cashews are exported raw).

> *Whereas before there was information asymmetry between seller and buyer, there is now transparency of information right across the board and accountability to each other.*

A farmer surveys his cashew trees in Côte d'Ivoire.

RONGEAD submitted recommendations, now adopted by the government, for the nuts to be processed in country, adding value to the end product. As a result of this work, a processing firm in Côte d'Ivoire has tasked RONGEAD with undertaking training activities and quality tests for cashews so that they can secure high quality cashews from farmers for processing. This is being linked to a certification scheme that will guarantee the size of the cashew nuts by using a kernel output ratio. In addition, N'Kalô is now collaborating with ACA to provide commentary on the cashew market, which is disseminated to a pan-African and international network.

It is this expertise across the whole value chain that makes RONGEAD's data so versatile and impactful.

Julien explains:

"We have a very dynamic vision of how a value chain operates and have gained significant expertise over the years. We know how to make data accessible and useful, not just to farmers but to political actors as well, and also internationally."

Julien explains that there is a small value chain for cashew nuts in Côte d'Ivoire but it is connected to the international market. Improving the product through processing, for example, can have a significant impact on stakeholders in Côte d'Ivoire and is a key to development for the farmers involved. While there is already an international market for cashews, the market is influenced by changes affecting other nut varieties. For example, the market for cashew in Côte d'Ivoire is affected by the huge almond-growing industry in California.

Julien continues:

"Why? Because if there is a drought on the west coast of America and almond production is down and the price of almonds increases, then the European consumer will buy cashews and the price and demand for cashews will rise in Côte d'Ivoire.

"The key point is that we try to see the biggest possible picture in terms of local, national and global markets, so that our data can have the greatest impact."

Ben Addom of CTA concludes:

"One of the greatest impacts of this project, which resulted directly from the CTA seed funding, is the rich networks that it mobilised to enable the project to be more sustainable."

> *We have a very dynamic vision of how a value chain operates and have gained significant expertise over the years.*
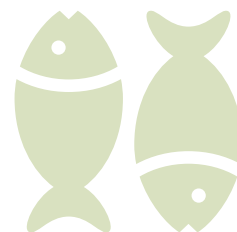
For further information:
RONGEAD: www.rongead.org
N'Kalô: http://www.nkalo.com/

An N'Kalô trainer in action with local farmers

SUPPORTING STAKEHOLDER COOPERATION WITH A SMARTPHONE APP IN TRINIDAD AND TOBAGO'S SMALL-SCALE FISHING INDUSTRY

INTEGRATING ICTS INTO THE SMALL-SCALE FISHERIES VALUE CHAIN

Amanda Suraj, field assistant at The University of the West Indies (UWI), tells the story of her husband Joey, a fisherman, who was attacked by bandits:

"Pirates boarded his fishing boat in the Gulf of Paria, west of Trinidad, stole the boat and threw him and his crew member overboard. He managed to swim for an hour, his fellow sailor on his back, until he reached a ship, where they clung to the anchor chain. Their cries for help went unheard until early the following morning, when a patrol boat spotted them."

Had Joey had UWI's new mFisheries app on his phone, with its SOS facility, this incident could have been averted. One of the most significant concerns for fishers in Trinidad and Tobago is safety at sea in terms of piracy, which is rampant as a result of the fisheries' proximity to drug trafficking routes. Most incidents happen within 7 to 10 miles of the shore, where there is cell coverage.

Addressing this concern was the original concept for the development of the mFisheries app, but what the project unearthed was the hidden complexity of the scope, scale and potential of the programme and its impact not just on fishers but on numerous other stakeholders. Kim Mallalieu, senior lecturer and principal investigator of the Caribbean ICT [information and communication technology] Research Programme (CIRP) in the Department of Electrical and Computer Engineering, UWI, explains:

"We started with this really simple idea – let's use ICTs to help fishermen avoid harm and increase their catch. It was that simple. Then only a few weeks into the project we realised it was about so much more than that.

"It was about how to get an engineering department at a university to conduct social research – something we had never done before. It was about how to persuade fishermen, some of whom are illiterate, to accept and use a smartphone. It was about identifying an Android phone that is robust enough to survive life at sea – we are still looking for the perfect phone!

"It was about building the capacity of a complex interdisciplinary staff team from multiple backgrounds, including fisheries, ICTs, training, academia. And it was about contextualising the simplicity of a mobile phone app within the complicated political context of fisheries, with stakeholders as diverse as international crime agencies and environmentalists!"

Reaching fishers when every day is a fishing day

The project began when the Ministry of Science, Technology and Tertiary Education (MSTTE) asked UWI to develop a mobile application as a training tool that could help to build the livelihoods of fishers. In conjunction with the Caribbean Fisheries Training and Development Institute, the MSTTE had previously tried to deliver training to fishers but they would rarely attend because they could not afford the potential loss of income from a catch that day.

Amanda comments:

"The community has an expression, 'every day is a fishing day, but not every day is a catching day.' The pressure is immense to always be on the water. Boys start fishing at 12 and miss their education, as a result of which most fishers are illiterate. My father fished from that age."

The International Development Research Centre, Canada, supported the design of the initial mFisheries app. The CTA project, 'Building Viable Delivery Models for ICT for Agriculture in ACP Countries,' then funded further development to make the app scalable and adaptable to other geographic jurisdictions, the number of end users, the type of end user and functionality.

The programme started with a simple survey of 542 fishers. This revealed a number of issues that an app could address, a key one being that, when fishers come ashore with their catch, buyers always set the price.

Amanda explains:

"Fishers felt at the mercy of the buyers, so we developed an app called Got Fish

Amanda Suraj, University of the West Indies, looks on while fisher Errol uses the mFisheries app at sea in Tobago.

> **When we explain what happens when we conduct a mission, the fishers have been able to understand the challenges we have in finding them at sea.**

Need Fish. But it failed because it did not take account of the human relationships involved. For example, the fact that the fisher depends on traders not just for buying the catch but for ice and for transport. There could be 50 to 100 fishers in a small port but only 3 to 10 traders, so it is not an equal dynamic or a straightforward exchange of fish for money, it is far more complicated."

What this exercise revealed was the interdependence of the relationships within the fishing industry.

Kim notes:

"It turned out we were identifying problems at the system level in the small-scale fishing industry, rather than operating at the level of fisher outreach, which we had initially thought would be a key thrust of the project. In the end, we simply did not have the capacity to reach many end-user fishers because our attention became focused on conceptualising, understanding and mapping the complexity of such a project, so that it can be taken forward effectively."

Uniting stakeholders
Understanding the complex relationships between the various stakeholders is something that the project was later to capitalise on.

The mFisheries app is a valuable tool not only for fishers but also for various branches of the government. The app

can be set up to feed information to the fisheries cooperatives and ministries responsible for fisheries management. With the permission of fishers, these agents can track the location of fishing boats and work out which areas are being over- or underfished. They can determine fees to charge for fishing in co-managed areas, such as those around buoys or floats in the ocean used to attract fish. Information on fishing patterns is of critical importance in policy-making and in formulating rules on using common marine resources.

Another user for the app is the Coast Guard. With few boats and personnel but huge areas of sea to patrol, the Coast Guard is overstretched. The SOS alerts from the mFisheries app come with accurate GPS coordinates, so they can dispatch a boat to the right place quickly. Fishers can report suspicious vessels that might be smuggling drugs to or from neighbouring countries. Georeferenced photographs help with fisheries protection and pollution surveillance.

Getting fishers to sign up for this was a challenge. Coast guards are traditionally suspicious of the fishers, as they believe they may be involved in

illegal trafficking of, for example, drugs and arms. The fishers can respond antagonistically. Delano Henry, chief petty officer, Trinidad and Tobago Coast Guard, explains:

"The project enabled us to develop relationships with fisherfolk. Having a personal rapport with them and having them get an appreciation for what is required for the Coast Guard to conduct a search-and-rescue mission has been invaluable. Through our interactions with them over mFisheries, we have been able to explain in clear terms the impact that a lack of information has on search and rescue.

"When we explain what happens when we conduct a mission, the fishers have been able to understand the challenges we have in finding them at sea. The ability to locate and track a boat from a search-and-rescue standpoint is so important to us that there is reference to mFisheries in the 2015–2020 Strategic Plan of the Trinidad and Tobago Coast Guard."

Users of the mFisheries app sign a pledge to pass tracking information of their boats to the Coast Guard. This increases understanding and trust between fishers and the Coast Guard and improves cooperation.

The mFisheries suite

As well as an SOS and tracking function, the mFisheries app offers other features such as navigation, weather and tides, first aid instructions, alerts, a camera and market price data.

A guiding principle of the project is that fishers themselves need to drive the process and be provided with support to understand and access services. It is important they can understand the benefits and persuade others to use the app. Fishers attended informal workshops at UWI to contribute to the app's design. The mFisheries app was then taken into communities for training

and sensitisation. This was conducted by a full-time field liaison officer funded by CTA.

The app created gave fishers options for tools they were already familiar with and would find practical and useful, such as a compass. It also delivered information that they already use, such as the weather and tides, but in a more timely manner. Exposure to communications functions, such as SOS alerts, and collaborative aspects, such as transactions with Got Fish Need Fish, built up the fishers' ability to capitalise on ICTs to support their trade.

Kim observes:

"A big part of UWI's interest was exploring the use of the mFisheries intervention to guide fishers through a pathway to digital literacy, as a way to ensure they are not left behind. However, this is a part of the project which is yet to be fully explored."

Candice Sankarsingh, instructional and multimedia designer at CIRP, found field work with fishers insightful:

"The project has answered a lot of questions for me in terms of what will work and what won't work when it

Kim Mallalieu, University of the West Indies, conducts field research with fishers.

A fisherman secures a day's catch.

"

The project has answered a lot of questions for me in terms of what will work and what won't work when it comes to an engagement platform design for Caribbean fishers.

"

comes to an engagement platform design for Caribbean fishers. There are distinct and indigenous traits that could only be discovered and uncovered from living through the intended users' frustrations with, and reactions to, mFisheries."

Regional and global scope
mFisheries is the first pilot of its kind in the world. "There was nothing like this before mFisheries," says Kim. "A USAID mFish project started after ours, so we really were the first to test all this out."

The initiative has since inspired the formation of a regional and global network. An ICT4Fisheries consortium has been established between CIRP and key partners from UWI's Department of Computing and Information Technology and Centre for Resource Management and Environmental Studies, as well as the Caribbean Network of Fisherfolk Organisations and the Marine Research Institute at the University of Cape Town, South Africa.

The free mFisheries app is now available for countries in the Caribbean

and around the world to use in their own fisheries sectors, thanks to the support from CTA. Once a country has set up a tracking and SOS alert system with local authorities, the app is ready for use. Developers can also extend or adapt the software for their own purposes.

The mFisheries app can be adapted for use in other jurisdictions: land boundaries are easily configured; connections can be made between mFisheries users and the local authorities through country-specific SOS and tracking; contact information for local search and rescue and other agencies can be tailored; and local authorities can view and manage incidents at sea on a private web portal.

Recognising that many countries share economic, political and cultural ties, mFisheries is built so that the application in one country can be administered from another country, and SOS and tracking information from different countries can be easily exchanged and viewed.

The project secured its key objective to produce a scalable, reconfigurable app for fishers.

Kim concludes:

"Ultimately we have asserted the relevance of electrical and computer engineering in creating significant social and economic impact, particularly with regard to small-scale fishers who face so many issues regarding the sustainability of their livelihoods. The most exciting result is the potential impact of the project beyond the Caribbean. To support small-scale fishers in so many potential contexts will be very rewarding."

AGRIPOL WEB PLATFORM SUPPORTS AGRICULTURAL ADVOCACY IN BURKINA FASO

PUBLIC QUESTIONING OF THE MONITORING AND IMPLEMENTATION OF AGRICULTURAL POLICIES USING ICT IN BURKINA FASO

The use of information and communication technology (ICT) in agriculture is well established in Burkina Faso. However, according to Sylvestre Ouédraogo, president of Yam Pukri, a development NGO, "the benefits have low visibility as projects tend to be short term and disappear with donor funding".

Sylvestre was determined to change this and create a sustainable ICT platform in Burkina Faso, one that would give a voice to small-holder farmers to create more inclusive agricultural policies. In particular, it would strengthen the contribution of farmer organisations in policy development and debates, and help them to lobby for the implementation of those policies.

The CTA project, 'Building Viable Delivery Models for ICT for Agriculture in ACP Countries,' funded Yam Pukri to develop its Agripol farmer advocacy platform, to train stakeholders on digital advocacy and toreach into communities with specific campaign messages.

Supporting provincial growers
Yam Pukri works with the leaders of organisations of various sizes, from the CPF (Confédération Paysanne du Faso, the smallholder farmers' federation in Burkina Faso), which boasts over 300,000 members, to FUGCOM-Bam (Fédération des Unions Groupements et Coopératives Maraîchères du Bam, a federation of vegetable growers' unions in Bam), which has 328 members, 60% of whom are women.

FUGCOM-Bam chairman, Théophile Assane Sawadogo, on his family farm.

FUGCOM-Bam chairman, farmer Théophile Assane Sawadogo, runs a family business growing vegetables for hotels in Burkina Faso's capital city, Ouagadougou. Théophile established UGCOM-Bam with three friends when he graduated from his agricultural studies.

He explains:

"We realised that if we were producing individually we could not meet the quantities required by hotels, but together we can easily supply them. So

establishing the federation opened up new markets for us."

The work of Yam Pukri has been important to furthering one of Théophile's key objectives: to fund the building of a shop for agricultural producers in Kongoussi, the capital of Bam, by raising the profile of the needs of farmers in the region. Farmers in the province produce a wide range of crops, including onions, tomatoes, green beans, aubergines, garlic, okra, cabbages, potatoes, mangoes, bananas and papayas,

but had no major outlet for their produce in the capital. The shop (pictured on right) is currently under construction, with partial funding having been secured from the French Embassy's social development fund. The building comprises a shop for growers to sell their produce, a second shop where growers can purchase seed treatment products and small farm equipment, and a meeting room for use by the FUMCOM-Bam management committee and members.

Yam Pukri helped FUGCOM-Bam to produce an information video on fruit and vegetable production in Bam, which is hosted on the Agripol website.

> "
>
> *It is helpful to work across sectors with a common goal of social development. For example, our advocacy around schools helps young people understand new technologies and innovations in agriculture.*
>
> "

The target audience for the video includes Burkina Faso's Government and stakeholders in the agricultural value chain from farmer producers to retail buyers. In the video, smallholder farmers deliver various advocacy messages, from the need for an outlet for produce and access to credit to purchase farm machinery, to the benefits of mobile phones in facilitating communication with buyers from Ghana and Togo.

Théophile says of the video:

"Yam Pukri's support has enabled us to become more visible. It is very simple. Members of my organisation and other stakeholders who become familiar with Yam Pukri's platform and its information on agriculture make more progress with their businesses and have a stronger lobbying voice as a collective."

Théophile remains ambitious, explaining that his next project will focus on the link between agriculture and ecology

in Burkina Faso. "They need to be developed side by side to ensure human and environmental sustainability, and I will certainly be involving Yam Pukri in furthering the understanding of that," Théophile concludes.

Promoting locally grown rice
As well as conducting advocacy at a provincial level, Yam Pukri also advocates for specific produce. Rice is one of Burkina Faso's top imports, costing the country €65 million a year. In 2015, around 520,000 tonnes of rice were consumed in Burkina Faso, 300,000 tonnes (58%) of which were imported. Sylvestre urges:

"Burkina Faso must invest more in rice production but also in committing to buy locally grown rice. The country could save millions of dollars spent on imported rice, and could contribute to food security and combatting poverty, especially among rural women who are often involved in rice growing."

Farmers are filmed for an advocacy video.

The 2014/15 season was difficult for rice producers in Burkina Faso. Their organisation, UNERIZ (Union Nationale des Etuveuses de Riz du Burkina Faso, the national union of rice steamers) had over 2,000 tonnes of unsold rice due to the massive importation of rice in previous years (rice imports into Burkina Faso increased by 70% in 2012). Consequently, small-scale rice farmers and cooperatives were no longer able to sell their stocks.

Awa Ouédraogo, 35, had harvested rice valued at 2 million CFA Francs (€3,000). However, with local rice costing slightly more than imported rice and because consumers do not always recognise the quality of local rice, Awa could not sell his production through UNERIZ. To address the poor sales of local rice, the CIRB (Comité Interprofessionnel du Riz du Burkina, an interprofessional committee on rice), which is mandated to be the go-between among actors in the rice value chain, launched an advertising campaign using billboards and television broadcasts to encourage people to buy local rice. Yam Pukri supported the campaign by posting the CIRB posters on websites and social networks. This helped widen the reach of the campaign beyond the urban centres where the billboards were displayed.

With CTA's support, Agripol advocated for the consumption of local rice through social networks, producing a documentary, Local rice product marketing difficulties in Burkina Faso, which highlighted the problem of women farmers in marketing their rice, and urging consumers via humorous posters in urban centres to purchase only locally grown rice. Speaking about the success of the campaign, Sylvestre Ouédraogo comments:

"Our advocacy on rice production touched thousands of people and put pressure on

Shop for agricultural producers in Kongoussi, which is currently under construction. The building comprises a shop for growers to sell their produce, a second shop where growers can purchase seed treatment products and small farm equipment, and a meeting room for use by the FUMCOM-Bam management committee and members.

the government and civil society. As a result, several NGOs have decided that 50% of the budget allocated to the food served at their meetings and seminars must be used to buy local produce, including rice. There are now more than 10 local companies producing juices bas-ed on local commodities to meet this demand."

Yam Pukri also works on advocacy with other sectors, including the education sector.

Sylvestre Ouédraogo explains:

"It is helpful to work across sectors with a common goal of social development. For example, our advocacy around schools helps young people understand new technologies and innovations in agriculture. Even if young people do not directly apply these innovations, this knowledge can influence their future career and even the practices of their parents, which can be improved."

The project has been so successful that the advocacy platform is now being expanded across Africa, heralding a pan-African forum, which will advise farmers' organisations about cross-border trading. Ben Addom, CTA programme coordinator, comments:

"We provided seed funding to Yam Pukri to enable them to raise more funds to conduct their advocacy work. This was a small project from which we were not expecting big results but which would be the start of something significant. So we are delighted to find out there are already plans for a pan-African platform. That is quite something!"

For further information:
Yam Pukri: http://www.yam-pukri.org/
Agripol: http://agripol.faso-dev.net/
FUMCOM-Bam advocacy video:
http://agripol.faso-dev.net/spip.php?article62

USING TECHNOLOGY TO BRING FINANCIAL SERVICES TO RURAL FARMERS IN UGANDA

TRAINING ON DIGITAL FINANCE AND MOBILE BANKING FOR FARMER-BASED FINANCIAL INSTITUTIONS IN UGANDA

Gerald Otim, 29, is the son of a single mother. At the age of 10, Gerald began growing and selling tomatoes to help his mother support him and his two siblings.

Gerald recalls:

"I started a market stall in front of my mother's house, and I was so excited that I could earn money for the family. By age 11, I had earned enough to buy two cattle of my own."

Gerald was a determined young man, but being from a poor family he had to fund his own education.

Gerald continues:

"While I was at university, I would travel hours by bus to help on my mother's farm and then study by torchlight on the bus journey back to university the next night. I also did brick laying and charcoal burning to make ends meet."

By the time Gerald was 24 and out of the university, he had set up his own microfinance cooperative to help other young people in his community with their own income-generating initiatives. Three years later, he co-founded Ensibuuko with his business partner David Opio, going on to win CTA's Uganda AgriHack Talent initiative and the CTA East Africa regional hackathon in Rwanda.

It was during the national hackathon that Gerald conceived MOBIS, a mobile money product for farmers, which is linked to community rural finance

Gerald Otim, co-founder of Ensibuuko, presents the principles of digital and mobile banking at a workshop.

service providers known as savings and credit cooperatives (SACCOs).

Gerald explains:

"Mobile money was already popular in Uganda, as a means by which people can add a cash credit to their phone via roadside mobile money agent's booths. They then pay for goods and services just using their phone. So I extended this concept to create a mobile wallet for smallholder farmers – I would have enjoyed using that as a young boy!"

The hackathon award from CTA gave Ensibuuko a grant, including 6 months' business incubation at the Outbox information and communication technology (ICT) innovation hub

in Kampala, Uganda. Outbox helps upcoming technology entrepreneurs with workspace, mentorship and training programmes. Gerald received valuable coaching support and mentoring from several mentors such as Michael Niyitegeka, an academic and senior member of the ICT Association of Uganda.

CTA invited Gerald to attend several of its workshops to build Ensibuuko's credibility and benefit his learning and networking. These included the Fin4Ag conference in Nairobi, Kenya, in 2014 and the 3-day High-Level Conference on Agricultural Transformation in South Africa in 2016.

Attracting high-level interest

Ensibuuko has now bundled several applications into one product. These include the mobile wallet, a management information system (MIS) for SACCOs, training on digital finance and a portal to manage personal finances. However, there were issues with internet connectivity, as Gerald explains:

"An MIS with this level of innovation, with mobile banking embedded in it, needs good connectivity. However, internet connectivity is so poor in some areas of Uganda. There is no 3G [which allows internet data], only 2G GSM [allowing only voice and SMS], so any cloud-based storage of data is difficult to manage. As a result, other organisations competing with us are offering locally based software but it cannot connect between regional branches – which the SACCOs need – and it cannot offer mobile banking. We therefore needed to partner with a telco [telecommunications company], but it is so difficult to get in front of them."

Gerald had a lucky break when he attended the Nairobi conference in 2014. Eddy Sam Komaketch, a senior cooperatives officer from the Government of Uganda, attended Gerald's presentation about his plans for Ensibuuko. He was so impressed that he invited Gerald to present to senior staff from the Ministry of Trade, Industry and Cooperatives (MTIC).

Eddy comments:

"I know for sure that SACCOs will benefit greatly from this project. Good technology is hard to find. And even harder to comprehend. I like that Ensibuuko is addressing the issue through a digital finance literacy programme."

The MTIC has its own SACCO offering banking services to its staff and now uses Ensibuuko's MOBIS system.

Perhaps more significantly, as a result of Gerald's increasing profile, he was approached by telco companies wanting to collaborate.

Gerald explains:

"Normally, you could only work with third-party licensed providers of the telcos who take all the revenue. But because we had already proved the concept, telcos came to us with offers – it was incredible! And that is what the CTA funding allowed us to do – to prove our idea could work in practice."

Ensibuuko partnered with Airtel Uganda, a mobile communications and information technology services provider in Uganda. Airtel established a 2G network at their data centre especially for Ensibuuko, allowing MOBIS to access all the services needed.

Gerald explains:

"Airtel provided us with unique SIM cards which enable access to only their 2G system, and which give remote access to our server but to no other internet services. So it is cloud-enabled, but only to access our data – not the general internet. This arrangement provides protection from hacking as we have a private line which goes directly to the Airtel server rather than going via the internet."

Helping farmer finance

Many people in Uganda do not have access to financial services such as savings and credit facilities. This is where SACCOs come in, bringing financial services to rural communities and farmers – 82% of people in rural areas are employed in agriculture. There are 5,200 SACCOs in Uganda serving over half of the population. The Government of Uganda praises SACCOs' role in helping individuals to acquire

land, pay medical bills and school fees and expand businesses, and for their significant role in reducing poverty.

Alfred Tokwiny, branch manager in the Gulu and Hoima districts of Uganda for the Allied SACCO, was the first to pilot the MOBIS software. The CTA 'Apps4Ag Learning Opportunities' project, which trains potential and existing end users of mobile apps to increase their uptake, funded the design of a training module for farmers on how to use the MOBIS app, including a training-of-trainers module. The module is a simple design, with 5% text and 95% visuals to overcome issues of illiteracy among farmers. In all, 25 SACCO staff were trained and subsequently ran workshops for thousands of farmers in their communities.

The Allied SACCO has 50,000 members and 15,000 have now subscribed to MOBIS for a fee of 200 Ugandan Shillings (USh) (€0.05) per month. Alfred takes up the story:

> *I know for sure that SACCOs will benefit greatly from this project. Good technology is hard to find. And even harder to comprehend.*

We used the first MOBIS prototype and it was terrible! We realised we needed end users to be involved so I introduced Gerald to our SACCO clients and ran co-creation workshops. One of the first things to come out of this was that the seven menu items originally installed were too many, so they were reduced to five. Second, we realised that many farmers borrow a phone and so we could not link the service to a phone number, but needed an ID and password."

Gerald continues:

"I had no background in finance so I had to make sure the Commissioner for the Cooperatives Department and the local government approved of the package as regulators. We are constantly updating MOBIS in line with new regulations so that it is always compliant."

The service has many clear benefits for both farmers and SACCOs. For example, transport costs are so high that farmers could not afford to visit a SACCO branch to pay in their cash. Instead, a SACCO field officer would travel by motorbike to collect payments. Farmers could wait days for such visits, and this service added to the overheads of the SACCOs. MOBIS overcame this problem, but there were still barriers to the programme, including technological literacy and financial barriers.

Gerald explains:

"Farmers wanted to know why they should use it, how they would use it and why they should pay. They were also confused and concerned about how a mobile phone could 'transmit' money to their SACCO savings account. It made no sense, as it was totally out of their experience."

Alfred agrees:

"The reaction was not positive when we first went into the field, but after we had trained farmers and they saw live examples of how to use the system, they became excited and could see how it would

work for them. After explaining that they could now transact among themselves and make payments via their phones, credited using the mobile money booths that are dotted all around, they were excited and could see this made sense."

Agriculture employs more than 70% of the working population in Uganda, and 77% of working women are employed in the sector. Alfred explained the significance of MOBIS for his female clients:

"In areas of Uganda that were affected by conflict, many men are not working and women are the main breadwinners through their farming activity. However, these women need a safe way to save money, as if cash is left in the household it is spent on alcohol by the men, not on food and essentials for the family. MOBIS gives women farmers a way to quickly and easily place their cash in a bank account which only they can access."

Alfred now conducts advocacy work with other SACCOs, explaining the

benefits of the service, including the advantages for female farmers in particular. Other SACCOs are equally enthusiastic. Margaret Irumu, Gerald's mother and member of Olio SACCO in Soroti, Uganda, comments:

"As a member and board representative of a SACCO, I am excited about digitisation. In as much as I desired software for my SACCO, I was worried that since many of my members are illiterate they may struggle to embrace it. But after attending the community demo workshop I have no doubt that my members understand how to use their phone to bank with my SACCO."
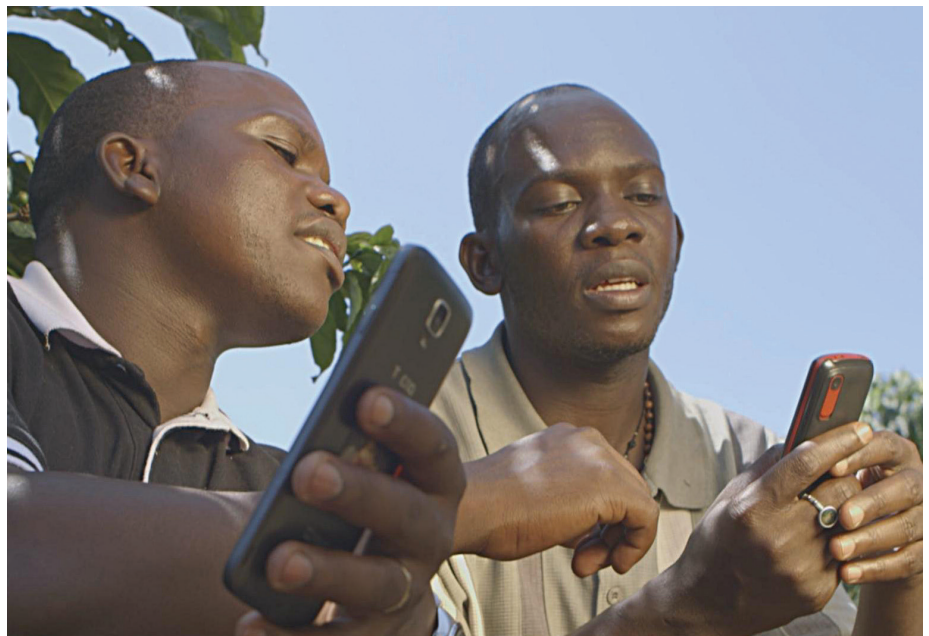
For further information:
Ensibuuko: http://www.ensibuuko.com/
MOBIS: mobisapp.net
Fin4Ag conference 2014:
http://www.fin4ag.org/en/
Outbox Hub: http://www.outbox.co.ug/

An Ensibuuko staff member explaining the principles of MOBIS to an interested farmer.

Patrick Sakyi of Farmerline and Mohammed Abdul-Fatawu of MEDA Ghana with women farmers from the GROW programme.

EMPOWERING WOMEN FARMERS IN GHANA WITH INFORMATION

IMPROVED INFORMATION ACCESS FOR SMALLHOLDER FARMERS AND DATA COLLECTION SIMPLIFIED

> *Before Farmerline, women had very little access to agricultural information. We now send women messages on the weather, the best agronomic practices to maximise yields.*

Agriculture in Ghana is dominated by small farms, operated by over 76% of rural households.

However, there is huge gender inequality in agriculture. Among farms of less than 2 hectares, for every one owned by a woman, three are owned by men. Only one in 10 larger farms is owned by a woman. The Government of Ghana recognises that, while women produce nearly half of the food grown in the country, they are consistently left out of land-ownership provisions. As a result, these women are at an increased risk of losing their source of food, income and shelter.

Empowerment of women smallholder farmers is therefore high on the agenda. A new service, MERGDATA by Farmerline, has been supporting women farmers by providing agricultural information via mobile phone and is reaping promising results. The CTA 'Apps4Ag Learning Opportunities' project funded a series of workshops to train users and potential users of the service.

MERGDATA provides agricultural advisory services through voice messages in local languages. These messages include weather forecasts, advice on good agricultural practices

and market price information. MERGDATA also provides data-collection tools for organisations and stakeholders who work with farmers.

One such organisation is Mennonite Economic Development Associates (MEDA), which runs a 'Greater Rural Opportunities for Women' (GROW) project in the Upper West region of Ghana to assist women farmers with their soybean production. The area is badly affected by extreme poverty and there is great gender inequality, with half of young women illiterate, for example.

Benedicta Bayuo, 41, grows 0.8 hectares of soybeans and 0.4 hectares of peanuts in the Lambussie-Karne District in the Upper West region. Benedicta's growing conditions are challenging.

She explains:

"We are very weather dependent. The north of Ghana has one short rainy season, June to August, whereas there are two rainy season in the south. So, if you miss the rain, you have to wait a whole year to grow produce and your livelihood that year is ruined."

This is why the Farmerline service is so vital to women like Benedicta, as they can receive a voice call advising them of forthcoming rains and prepare to plant.

Benedicta explains:

"I get all my seeds ready, and then when I get a weather message on my phone saying the rains are about to happen I can quickly rush out to plant. The one episode of heavy rains will be enough to support germination of the seed."

Mohammed Abdul-Fatawu, value chain officer, MEDA Ghana, adds:

"Before Farmerline, women had very little access to agricultural information.

We now send women messages on the weather, the best agronomic practices to maximise yields, and information on market prices, so in various ways we are maximising their yields and the price they receive. The project is about empowering women economically as well as providing improved food security and nutrition."

Prior to using the Farmerline service, a 0.4-hectare plot may have produced three sacks of legumes such as soybeans, but now produces five or six sacks. That means that after some is consumed by the family, there may be four sacks to sell, with the income reinvested in the farm or the family. The MEDA GROW project targets only female farmers.

Mohammed explains:

"Many of the women are married, but it is well known that increasing the livelihoods of women will directly benefit the family and children, whereas if you target men with income-generating activities, the money is dissipated and is not used to support the family."

> "
> *I get all my seeds ready, and then when I get a weather message on my phone saying the rains are about to happen I can quickly rush out to plant.*
> "

Farmerline provides hands-on training on their service.

This is evidenced by the decisions made by Benedicta in choosing how to invest her additional income.

Benedicta says proudly:

"I have used the increased proceeds from farming to pay for my 20-year-old daughter to go to the College of Nurses and Midwives and to support the education of my younger children."

Meeting farmer needs

MEDA approached Farmerline to develop a product to meet the needs of farmers. Farmerline's service is based upon communicating in local language via a voice call to a mobile phone. A message is translated from English (Ghana's official language) into one of four local languages: Sisaala-Piina, Sisaala-Tumu, Waale and Dagaare. Patrick Sakyi, Farmerline monitoring and evaluation associate, observes:

"At first we were very excited by an SMS service we developed for Ghana's fish farmers. Then we realised that our target audience did not read or write! So that was an important learning process but one easily fixed. We know that many farmers are illiterate and so voice calls are a must. They are also more friendly and the service is seen as part of their community as it is in their local language."

The calls are pre-recorded but are delivered as live phone calls. This was another important learning curve for the project, as Patrick explains:

"We also discovered that if we left a voice message rather than deliver a voice call, it was too complicated for the famers to access their messages. All they have to do to hear a live call is press one button – it is quick and easy."

Voice messages are purposefully short – less than a minute long – as research showed that people stopped listening if they were longer. If phone connectivity

The Farmerline service is vital to women like Benedicta Bayuo, 41, who grows 0.8 hectares of soybeans and 0.4 hectares of peanuts in the Lambussie-Karne District in the Upper West region of Ghana.

is poor, the service will redial five times. If the women farmers have a question about the message or another issue related to the farm, they can call the Farmerline Centre in Kumasi, Ghana, and an in-house expert will call them back. The service receives around 10 such queries a week, with questions on subjects as diverse as pest control and finding the best traders to sell to.

The service also allows groups to be created so that, for example, a message group can be created for farmers in and around a particular village, or those growing similar crops.

Sustainability

Farmerline set the price for MERGDATA at US$1.20 (€1.13) per month for its full three-tiered service with weather, best farming practices tips and market prices. This gives farmers an information service 4 days per week. Once MERGDATA was live, the question was how to get it to the end user.

This is where CTA's support came in. The GROW project trained 109 female lead soybean farmers with CTA support. It subsequently trained a further 406 female farmers, bringing the total number female farmers trained to 515. Each of these farmers trained a further 25 peers, reaching almost 13,000 farmers.

Farmerline's MERGDATA technology is also currently being used to support global food companies, governments and agribusinesses with farm management, communication, data collection and traceability tools. This will help them to better manage their network of over 200,000 smallholder farmers and the entire supply chain across five countries in Africa: Cameroun, Ghana, Malawi, Nigeria and Sierra Leone.

Patrick comments:

"This project is very simple to scale up to more farmers in more countries as there is no more investment involved other than for the training. As we are using a training-of-trainer model with agricultural extension workers and lead farmers, it is sustainable and cost effective."

For further information:
Farmerline: http://farmerline.org/
Agripol: http://agripol.faso-dev.net/
MEDA GROW project:
http://meda.org/wew/wew-women-focused-projects/41-greater-rural-op-portunities-for-women-grow-ghana

3 Stories from the field

GOING TO SCALE WITH **ICTs FOR AGRICULTURE**