PRECISION AGRICULTURE
The tools and data for a smart farming approach

INTERVIEW
Jean-Michel Severino highlights the opportunities in agribusiness

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SPORE N°185

EDITORIAL

Modernising agriculture for a prosperous future

Michael Hailu, director – CTA

Many people may not easily imagine a smallholder farmer in Africa making use of modern ICTs, but this is changing with the rise of affordable mobile phones and increased accessibility to satellite data. In Africa, 81% of the population has a mobile subscription and 362 million people use the internet, many of whom are farmers. Facilitated by partnerships among mobile service providers, governments and development organisations, farmers in ACP countries are increasingly able to harness the potential of ICTs to maximise their productivity and profitability.

Unmanned aerial vehicles, or drones, are used to gather extensive data on the state of farm crops, which helps farmers to better plan their farming activities and to more effectively use inputs. In this edition of *Spore*, the potential that drones and sensors hold for precision agriculture is examined in the *Trends* article, which highlights CTA's work to establish drone operators in five different African countries.

Technology is also helping prove to young people that agriculture has a future in the modern world and attracting them to work in the sector. Young agribusinesses offering farmers advice via text and voice messages, or connecting them to different markets and traders through their phones, are being supported by CTA's Pitch AgriHack! initiative. In the *Publication Interview*, Ken Lohento, CTA's ICT4Ag Programme Coordinator, describes the challenges and opportunities for young entrepreneurs launching ICT agribusinesses.

One particular challenge for young people, especially women, working in agriculture is access to financial services. Mobile banking has vastly improved access to finance in rural areas, as highlighted by the *Dossier Analysis* and *Field Reports*. Not only are mobile applications allowing farmers and agribusiness owners to make and receive payments without needing cash or travelling to the nearest bank, but farmers can also receive financial advice and loans via their phones.

Availability of agricultural data provided by ICTs can also be used to provide private sector players with evidence of profitability for investing in smallholder agriculture. The data can be used for index-based insurance for farmers, which was discussed extensively at a recent conference organised by CGIAR, Syngenta Foundation, CTA, and the KfW Development Bank on the margins of the UN climate change conference in Bonn, Germany. The *Finance* article summarises some of the key challenges and opportunities raised at the event and we will be covering this issue in more depth in a forthcoming *Dossier* article.

PRECISION AGRICULTURE

A smart farming approach

Precision agriculture promises better returns to investment and improved livelihoods for farmers around the world. One of the biggest changes in agriculture in our lifetimes, it is spreading to developing countries, where smart farming technologies, including data collected from satellites and drones, are set to finetune the way farmers grow their crops.

Wendy Levy

For centuries, farmers have planted and harvested according to ancient seasonal patterns, using traditional knowledge to warn of droughts and floods that could threaten crops and livelihoods. Now, farmers are taking a giant step into the future with precision agriculture. Using smart technology, today's farmers can manage their farm from a laptop to remotely control tractors installed with GPS and instruct distant crop watering systems to turn on and off. Sensors can be placed in fields to measure soil and air temperature and humidity, and drones and satellites used to collect and analyse data to help inform how farmers fertilise and tend their crops. The new methods augment local knowledge rather than replace it, providing cost-effective and highly accurate ways to predict and protect the growth of agricultural crops.

Using real-time information collected by control centres to decide when to plant, fertilise and harvest, farmers in developed countries are harnessing technology to look at data on weather, soil and air quality and crop progress. Equipment and labour costs and availability are analysed to ensure that the right number of people and machines are available at the right time. There has also been a rapid increase in the use of unmanned aerial vehicles (UAVs), or drones, but the technology also promises change for agriculture in ACP nations, as drones provide valuable and highly precise data that can save farmers time as well as money. Other smart technologies are spreading to developing countries where the benefits of precision agriculture could be a boon to farmers struggling with the dual vagaries of weather and markets.

Precision agriculture provides the tools and data for deep analysis of farming practices on individual farms and in regions and countries. To analyse a farm, information about the soil and water and land features allows farmers and researchers to look at variations across an area. This information helps producers understand their soil and its reactions, so they can make smarter decisions about how to farm and what inputs are most appropriate for their soil and crop, boosting crop productivity. However, precision agriculture definitions vary. While some use it only when referring to production, others maintain it is more about more holistic smart farming solutions, including ICTs such as sensors and drones.

Sensors

Smart farming makes use of a range of new technology and sensors that are key to precise data collection. Sensors can be small enough to hold in your hand, but they make a big difference for farmers. High-quality optical sensors can instantly measure how well your plants are growing and information can be sent to farm control centres, including details of fertiliser requirements

© NEIL PALMER/CIAT

Drones provide valuable and highly precise data that can save farmers time as well as money

and pest control. Rolf Sommer, soil health and climate change scientist at the International Center for Tropical Agriculture (CIAT), says that smart farming and new technologies are bringing plenty of benefits to African nations. "Sensors [are] informing farmers real-time about crop requirements – water and nutrients – not only in general but spatially explicit and high resolution."

Sensors can be as simple as a hand-held smartphone that a farmer uses to photograph an unhealthy plant, and then receive feedback online about what is wrong and how to treat it and whether it is worth it. However, a typical farming sensor is a device 'planted' in a field or attached to a drone that provides a range of data and allows farmers rapid access to specific information to enable smarter, more cost-effective farming, using WiFi, mobile phone or Bluetooth connectivity. Sensors enable crop yield projections using actual plant status and weather forecasting information.

A precise partnership

Smart farming in Kenya has taken a step forward with a recent partnership to provide better access to knowledge, precision agriculture and quality inputs, between two young agripreneurs supported through CTA's Pitch AgriHack! Combining their skills and services to provide an innovative approach to farming, UjuziKilimo and Farmers Pride are offering quality inputs and real-time soil testing services, as well as access to crop and soil advice specific to individual farms, and weather and market information via SMS. The partnership intends to benefit 50,000 farmers by distributing 4,000 t of Mavuno fertilisers, which have been tailored to suit Kenyan soils and provide 30% higher yields. Farmers Pride works with agro-dealers through an innovative franchise model, across 12 counties in Kenya, to improve rural farmers' access to inputs. In March 2017, 10 young field agents were employed and trained in sales, soil testing and other valuable agribusiness skills.

In 2017-18, the UjuziKilimo/Farmers Pride partnership aims to set up 50 farmer education demonstration farms, hold 50 farmer training events and carry out 1,000 soil tests. "It takes a whole community to bring up a child in Africa. It also takes strategic partnerships to bring up a successful farmer in Africa," says Samuel Munguti, chief executive and co-founder of Farmers Pride.

Using drones for precision farming

Drones are capturing the imagination of modern farmers. Gaze up into the sky in farming areas of Europe and the US, and you just might see a drone flying overhead, collecting data for use by researchers and farmers. Ideally, agronomists and researchers want drones to ›

› collect data several times in a season to ensure they make well-informed decisions. Reliable data will comprise a wide range of indicators, including biomass, chlorophyll rate, leaf area index, emergence rate, water stress, missing plants, height or flowering. Drones also look at normalised difference vegetation index, which is a mapping method that identifies whether or not an area contains live green vegetation. Drone surveillance can also provide early warning of crop stress and crop health issues, providing images that enable precise and reliable statistics, a boon for evaluating field trials.

However, while drone technology has caught on as a crop management tool in technology-rich parts of the world, for farmers in many African nations, the drone is still something 'out-of-this world'. Keen to see farmers everywhere enjoying the benefits of drones, CTA is working to establish drone operators in Benin, Democratic Republic of Congo, Ghana, Tanzania and Uganda. "An important part of our work focuses on innovative ICTs," says Giacomo Rambaldi, CTA Senior Programme Coordinator for Information and Communication Technologies. He believes that there is huge potential for drones in African agriculture and that youths could benefit by setting up enterprises to serve the farming community.

CTA has partnered with the French start-up company Airinov, which is providing remote-sensed data interpretation services. Their technology has been showcased in Ghana, allowing a range of stakeholders to meet and discuss opportunities. Airinov has been supported by CTA to train seven African entrepreneurs. In March 2017, the group visited Airinov's offices in Paris for a week-long training. Airinov is a thriving business, with 40 staff and a turnover in 2015 of €2.5 million. Their training ensured that the visiting team acquired the skills and experience to lead the way in using drones for precision farming back in their home countries. "They are now able to appropriate our technology and then deploy tailored services at home," explains Hamza Rkha Chaham, in charge of international affairs at Airinov. Each of them acquired a four-rotor drone, a multispectral sensor and additional equipment for €5,000, 60% of which is financed by CTA. They will then be followed for 1 year by Airinov. The group has been trained in areas such as data-processing and business development.

Precision agriculture provides the tools and data for deep analysis of farming practices on individual farms and in regions and countries.

Frederick Mbuya, founder of Uhurulabs in Tanzania, says that farmers needed to see drones in action to understand the possibilities. "The critical response from farmers when you mention drones is that it is nothing for us, how could that possibly help us in our business," says Mbuya. "But the great thing about flying a drone with farmers is that they immediately start to say 'I could use it for this, I could use it for that'. Getting a 50 or 100 m aerial view of their farm enlightens the farmer in things as trivial as fence and border inspection."

Sensors carried by drones can detect weeds, forecast yields, measure lack of or excess water, pest infestations and lack of nutrients. Farmers inspect the drone images of their crops, discuss interpretation with technical staff and decide when and where to apply fertilisers and other inputs. The data is comprehensive, accurate and provided in real-time; it can also be used to determine crop damage for insurance purposes. Farmers will still want to check the data against the situation on the ground, but drone images can direct them to their target area.

On a pineapple farm in Ghana, Joshua Ayinbora, chief executive of GROITAL Farms, became interested in the possibilities of using drones for his farm after CTA organised a demonstration on his farm. He checked out the technology on YouTube and contacted a friend in the construction business, who agreed to fly his drone over his plots, leading to the discovery of a fungal attack in some

UjuziKilimo uses sensors to capture soil and farm data to send farmers real-time advice on crop breeds, fertiliser requirements and pest control

parts of the crop. "When we are looking at the field laterally, it is difficult to see the various shades of green in the pineapples," explains Ayinbora. "After we analysed the images, we realised some of the fields were dark green, whereas others were light green." The team from GROITAL inspected the light green areas and discovered the problem. "And that helped us save a lot of money," he states.

Keeping the skies open

Drones took to the air in a legal vacuum, flying into tightly-regulated airspace that was not fully prepared for the arrival of UAVs. To help address this, CTA has been working on drones for nearly 2 years, bringing together more than 500 members from 82 countries into a community of practice. Recognising the need for clarity, CTA studied existing policies and regulations, producing a comprehensive document on governance. In addition, an online database, with summaries of national drone laws is regularly updated in line with any changes to regulations (see https://tinyurl.com/y8ymw49j).

South Africa was the first African nation to regulate the use of drones, targeting topographical studies, mining and anti-poaching activities. Over time, private firms began to offer services to farmers that were based on data collected by drones. Other African countries that have regulated drone use include Botswana, Cameroon, Côte d'Ivoire, Gabon, Ghana, Kenya, Madagascar, Nigeria, and Rwanda.

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A suite of smart-farming solutions

Smart farming technology developed by Nigerian innovator, Professor Ndubuisi Ekekwe, and his team is available in eastern Nigerian states and is currently being piloted for the African Development Bank (AfDB) for implementation across all AfDB-supported farms. Launched in 2014, Zenvus uses electronic sensors to collect soil data (moisture, nutrients, pH) sent via mobile phone, satellite or WiFi to a cloud server; data is then analysed to provide advice to farmers. Zenvus also deploys cameras, mounted on sticks or drones, to monitor vegetative health and detect drought stress, pests and diseases. This data is used by farmers via a free Zenvus web app, but also by agro-lenders, agro-insurers and others providing services to farmers. A range of other Zenvus smart-farming products are also now available including zManager, an electronic farm diary, zInsure to help farmers insure farms based on farm data, and zPrices, which provides real-time prices.

Sensors can be small enough to hold in your hand, but they make a big difference for farmers.

Whilst drones, sensors and other precision agriculture tools may be the way ahead for modern farmers, much of this new technology is still out of the reach of smallholders in developing countries. To be cost-efficient, drones need to work with agribusiness or small farmer cooperatives owning 3,000 to 4,000 ha of land. New generation cooperatives have an important role to play in the adoption of precision agriculture techniques, as they can be used to break down financial barriers experienced by rural smallholders. "Enterprises are usually very small, while upfront investments are high; [there is a] lack of computer knowledge," says Sommer. Cooperatives can provide the financial power required to invest in smart farming technology, unlocking the benefits of new technologies and smart farming for all.

Airinov also sees the benefits of having farmers grouping together to work with drones, as the technology may be beyond the reach of a single farmer. "The main objective of that is to make it affordable for the farmer," says Chaham. "You won't be moving to the field to fly 1 ha, you would be moving to fly 20, 30, 50 ha. And then you can make economies of scale and make the services useful for them," he explains.

Data collection on a big scale

With African farmers starting to collect a range of data about their work, there are new possibilities for data coordination and analysis on a wide scale. The CGIAR is working on a big data coordination project that will see farmers monitoring their farms and providing scientists with data on rainfall, fertiliser use, crop varieties and yields. Old and new data from research organisations, universities and governments is being used to populate the CGIAR Platform for Big Data in Agriculture. CGIAR says that sharing high quality data has amazing results. In Colombia recently, rice producers saved millions of dollars by delaying planting until a dry spell had passed, which was the result of CIAT and the Colombian government working together with shared information and goals. The CGIAR Platform for Big Data in Africa will run from 2017 to 2022, with the goal of harnessing the capabilities of big data to accelerate and enhance the impact of smart faming. ■

For more information visit:
Drone Regulation: A Guide to the Laws Governing UAVs https://tinyurl.com/kyx4bo3 ; Spore interview, Theo de Jager: Farmers Need to Organise https://tinyurl.com/ldclh65

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Value-added vanilla products from Tanzania are being exported worldwide

ADDING VALUE

Breaking down barriers to premium vanilla

A social enterprise is linking smallholder farmers in Tanzania to the international organic vanilla market to realise sustainable livelihoods.

Sophie Reeve

In Tanzania's Arusha, Kilimanjaro and Morogoro regions, 1,500 smallholder farmers are benefitting from increased access to regional and international premium vanilla markets. As part of a supply chain programme funded by the social enterprise Natural Extracts Industry (NEI), since 2012 smallholders have received subsidies for vanilla vine cuttings and training in good agricultural practices, including the use of natural bio-pesticides and composting, to enhance their production capacity. Once processed and packaged under the brand name 'The Epicurious Hedgehog', the value-added vanilla products are exported to dairies, restaurants and bakeries, worldwide.

1,500

Tanzanian farmers are benefitting from improved access to premium vanilla markets

Agriculture employs about 80% of the workforce in Tanzania and accounts for roughly half of the national income. Yet, most Tanzanian farmers are smallholders relying on coffee, banana and seasonal vegetable crops, and struggle to earn a sustainable income. Vanilla, as one of the most labour-intensive crops in the world, is not considered a viable income source by many farmers. The flower must be pollinated by hand and the beans blanched, sweated, dried and cured, after which a plant or vine yields on average 1.8 kg of pods per year, for a typical price per kilo (for average grade vanilla) of €2.20. However, training by NEI in vanilla intercropping using organic farming techniques, has enabled 1,500 farmers and women's groups in the region to overcome the barriers to the premium vanilla trade. According to Juan Guardado, NEI managing director, the farmers involved in the project have seen an increase in their earnings from an average of €330, to around €590 per year.

To maintain the quality of the raw materials used and avoid post-harvest losses, a processing plant funded by NEI has been developed in Moshi,

Kilimanjaro, with the capacity to process 10,000 l of vanilla extract. The vanilla pods are processed within 3 days of harvesting, before the onset of deterioration. Safarani Seushi, senior supply chain manager at NEI explains, "The technology required for value-added processing in Eastern Africa has been cost-prohibitive for the smallholder farmer. Setting up facilities at this scale was daunting, even for a company like NEI that is processing hundreds of kilos of vanilla. There are also regulatory challenges. As the only company who processes natural flavour extracts, we are defining new standards for Eastern Africa."

Through a vanilla outgrowers programme, NEI-registered farmers are also learning about eco-friendly cultivation techniques and production methodologies that help minimise the impact on the environment. Penina Mungure, from Ndatu village near Arusha, is part of the programme and planted vanilla vines in 2005, but only learned how to pollinate the vanilla flowers through the NEI farmer support network. She now works with new members as a mentor and has bought an egg incubator with her additional income, which allows her to produce chickens for her community.

"The technology required for value-added processing in Eastern Africa has been cost-prohibitive for the smallholder farmer."

In future, NEI hopes to expand its reach. "In each of the next 3 years we hope to add 800 farmers to our network which will increase the impact of NEI across Tanzania. NEI is a model for social enterprises across Africa and we've been recognised by many organisations (like Unreasonable.is and Nestlé) for the work we have done," explains Seushi. To date, NEI has purchased over €75,340 worth of produce from smallholder farmers. The company's medium-term goal is to reach 5,000-6,000 farmers, with the overarching aim to expand up to 20,000 farmers over the next decade. ■

INCREASED COMPETITIVENESS

Strengthening links with the private sector

Smallholders in Ghana are building mutually beneficial business relationships with the private sector to enhance their access to high-end markets.

Stephanie Lynch

In Ghana, 100,000 smallholder farmers have been linked to out-grower businesses to obtain drought resistant seeds, fertilisers and other services to boost their maize, rice and soybean productivity. Using a value chain facilitation approach, the ACDI/VOCA-implemented Agricultural Development and Value Chain Enhancement (ADVANCE) II project is scaling up private sector investment in production and enabling farmers to increase their yields by up to 300%.

Smallholder farmers' access to financing has been improved by ADVANCE II's collaboration with one of the largest mobile network providers in Ghana, MTN Ghana. MTN helps farmers to set up basic transaction accounts on their mobile phones and trains them how to use the mobile banking service to store, send and receive money. According to Doris Amponsaa Owusu, project business services specialist for ADVANCE II, "Mobile money has served as a means of saving, especially for the women, who are socially not allowed to own assets. Once their money is on their phone, unless they tell somebody, no one would ever know they had money on their phone." ADVANCE II, a USAID Feed the Future initiative, has connected over 3,000 subscribers to mobile banking and plans to scale this out to 10,000 smallholder farmers by 2018.

In December 2016, the ADVANCE II chief of party signed a memorandum of understanding with Nestlé, Ghana. The partnership will help ADVANCE II extend their work linking smallholder farmers to industrial output markets, as well as financial institutions and input businesses. ■

MTN officials have been helping farmers enrol in mobile banking

RECYCLING

Turning a profit from human waste

Irrigation systems channelling waste water and an organic fertiliser produced from human waste are boosting harvests for African farmers.

Elias Ntungwe Ngalame and Olivia Frost

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In Ghana, wastewater rich in nutrients is being used to irrigate horticultural crops

Irrigation systems that channel waste water from people's homes into agricultural fields have dramatically improved crop yields in Yaoundé, Cameroon. The water mitigates the effects of drought and allows farmers to continue harvesting during the dry season and, as a result, get up to five harvests a year. In 2016, the irrigation is estimated to have raised annual vegetable production by about 37,000 t, as well as increase annual income per producer to €545 from €380 in 2013, for an area of about 200 m^2.

With rain-fed agriculture becoming increasingly unreliable, the irrigation systems are enabling around 300 members from Buyam Sellam women's groups and 3,500 agricultural labourers to grow assorted vegetables, including cabbage, cucumber, and tomato. "In the absence of rain we can have food on our tables and raise much needed income to send our children to school," explains Anita Nveng, a Buyam Sellam member. The use of waste water irrigation is not only helping to increase the incomes of farmers, but has also succeeded in bridging the supply gap in vegetable production during the dry season so that production now satisfies 95% of demand rather than just 15%, as was previously the case.

According to UN-Water, 80% of all waste water, including faecal sludge, gets dumped without treatment, leading to a range of health and environmental risks. The problem is of particular concern in low-income countries where only 8% of waste water is treated. A field report carried out by the University of Yaoundé noted that crops irrigated with waste water from the river Avo'o in Yaoundé showed the best growth rates in the area. However, the investigation also highlighted the health risks associated with using waste water in urban agriculture, particularly if the water has high levels of pathogenic microorganisms, and recommended that laws ensuring the treatment of faecal sludge before discharge be properly enforced by the government. To address concerns over the health risks and environmental hazards of using waste water to produce food, the International Water Management Institute (IWMI), in collaboration with the World Health Organization (WHO), has helped to update guidelines on the safe use of waste water in irrigation and the 2015 *Sanitation Safety Planning Manual* to facilitate implementation of the WHO guidelines.

37,000 t
more vegetables were produced in 2016 in Yaoundé, Cameroon, using waste water irrigation

In Ghana, a new treatment plant is the first commercial scale project in West Africa to produce high quality, safe fertiliser from treated human waste. The facility is operated by a public-private partnership (PPP) and, when fully operational, will process 12,600 m^3 of waste a year to produce 500 t of pathogen-free organic fertiliser under the trademarked name 'Fortifer'. The PPP to commercialise Fortifer was initiated by IWMI after pilot projects in Ghana showed the product to be safe and, when compared to inorganic fertilisers, improved agricultural yields by 20-50%.

Market research revealed a widespread demand for the product among farmers in West Africa. "Turning faecal sludge into a fertiliser is an enormous development opportunity, with the potential to benefit millions of farmers while reducing the world's most pressing sanitation problem in growing towns and cities," says Pay Drechsel, IWMI's theme leader on water quality, health and environment. ■

CLIMATE CHANGE

Increasing agriculture's climate resilience

Innovative initiatives are increasing agricultural resilience to unpredictable weather by enabling farmers to adapt to the effects of climate change.

Stephanie Lynch

Data-driven climate information is enabling pastoralist farmers in Ethiopia to make informed and timely decisions about where to graze their livestock. Satellite-Assisted Pastoral Resource Management (SAPARM) digitises maps of traditional grazing areas, drawn up by local communities, and overlays them with up-to-date satellite vegetation data. SAPARM's maps could aid over 200 million pastoralists in Africa, who currently seek pasture for their herds using indigenous knowledge, scouts and verbal exchange – methods which are fast becoming unreliable due to climate change.

SAPARM, led by Project Concern International (PCI), prints the digitised maps every 10 days and distributes them to local farmers. Almost 80% of pastoralists in the community that first trialled SAPARM used the maps for migration decision-making, and many stated it was one of their most important resources. George Guimaraes, who recently stepped down as president and CEO of PCI, explained that in the context of feed and water shortages caused by El Niño, "As climate change ravages arable land in East Africa, herd deaths have been cut in half when pastoralists use these satellite maps to find green pasture for their animals."

© DAVID ORR/WFP

Goziline, a Zambian farmer, checks a rain gauge metre which he monitors daily to provide data for R4 weather index insurance

Another initiative supporting farmers to prepare for climate-related risks is the R4 Rural Resilience Initiative which enables them to access weather index insurance through Insurance-for-Assets (IFA) schemes. In exchange for weather insurance, farmers participating in R4's IFA schemes work on disaster risk reduction and climate change adaptation activities in their communities. The financial protection offered by R4 encourages farmers to invest in more remunerative enterprises and inputs to increase productivity and, when a bad season hits, compensation for weather-related losses prevents farmers from selling these productive assets, stimulating faster recovery. Since it was launched by the World Food Programme and Oxfam America in 2011, R4 has grown its participation from 200 farmers to nearly 40,000 in Ethiopia, Malawi, Senegal and Zambia.

A recently launched bi-annual report, *The Global Report on Food Crises 2017*, published by the Food Security Information Network, provides a global analysis of the causes and effects of food crises. Access to such information will aid regional institutions and governments to make informed decisions and coordinated plans to deal with climate change disasters and mitigate food crises. ■

Carbon credits

Reducing emissions

IN ZAMBIA, carbon dioxide emissions have been reduced by 738,840 t since 2012. A Reducing Emissions from Deforestation and Forest Degradation (REDD+) project has incentivised the local community of Rufunsa Conservancy in Lusaka Province to protect the area's threatened forests in exchange for carbon credits. In 2016, through the sale of credits for 39,000 ha of conserved Miombo forest, 28 villages (8,300 people) generated a total of €48,994. These credits have been used to sink 14 boreholes, which provide safe drinking water to 2,000 residents. The project, implemented by Biocarbon Partners, also engages local farmers in sustainable poverty eradication activities, such as honey and charcoal production, and trains local staff to protect forest biodiversity.

Online tool

Comparing climate action

A NEW INTERACTIVE online tool highlighting the priorities of African countries in the fight against climate change is making action plans more accessible and comparable. The tool offers an opportunity for stakeholders, including policymakers and scientists, to gain valuable insights into the status of African countries and the continent as a whole, with regards to climate actions. Created by the German Development Institute, together with partners including the African Centre for Technology Studies, the Nationally Determined Contributions (NDC) Explorer tool was developed using 163 national action plans. NDC Explorer provides detailed data on topics such as climate change adaptation, finance and technology needs.

For more information visit:
https://tinyurl.com/lnvux5y

AEROPONICS

High-quality seed yam production

Seed yams are being mass produced by scientists in a rapid and affordable process, which avoids using soil and transferring disease.

Oluyinka Alawode and Stephanie Lynch

Scaling breakthroughs in seed multiplication technology is expected to increase the productivity of yam cultivation by up to 30% in Ghana and Nigeria. The Yam Improvement for Income and Food Security in West Africa II (YIIFSWA-II) project, led by the International Institute of Tropical Agriculture (IITA), is using aeroponic propagation technology to address the increasing demand for high-quality and improved varieties of seed yam in the region.

Yam is a staple crop in West Africa. At least 1.6 million people directly depend on the yam value chain for their livelihoods. Yet, seed yam markets remain underdeveloped for reasons such as outdated seed production methods, poor distribution networks and lack of quality assurance systems. Traditional methods of seed yam production are expensive and inefficient, requiring farmers to save 25 to 30% of their harvest to plant tubers the following season. This not only reduces farmers' incomes from harvests, but the saved seeds are often diseased, producing significantly lower yields each year. However, scientists working on the €11.32 million funded YIIFSWA project have successfully used an aeroponics system (AS) to rapidly multiply large quantities of desired varieties of seed yam tubers in a clean and cost-effective process.

© OIWOJA ODIHI YIIFSWA-II/IITA

IITA is growing yam tubers using an aeroponics system

Yam plantlets are planted in AS boxes and grown in a purely air or mist environment, without soil or any other aggregate medium, to produce mini-tubers. The results from YIIFSWA-I showed a 95% success rate in AS yam propagation and the multiplication rate was about 30 times faster than traditional seed yam production. The AS pruned vines start producing shoots within 2 weeks of being planted, whilst normal vines from field plants take 4-6 weeks to develop shoots. The process also reduces disease in yam crops as no soil-borne pests and diseases can infect the plants whilst they develop into mini-tubers. This is particularly vital given that national agricultural research and extension systems (NARES) were at risk of losing seed stocks of improved yam varieties due to pathogen infestation. "Yam is an important crop in Africa and addressing the seeds' constraints will go a long way in improving the livelihoods of farmers who depend on the crop," states Dr Robert Asiedu, IITA director for West Africa, in reference to the achievements of YIIFSWA-I.

To expand the adoption of these technologies and protocols in the private sector, in November 2016 YIIFSWA held a 2-day training workshop for 18 technicians from 11 commercial seed companies. The technicians were trained to operate high ratio propagation technologies, including AS, at the National Root Crop Research Institute in Umudike, Abia State, Nigeria. It is expected that the workshop will encourage seed yam businesses to invest in the establishment of their own AS, which have the potential to generate an annual gross income of about N16 million (€49,000) each, and lead to the formation of partnerships between private sector seed companies and NARES. ■

Soil enhancement

Vermicomposting in the Caribbean

TWO SPECIES of epigeic (leaf litter) earthworms with the potential to produce vermicompost have been identified in Trinidad and Tobago by researchers at the University of the West Indies (UWI). The earthworms, *Perionyx excavatus* and *Eudrilus eugeniae*, primarily feed on decomposing plant and animal waste and have the potential to be used in sustainable waste management in the region. Micah Martin, a PhD student at UWI, has worked on the research and, from the results, has been able to cofound Boissierre Green Earthworm Farm, a local composting business which provides products such as soil amendments, composting worms, antibiotic free poultry feed and soil mixtures.

Disease resistance

Cassava production

TWO CASSAVA varieties with dual resistance to cassava brown streak disease and cassava mosaic disease have been released by CGIAR and Uganda's National Agriculture and Food Research Organisation (NARO). With a yield potential of up to 55 t/ha, NARO says the new varieties are unrivalled compared to other types on the Ugandan market. NARO-CASS 1 and NARO-CASS 2 are suitable for cultivation in the mid-altitude areas of Africa where approximately 4 million ha are under cassava production. Up to 2.4 million farming households across the continent are estimated to benefit from the improved new varieties.

INNOVATIVE INTOXICANT

Fruit fly control in Kenya

A protein-based fruit fly bait to attract and kill the pests, is boosting incomes for fruit and vegetable farmers in Kenya.

James Karuga and Munyaradzi Makoni

A protein-based bait for fruit flies has been produced to reduce the significant fruit and vegetable losses experienced by farmers in Kenya. Fruitfly Mania™, developed by a public-private partnership between the International Centre of Insect Physiology and Ecology (*icipe*) and Kenya Biologics, is made from waste brewer's yeast – an industrial byproduct – and represents a cheaper alternative to commercially available pesticides.

The direct damage fruit flies cause to fruit and vegetable crops, along with the subsequent loss in export opportunities, are estimated to cost Africa over €1.8 billion annually. "Over the past 20 years, *icipe* and partners have conducted extensive research to address the fruit fly challenge in Africa. The Centre's aim is to reduce yield losses and the huge expenditure incurred by growers to purchase synthetic pesticides," says Dr Segenet Kelemu, *icipe* director general and CEO. "We also intend to contribute towards reducing the health and environmental risks associated with the use and misuse of such chemicals, and increase the global competitiveness of fruits from Africa."

The protein bait product is laced with an intoxicant, which attracts female fruit flies and kills them when they feed upon it. Continued application of the product on a weekly or bi-weekly basis, until the fruits are harvested, interrupts the fruit fly breeding cycle and reduces the female population in orchards. According to *icipe*'s research from pilot trials in fields across Africa, Fruitfly Mania™ reduces maggot infestation in fruits from over 80% to 5-9% of the fruit produced. Farmers who use the product and ensure orchard sanitation are guaranteed a 66% gain on their income, translating to roughly 236,692 KSh (€2,160) per hectare of orchard, per season.

A facility to mass manufacture Fruitfly Mania™ was officially launched in Muranga County in March 2017, and is the first of its kind in sub-Saharan Africa. Operated by Kenya Biologics, the facility has the capacity to produce 2,000 l of Fruitfly Mania™ per day, sufficient quantities to meet the demand from Kenyan households that rely on mangoes for their livelihood. A 400 ml bottle of Fruitfly Mania™ costs 250 KSh (€2.4), 70% less than commercial fruit fly protein baits currently available on the market. The trademark has been registered for this product in Kenya, and once the product is registered across Eastern Africa to include Tanzania and Uganda, the bait will benefit approximately 600,000 fruit growers. ■

© ICIPE

Fruitfly Mania™ interrupts the fruit fly breeding cycle

PRECOOKED BEANS

A cost-effective approach to improving nutrition

Fast-cooking beans are saving time and money for low income families in Kenya and Uganda, whilst providing essential nutrients to improve household diets.

Munyaradzi Makoni and Sophie Reeve

Twelve bean varieties to be processed as precooked beans have been adopted for production among farmers in Kenya and Uganda. Whilst unprocessed beans take around 2 hours to cook, the precooked bean varieties are steam-cooked before sale and can be reheated in just 15 minutes. The fast-cooking beans contain all the nutrients of regular beans, but are saving low income families over 100 minutes of cooking time and fuel expenditure worth €0.47/kg. The IDRC-ACIAR supported initiative is expected to increase bean consumption, improve diets and income generation, and reduce environmental damage by cutting the amount of charcoal and firewood required for cooking.

Beans are a key source of protein, carbohydrates and micronutrients for more than 400 million people in sub-Saharan Africa. As such, they are a valuable staple in the fight against malnutrition and iron deficiency – the lead cause of anaemia. However, consumption is low due to the long cooking time and high fuel requirements and, in recent years, the rapid expansion of urban populations, rising incomes, and high energy costs have fuelled demand for fast-cooking, processed foods. With funding from the International Development Research Centre (IDRC) and the Australian Centre for International Agricultural Research, researchers have identified the most popular bean varieties among farmers and consumers in the region due to their taste and high levels of protein, as well as key nutrients including calcium, zinc, iron and selenium.

Seed companies and community-based seed producers have been engaged to produce an adequate supply of the selected precooked bean seeds. Models for seed and grain production were tested and now over 10,000 farmers are producing grain to supply a factory with the capacity to process 9 t of precooked beans per day. The initiative has created employment opportunities at various other stages of the bean value chain, including seed and grain bulking, packaging, transportation, and marketing, especially for women and youths. Over 6,000 farmers have also received training in good agronomic practices such as field and post-harvest management.

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Precooked beans will save consumers time and fuel, and boost nutrition

400 million
people in sub-Saharan Africa rely on beans as a key source of nutrition

In addition, a salted, ready-to-eat bean snack has been developed and this, along with the precooked packaged beans, have been taken up by a private sector partner, Lasting Solutions Ltd, for sale in supermarkets and grocery stores. Jemimah Njuki, IDRC senior programme specialist says, "This innovative partnership has combined research and private sector expertise to move the product into market, responding directly to our objective of achieving impact at scale." Plans to expand the initiative across Africa by supporting the development of precooked bean value chains are to be rolled out in Ghana, Nigeria, the Sahel region and Zambia. ■

IMPROVING NUTRITION

Chefs drive demand for local food

Chefs are working to promote healthy food and widen the market for local produce in an attempt to reduce rising cases of non-communicable disease in the Pacific.

Avneel Abhishay

Nutritious, locally sourced alternatives to fast food are being provided by Pacific island smallholder farmers working with well-known chefs to tackle the rise in non-communicable diseases (NCD). Renowned chefs, such as Robert Oliver and Colin Chung, are on a mission to revolutionise culinary practices in the region.

After farmers and chefs were brought together at the CTA-supported 2015 Pacific Agritourism week, held in Nadi, chefs have stepped up to the challenge of promoting local food to combat rising NCDs, with a variety of initiatives. For instance, Chung recently launched a cook book, *Kana Vinaka*, at the University of the South Pacific (USP) campus in Suva, Fiji in April 2017. To bring his recipes to life, Chung held a live cooking demonstration with Ministry of Agriculture staff and University of the South Pacific (USP) Technical and Further Education students.

University students often resort to imported ready-to-cook meals, such as canned mutton, beef and noodles, high in salt and saturated fats. However, Chung's cookbook provides recipes based on their nutritional value and availability of ingredients throughout the region. It is hoped that the chef's demonstration at USP will encourage more students to prepare their own healthy food, using local ingredients.

The initiative was commended by Fiji's Minister of Agriculture, Inia Seraiatu, who noted, "Considering that a significant amount of food consumed in Fiji is imported, this book with its innovative recipes and focus on seasonal, locally-produced food will be easily adopted in schools and educational institutes." The cook book will be sold at USP campuses across the region and will also be available online.

While chefs are focusing on getting food from farm to table, a significant responsibility rests on the shoulders of farmers themselves. The Pacific Islands Farmers Organisation Network (PIFON) is working on several projects across the region to support farmers and increase market demand for nutritious local produce. In March 2017, PIFON's Tonga members – MORDI and Nishi Trading – signed an agreement with the University of Tokyo to implement a project to help fight obesity in Tonga. The agreement will extend PIFON's Pacific Breadfruit and Seeds Program, which currently helps farmers in Samoa and Taveuni procure machines to enable them to make healthier, gluten-free flour. ■

For more information visit:
https://tinyurl.com/lknt9pw

Colin Chung's new cookbook aims to encourage young people to make nutritious meals, using locally available ingredients

Knowledge bank

Tackling malnutrition using mobiles

A new open-access nutrition knowledge bank with content on good nutritional practices in the form of factsheets and mobile messages is helping to tackle malnutrition in Africa and Asia. The information is freely available in local languages to anyone with a mobile phone and topics include breastfeeding advice for new mothers, practical tips for rearing dairy cows, and growing healthier crops for human consumption. The GSMA mNutrition initiative is funded by the UK Department for International Development and is currently active in Bangladesh, Ghana, Kenya, Malawi, Mozambique, Myanmar, Nigeria, Pakistan, Sri Lanka, Tanzania, Uganda and Zambia. The project aims to deliver nutrition information to 3 million people in 12 developing countries.

For more information visit:
https://tinyurl.com/kmy3qf8

Sweet potato

Improving nutrition in West Africa

Expansion of orange-fleshed sweet potato (OFSP) markets in West Africa has improved availability of high yielding OFSP varieties. To advocate OFSP's value for nutrition security and generate local demand, an International Potato Center-led project 'Jumpstarting Orange-fleshed Sweetpotato in West Africa through Diversified Markets', has conducted 12 OFSP awareness campaigns and distributed almost 19,000 promotional materials since 2014 in Burkina Faso, Ghana and Nigeria. According to project manager, Erna Abidin, the work in these countries has helped combat Vitamin A deficiency, which causes blindness in up to 500,000 children a year. Incomes have also increased as a result of improved OFSP varieties, with farmers earning about €3,200 per hectare.

For more information visit:
https://tinyurl.com/mvdfshy

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Sea cucumber is the Pacific's second most valuable marine export after tuna

SEA CUCUMBER

Sustainable management of a seafood delicacy

Sea cucumber is becoming increasingly profitable in the Pacific, as fishing communities are helped to improve post-harvest processing and sustainably produce high-quality *bêche-de-mer*. A variety of initiatives led by the Pacific Community are boosting incomes from high-quality sea cucumber exports, whilst protecting against overexploitation.

Avneel Abhishay

Sea cucumber farming is set to become increasingly lucrative in the Pacific as initiatives address poor post-harvest processing and over-exploitation of natural stocks. Focused on ensuring that communities in Fiji, Kiribati and Tonga fetch the best price for sea cucumber, since 2013 a project has been training fishermen to efficiently process high quality *bêche-de-mer* (dried sea cucumber).

Sea cucumber is the Pacific's second most valuable marine export after tuna, providing a primary source of income for around 300,000 small-scale fishermen and earning the region €18-46 million per year. However, depending on species, size and quality, the price that *bêche-de-mer* can be sold to Asian exporters, where it is a delicacy used in a variety of dishes, varies considerably, ranging between €2.70/kg and €78/kg. Despite its potentially high intrinsic value, sea cucumber fishers have not been successfully maximising their returns, which has been attributed, in particular, to a lack of knowledge of effective post-harvesting processes.

300,000 small-scale fishermen rely on sea cucumber farming as their primary source of income

To raise awareness about best practices in sea cucumber handling and production, the Pacific Community (SPC) has partnered with the Australian Centre for International Agricultural Research. Socio-economic surveys of Pacific fishers, investigating common post-harvest practices, led to the compilation of a technical manual explaining the most effective methods of sea cucumber harvesting and processing, specific to different locations. Available online, 5,300 manuals were

also printed in English, Fijian, Kiribati and Tongan and distributed among fisher communities in these countries.

Researchers have also conducted training workshops demonstrating the best methods of collection, handling, storage and processing. The workshops particularly emphasised the importance of properly gutting, cooking, salting, smoking and drying the sea cucumber to produce a higher quality product to obtain higher prices. In Fiji alone, 353 fishermen, including many women, were trained in workshops held in 24 villages. For those unable to attend the workshops, a 20 minute training video was also produced, which has achieved almost 2,500 views on YouTube since 2015. Fishers who have followed the training have reported higher returns from their sales, and several of those interviewed are following the recommendation to allow natural stocks to replenish by only harvesting larger sea cucumbers.

To further address the overexploitation of sea cucumber in the Pacific, SPC has partnered with the Vanuatu Fisheries Department to establish Vanuatu's first privately owned and operated sandfish hatchery. The new hatchery, Aquaculture Solutions Vanuatu, which opened in March 2017, has the capacity to sustainably produce tens of thousands of juvenile sandfish, a type of sea cucumber, which once mature can be harvested and processed into *bêche-de-mer*.

According to SPC's mariculture and aquatic biosecurity specialist, Dr Michel Bermudes, "This type of hatchery provides a sustainable low-tech and low-cost template, a tool for stock enhancement and for marine aquaculture capacity building in Vanuatu. In time, this model can be replicated in other places where sandfish stock enhancement is also needed." SPC has also recently embarked on an initiative, in collaboration with the World Bank, to explore the potential establishment of a sub-regional *bêche-de-mer* trust, in the Melanesia region, to help manage and monitor sea cucumber exports. ■

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Over 4,000 fish farmers, traders and input providers in Kenya receive 'aquatips' and market advice through their phones

AQUATIPS

Supporting fish farmers in Kenya

In Kenya, an online platform is connecting fish farmers with traders and service providers and updating them with best practice tips and market information.

Munyaradzi Makoni

Fish farmers in Kenya are receiving best practice 'aquatips' and market advice through the Esoko digital platform. Since its launch in 2015, over 4,000 farmers, traders, input and service providers involved in Farm Africa's aqua shop initiative have been linked through the platform.

A network of 56 aqua shops, first set up by Farm Africa in 2011, has benefited over 7,500 farmers by providing high-quality equipment, feed and training. Fish farmers in Kenya have since increased their production by 54% and incomes by 63%. Farm Africa has now partnered with Esoko to expand its services, using digital technology to provide technical advice and market prices. Fish traders registered with Esoko receive information on their phones, including details on quantity, price, farmer location and contact details, to help connect them to farmers.

"When I joined Esoko, my catfish had not matured for selling but I kept getting calls from available buyers," says Zachariah Ishitote, a 63-year-old farmer. Alex Abweo, a farmer specialising in tilapia and catfish, started using the platform in 2014. Abweo, states that receiving tips from Esoko once or twice a week, such as advice on how to feed his fish so that they mature in the required time, has helped him grow his business. Another tilapia farmer, Faith Buluma, is upbeat about being connected with the market through Esoko. Buluma, who also runs an aqua shop, states that "It has made me network, meet other fish farmers and exchange practical information." ■

JEAN-MICHEL SEVERINO

Agribusiness: an opportunity for Africa

Jean-Michel Severino, president of Investisseurs & Partenaires impact fund and former director of French development agency, AFD, describes the success and challenges of agribusiness entrepreneurs in Africa.

Anne Guillaume-Gentil

In your book, Entreprenante Afrique (Enterprising Africa) published in 2016, you pay tribute to Africa. Are you as enthusiastic when it comes to agricultural entrepreneurship?

Yes because what we are seeing in this area, as in others, is a profound transformation of the protagonists involved. Until 10-15 years ago, the agricultural economy was made up of three types of players: a large farming population – which remains massive – large farms and state agricultural production companies, and private agri-processors belonging to large international groups. Since then, a new category of players has emerged in Africa: agribusiness entrepreneurs, who invest in agricultural production, but also in agricultural processing, from chocolate to soybean oil, from palm oil to cashew nuts, etc. It's really modern entrepreneurship. These are not large agro-industrial groups, but individuals who, with a few million euros, sometimes less, set up industrial processing units and try to penetrate the market, in the vast majority of cases domestic markets, because it is clearly easier. Why? Because there is an urban population that is growing and that consumes. This population makes choices between imported production and local production.

Some facilitating factors have also developed very recently, such as the sudden emergence of modern distribution. The appearance of shopping centres is transforming the situation. They sometimes start off with 40% to 90% of imported products on their shelves, but they have a major commercial interest in linking up with local supply chains, especially for food. They therefore seek to structure the supply chains. However, they cannot, for example, reach the thousands of urban or suburban growers. So they're going to look for intermediaries. Companies then step in to act as an interface between large-scale retailers and producers. We have, for example, in our portfolio, a company called Eden Tree Ltd. in Ghana. Its role is to negotiate with thousands of growers, to contract production with them, to standardise quality, to train, to retain producers' loyalty, and to process the production themselves in order to deliver products that are of calibrated quality to the supermarkets, that are clean, packaged, and even ready to eat. This is because the African middle class clientele is evolving, and they are buying their salad ready-wrapped. The idea is really to offer urban consumers in Accra – in the case of our example – an alternative on the food market to the imported products from England, Morocco, Nigeria or South Africa, and to offer a product with identical organoleptic qualities, but at a lower cost.

One of the most important characteristics of the nutrition market in Africa used to be that, broadly speaking, cities consumed imported goods, producers consumed their own crops, while major speculators existed around commodities such as cocoa, cotton, etc. What we see today, which is really helped by these African entrepreneurs, is a reconnection of the city with the countryside around a virtuous circle of local production and consumption, which requires intermediaries, traders, producers or processors.

Do governments provide enough support for this type of entrepreneurship?

The speeches are always perfect. The reality, however, is much more nuanced, especially in the food sector. This is because governments are very anxious to feed the cities at low prices. But in the medium and long-term, it makes no sense to have cities that are fed on production brought from thousands of kilometres away, when there is major agricultural potential at hand. When

Jean-Michel Severino, former executive director of the French development agency AFD, now works to support African SMEs

there is no supply, there is no point in creating tax systems that penalise the urban consumer. On the other hand, when it is possible to have a local supply, it makes sense to encourage it.

Are you in favour of protecting the market?

Not of protection, but of a fiscal balance. You must always be careful about protection. As soon as high customs barriers are erected at African borders, they are defrauded. They are therefore often ineffective.

Your investing group, Investisseurs & Partenaires, supports African small and medium-sized enterprises (SMEs). In the agricultural sector in particular, how do you identify projects to promote and what kind of support do you provide them?

We are an impact fund whose characteristic is to be very involved with the contractors with which we work. We maintain a constant dialogue with managers on their company's strategy and evolutions. In most cases, we have a fairly strong involvement in the financial and commercial side of the company. Entrepreneurs know their product, their profession, their process, but other issues can often be more complicated. We also try to bring them skills in marketing, human resources, and environmental, social, and governance management. This is the core of our expertise. In general, we are discovering the technical know-how that the entrepreneur knows perfectly. However, we have acquired skills over the years in the healthcare, distribution and microfinance sectors.

"What we see today, which is really helped by these African entrepreneurs, is a reconnection of the city with the countryside around a virtuous circle of local production and consumption."

Curiously, in the relationship with rural communities, we have also acquired a certain know-how. We are not specialists in any kind of production, be it tropical fruit, milk or whatever, but we have a strong agribusiness portfolio, whose common thread is the relationship with small farmers. Modestly, we are able to have a number of intuitions and our experience allows us to understand at least a number of obvious mistakes that entrepreneurs repeatedly make.

What are these frequent mistakes made by agri-food companies?

These errors are of course not deliberate. What is really important for a company that is relying on a supply model in a rural environment is the regularity and consistency of supply. This means investing in the structuring of suppliers, providing technical advice and having an impeccable financial relationship. It is important to retain farmers' loyalty by buying the promised quantity on the promised date at the promised price, paid for at the promised moment. It sounds simple, but in reality, SMEs face enormous cash-flow problems and *de facto* have great difficulty in meeting their commitments. Failure to comply with these commitments can be a fundamental cause of the breakdown in confidence and thus the breakdown of the supply chain, resulting in small farmers being tempted to work with others or to do something else. Yet often, when companies are short of money for reasons intrinsically linked to their business cycle, but also because of their inability to anticipate hard times – companies are often undercapitalised and underfunded because entrepreneurs do not want to lose majority control of their company or minimise financial burdens – they do not, for example, anticipate the difficulty of financing seasonal loans. So the whole mechanics of financing relationships with farmers is something that agribusiness entrepreneurs often underestimate with very serious consequences, both on the financial framework of the company and sometimes even on its whole strategy.

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Agribusiness entrepreneurs are investing in agricultural production and processing

The financing of seasonal credits, but more generally the financing of agriculture or agribusiness, seems insufficient and riskier than in other sectors. What are the possible solutions for finance in this sector, where banks are largely absent, apart from the major export sectors?

Two things are specific to the financing of agricultural activities compared to other SMEs. The first is the financing of the farming cycle, which is very specific since, in many cases, we are dealing with annual crop cycles that require specific funding. And, when you are outside the majority of production areas to which the banking system is accustomed, it can be very difficult to finance these seasonal loans. There are alternative options on the international market, such as crowdfunding or specialised funds, but they are very weak. The second issue is related to the fact that these activities are dependent on climate and natural hazards. This has several consequences. These companies need more equity, more financial buffers than others, and a much more flexible and much more shrewd financial conduct. They are more delicate than the others. We mustn't have any illusions. But this does not mean we cannot succeed.

We also need state interventions in every country. Developed countries have always had state interventions in the agricultural sector. This is what enabled Europe, for example, to build its agriculture. I believe governments have to build agricultural policies that now include these new players. Take the case of Burkina Faso, which is almost a counter-example because there is state intervention in the soya sector: but when you think agricultural sector in Burkina Faso, you think cotton and that all the farming policy revolves around cotton. When someone says, 'I'm coming to plant soya', it is alien to them. Governments need to build agricultural policies that are more open, more diversified. It's not very complicated. This might mean extending initiatives, such as input subsidies or guarantees for seasonal loans to other sectors, which were traditionally reserved for the main traditional sectors.

The financing of seasonal loans requires the emergence of new instruments. One could imagine new financial instruments that could be pan-African, regional or national, and specialised in this activity, either by granting guarantees or by providing short-term financing. We could also imagine that an important impact fund could be created with the aim of financing short-term seasonal loans on minority farming activities.

Do agricultural banks make sense to you?

There is room for specialised agricultural banks. The fundamental aim of these banks is not so much the economic model or the market, it is governance. If African states are able to put in place governance systems that are totally independent of political power, capable of judging a company's economic fundamentals, then this can work.

Could you give us one or more examples of an agricultural sector or value chain that stands out for its development and success?

There are many examples. Take poultry farming; this is a typical example of a crucial nutritional quality chain, through the supply of protein – meat and eggs – that is very cheap for the population. Africa has seen a flourishing of initiatives in this field, and this can only be the product of entrepreneurial dynamism, both in terms of quality and formal structure. If we want to build up production and deliver sufficient quantity to feed a growing urban population, we must have production and distribution chains that are irreproachable in terms of sanitary standards. This requires organised, structured entrepreneurs who enter the formal world. These companies also have downstream implications across the entire poultry product chain.

What are the current or possible links between these local SMEs and the major international groups that are increasingly interested in Africa?

That is a big issue. The multinationals that are going to invest in Africa are going to need local suppliers. They have an interest in developing them rather than importing products from the other end of the world. ■

Dossier

MOBILE MONEY: THE GROWTH OF INCLUSIVE DIGITAL AGRI-FINANCE

Payments and financial services delivered by mobile phone are transforming the lives and economic prospects of farmers and businesses involved in agricultural value chains.

© FAO/T. OGOLLA

DIGITAL PAYMENTS

Broadening the appeal of mobile money

Mobile network providers, agri-buyers and other private sector players are working to create simple payment channels and digitise payments to farmers. At the same time, private sector players are investing in education to help ensure that farmers buy into the concept of mobile money.

Helen Castell

Agriculture is the backbone of most ACP economies, which means the sector often results in the most prominent stream of payments. Within that, a substantial proportion is accounted for by payments relating to farmers – from buyers for crop sales, to input vendors, or to retail, education, healthcare or telecommunications organisations in the local community. Anyone able to commercialise that flow of money therefore faces a huge market opportunity.

Lee Babcock, global director for agriculture at the Grameen Foundation therefore argues that the definition of agricultural finance needs to be expanded from a historical focus on credit-based products to embrace straightforward digital payments from processors or traders to farmers.

Most smallholders cannot afford to pay for the development and use of finance applications, but this is not the case for mobile operators or large companies like Mars, Cargill and Monsanto, Babcock notes. "We need to climb higher up the value chain and figure out how to create an agriculture value proposition for somebody else that can pay for it, like an agribusiness," he says. "The huge costs of paying farmers in cash mean it is clearly in buyers' interests to digitise producer payments."

Mobile money of course is not without its security challenges states Babock. The loss, theft or fraudulent use of phones, for example, can have devastating consequences for a smallholder farmer or rural villager. With cash, however, each time a payment is due, big buyers must hire armed security guards to accompany staff into the fields with a cash box. On top of this, in most emerging markets buyers also pay a fee each time they withdraw cash from their own corporate bank account.

Cargill understands this and through a partnership with E-Zwich, MTN Mobile Money and Tigo Mobile Money, rolled out an initiative in early 2017 to electronically pay 30,000 registered cocoa farmers in Ghana direct to their phone or e-wallet and aims to expand this to 100,000.

However, Michael Spencer, CEO of SmartMoney, a mobile money provider in Tanzania and Uganda, is unconvinced that big agribusiness appreciates the benefits of digitising payments. Although SmartMoney has targeted offtakers for the past 7 years, uptake has been disappointing. Buyers depend heavily on farmer loyalty and invest years in building their trust and are therefore nervous of introducing any change that might threaten that, fearing farmers will blame them, rather than the payments provider, if an initiative fails, states Spencer. He continues

Increasing access to digital finance provides a vital service to smallholder farmers

that, even if senior management staff and field operations staff, who know first-hand the danger of travelling in rural areas with cash, buy into the idea of digitising payments, "The last thing those guys in the middle want is a transparent, electronic payment system that reveals where all the money goes."

Commercial opportunities for mobile network providers

Despite these challenges, mobile network providers are continuing to eye up new opportunities. When farmers are paid for crops into a digital wallet, that payment stream continues season after season, offering regular, reliable income. "That's what gets MTN, Tigo and Airtel excited," enthuses Babcock. "That represents to them the greatest opportunity to increase their bottom line. And this is what we need to capture."

One of the core offerings of the Connected Farmer Alliance (CFA) – a public-private partnership between the USAID, Vodafone and TechnoServe aimed at increasing the productivity and incomes of smallholders in Kenya, Mozambique and Tanzania (see p28) – is its facilitation of digital payments from processors to farmers via Vodafone's M-Pesa mobile money solution.

In Kenya, this is handled by Vodafone subsidiary Safaricom, which has just signed up Unilever and Diageo to the initiative, with formal roll out due to start imminently, according to Frederick Kiio, head of Safaricom enterprise commercial operations. This is on top of the roughly 19 agribusinesses including Kenya Nut Company, Sirikwa Dairies, Tarakwa Dairies and Meru Greens that are already using CFA to pay 69,000 active farmers in Kenya, as well as register and communicate with them via SMS. Brookside Dairy, which controls nearly 70% of Kenya's milk processing industry, is not itself a member but encourages all its suppliers to join, states Kiio

The CFA initiative gives agri-buyers – which pay for the service – more visibility over how much produce they are collecting each day, allowing them to plan accordingly, and earns them more loyalty and trust from farmers, explains Kiio. Processors like dairies can also use the product to determine the creditworthiness of a farmer and extend input loans based on the volume of milk they produce. Mobile network operators can be a 'critical channel' between farmers, offtakers and financiers, concludes Kiio, whilst acknowledging that network coverage can fluctuate in rural areas and that Safaricom must work to ensure rural collection centres have at least stable 3G coverage.

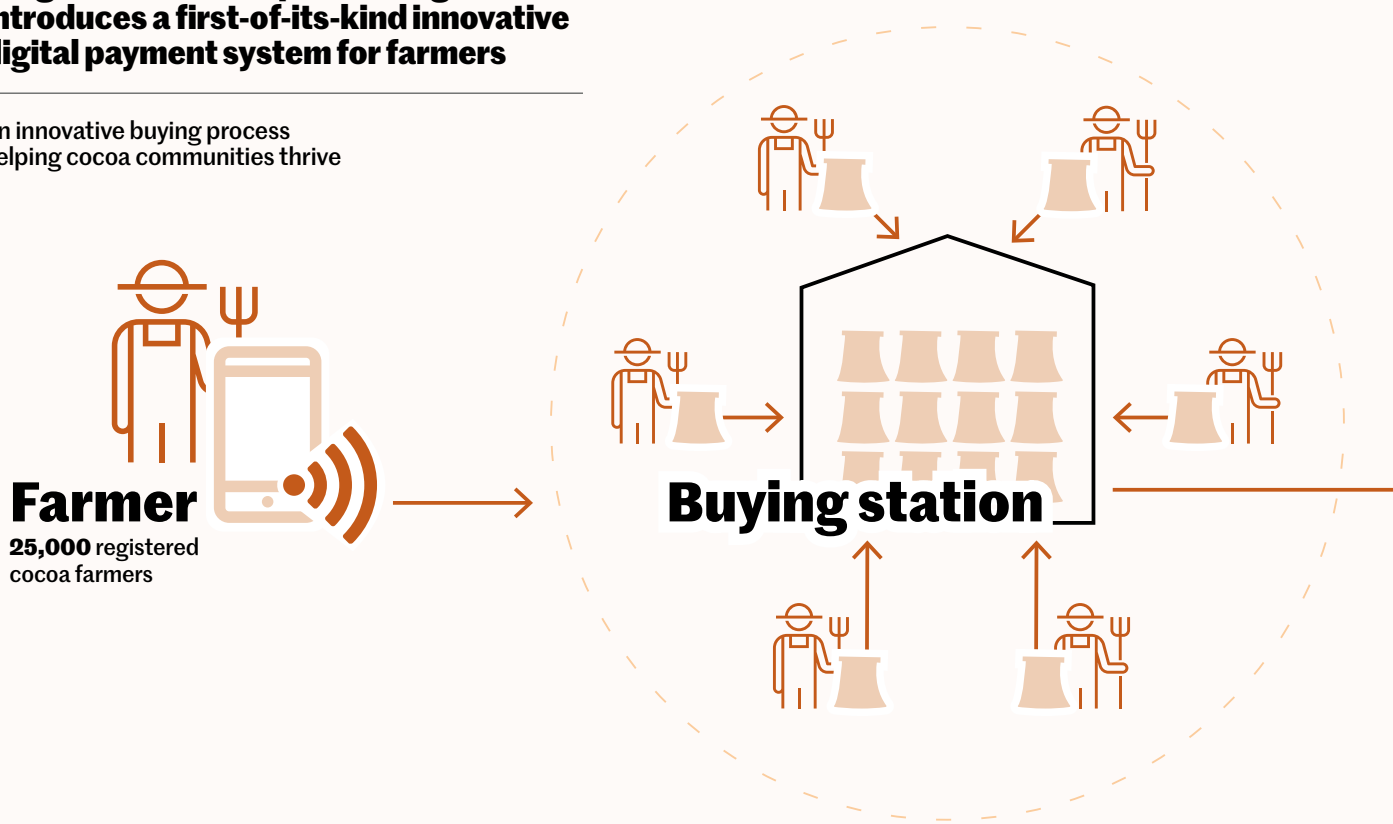
Building trust with farmers

However, the benefits for farmers of being paid electronically continue to be debated, unless, as with SmartMoney, a savings function is a core part of the offering. Creating a broader eco-system within which digital money has real-life utility for farmers can also take time.

One recent start-up whose tech solution is designed to help farmers get paid more quickly for their produce is Denver-based Bext Holdings, which in April 2017 raised €1.07 million in venture funding. Its debut product, bext360, comprises a kiosk-like mobile robot that uses optical sorting to grade coffee cherries at point of sale and a mobile app through which farmers can then negotiate a fair price, after which payment is made directly to their phone. As well as enabling farmers to be paid more quickly, the technology could help them command a higher price for their ›

Cargill's new cocoa purchasing model introduces a first-of-its-kind innovative digital payment system for farmers

An innovative buying process helping cocoa communities thrive



› harvest, according to CEO Daniel Jones. For buyers, blockchain (digital ledger) technology creates a record of where beans came from and who paid for them, providing more transparency and traceability.

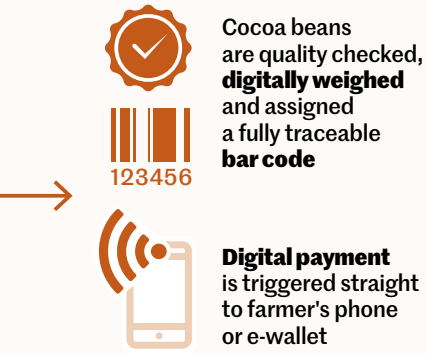
Bext has so far tested the technology at coffee plantations in Mexico and plans a bigger pilot in California later in 2017. The company has already formed relationships with financial institutions in the Republic of Congo and Rwanda and is in talks with investors interested in deploying the system in Colombia.

Convincing farmers of the benefits of digital payments is, however, more complex than creating a product, and can require a huge amount of marketing, education and trust-building. Giving farmers access to workable digital payment solutions would remove a major obstacle to integrating them into structured finance systems like warehouse receipt finance, says Kristian Schach Møller, CEO of the Agricultural Commodity Exchange for Africa in Malawi.

> "The huge costs of paying farmers in cash mean it is clearly in buyers' interests to digitise producer payments."

However, although there is no doubt that mobile money is the future for payment digitisation to truly transform agriculture, grass-roots infrastructure also needs to be put in place. An insufficient number of mobile money agents in many rural parts of Africa means it remains difficult – plus expensive – for farmers who receive payment digitally to 'cash out', while in Malawi it is nearly impossible, states Schach Møller. The ultimate goal is that mobile money remains just that, meaning that rather than cashing out, it is re-used by farmers to pay digitally for goods in shops or invested into savings products. However, for this to happen, "It's not only infrastructure you need to build – it's a whole mindset change," he adds.

Another challenge that SmartMoney's Spencer says traditional mobile money



SOURCE: CARGILL (2017)

Embedding digital payments in a wider eco-system

Digitising buyer payments to farmers can work – but only if a wider eco-system is also created to ensure it benefits farmers, states Buddy Buruku of the Inclusive Markets Team at the Consultative Group to Assist the Poor (CGAP). "For a digitisation project to add value for producers and win their buy-in, it must first identify the pain points they experience in terms of not just mobile money but their finances in general, and then pull in additional financial services providers to ensure these are addressed and that farmers have an incentive to transact digitally," emphasises Buruku. Paying producers digitally is clearly compelling for agri-processors, who anticipate big cost savings from the switch, notes Buruku. However, "Why farmers would want to take it up is another issue," she adds.

CGAP is working to address that in a current project with global agri-business Olam, which is looking to digitise payments to farmers in Ghana, and possibly to markets such as Côte d'Ivoire, Mozambique and Uganda, and Tanzania in due course. Still in the very early stages, CGAP's work with Olam involves conducting a cost-of-cash study to demonstrate the value of digitising payments to smallholders; its immediate aim is to identify locations where farmers spend money (e.g. with input providers, schools, hospitals and supermarkets) and look at how these transactions could be digitised. The study will also try and identify what additional financial service requirements, such as for savings or credit, Olam's farmers have so that it can bring in partners able to meet these needs. Olam already has a large number of farmers registered on its system, along with related data – for example around transactions with producers – that can be leveraged, notes Buruku.

For further information visit:
https://tinyurl.com/ycpc5txc** and **https://tinyurl.com/y87agquu

operators have failed to resolve is that, "The whole solution depends on the trust of the farmers themselves." Spencer adds that to gain trust, "You have to provide a service to farmers that actually works and that they can understand." Most farmers have little use for traditional money transfer services, do not want to pay high withdrawal fees and do not want to break away from work to hunt down agents with cash, he argues. "All of this is a huge inconvenience and cost for them."

This is why SmartMoney evolved from starting out as an agricultural value chain payment solution into a broader eco-system model that enables farmers and other rural people in Tanzania and Uganda to build savings and use digital money for a range of goods and services including food shopping, buying inputs, paying for their children's school tuition and even making offerings at church. "We found that until you get merchants to accept e-money as a form of payment, and accept it for withdrawals and deposits, and until you get a sufficient number of merchants so that this becomes more of a credit card system than a money transfer system, you won't persuade farmers that this is useful," Spencer explains.

SmartMoney has spent the past 7 years developing a formula for winning over communities, district by district, using trial and error to find the best way for everything from transporting five-member teams and their equipment deep into rural areas, to holding marketing road-shows, to overcoming highly localised language barriers. For each district the company targets, the first year is focused on building a service layer that is not just about the technology. Spencer says, "It's about having sufficient numbers of merchants who are accepting our e-money as a form of payment for goods and services and who are also acting as cash points where people can make deposits and withdrawals."

SmartMoney is now able to open around 700 new accounts per district in a single day and believes it should be able to replicate that in other districts once new teams are recruited and trained. Year two is focused on revenue, which SmartMoney mostly seeks to generate from bigger institutional customers like schools, churches, agribusinesses and NGOs, which pay a fee to either receive or make payments.

Although payment streams from farmers to individual churches and schools are nowhere near as big as those from agricultural offtakers to farmers, the large numbers of such institutions in rural locations mean that, in aggregate, they represent a bigger volume of payments for SmartMoney to tap. Tuition fees are among rural people's biggest costs yet getting payments to schools is a big challenge, with many relying on ›

› children to carry cash, which is as at risk of being stolen or spent, Spencer notes. For schools, being paid digitally can therefore greatly increase revenue.

Another major benefit of targeting such institutions is that their leaders act as filters or gatekeepers in a community, with rural people often looking to teachers in particular for their approval before they accept anything new. "When we target a school or a church as a revenue-paying customer, we're also targeting them as a trust-builder," Spencer explains. After this comes a process of education, explaining to communities how saving works, its benefits compared with borrowing, and how it can be possible even for those who do not believe their income is big enough.

Most rural Africans can name a person in their family or community for whom borrowing has proved catastrophic, for example losing their farm or being jailed because of non-repayment, states Spencer. This has created some scepticism around any form of mobile money with a loan component and is a hurdle SmartMoney must overcome before it starts explaining how its offering is different – and how savings can be an empowering tool for wealth creation. "If any of these other players are serious about this, they're going to have to understand what we now understand, which is that financial inclusion is an education business," he says.

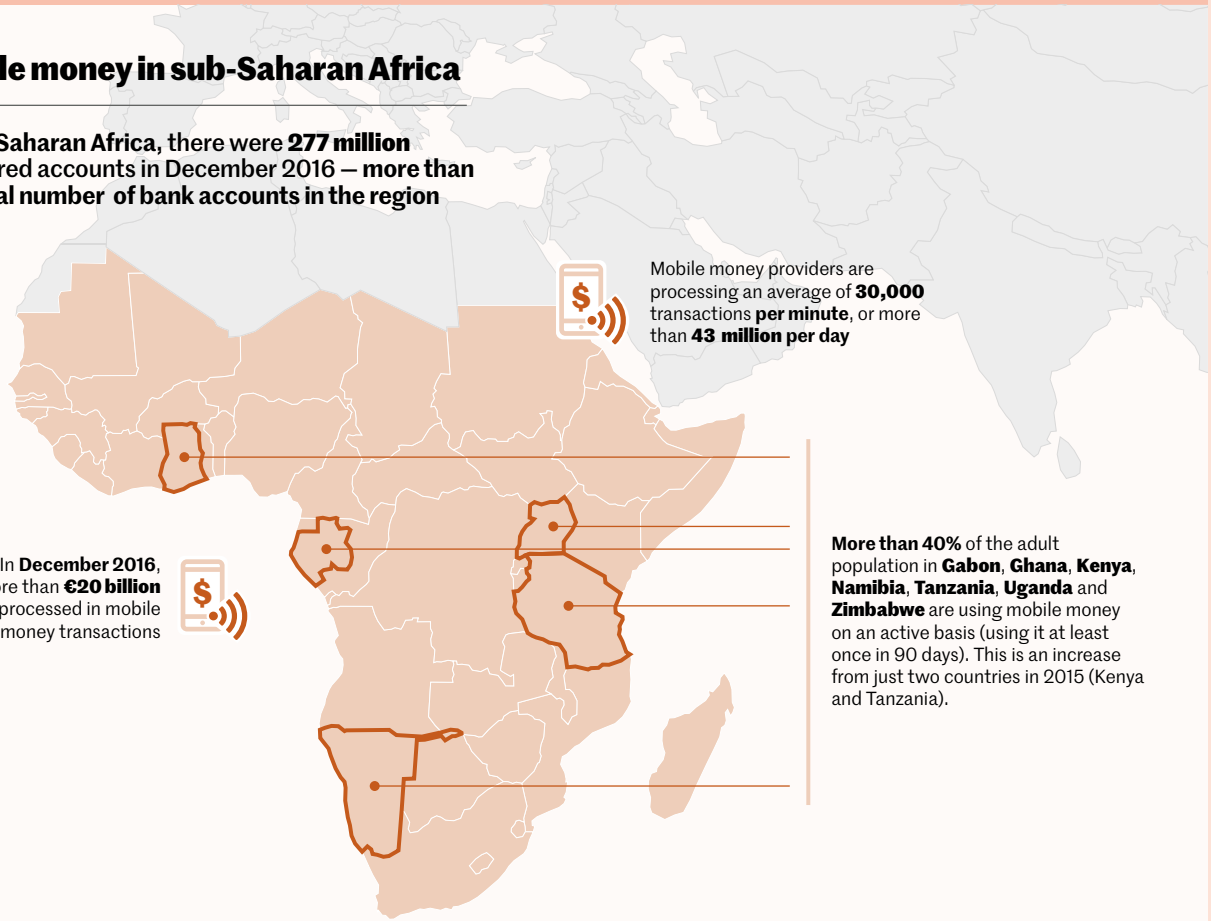
> "You have to provide a service to farmers that actually works and that they can understand."

Once that groundwork is complete and a channel for the transfer of value has been opened up, there are huge opportunities for wider use of digital payments, argues Babcock. Microfinance institutions, for example, can use the digital payments to disburse input, equipment or livestock loans and to receive payments, while farmers can use the same mobile wallet for crucial purchases such as pay-as-you-go solar power. "Once the channel is there, it's amazing what you can do with it," he concludes. ■

For more information visit: SmartMoney (https://tinyurl.com/mz9m2sq), Read CTA publication: Mobile Payments: How Digitial Finance is Transforming Agriculture (https://tinyurl.com/yaf9a5c2)

Mobile money in sub-Saharan Africa

In sub-Saharan Africa, there were 277 million registered accounts in December 2016 – more than the total number of bank accounts in the region



SOURCE: GSMA (2017)

INTERVIEW

Betty Wampfler: Agricultural finance for sustainable systems

Anne Perrin

Betty Wampfler advocates a systemic funding approach tailored to the family farming environment in ACP countries, which she feels is currently the only effective way to address agricultural finance issues.

How and in what way does technology change farming community access to finance?

Currently, 80-90% of agricultural production in ACP countries is from family farms, which are highly varied, particularly in terms of access to technology. In Africa, the digital divide is very broad and farmers are the first to be excluded, especially the poorest. In this setting, technology is not a way of life for many family farmers. Digital market information systems are available in some areas, but only the most well off farmers have access to this technology. Stakeholders do not seem to have much experience with digital agricultural finance in the areas; it is somewhat more developed in Eastern Africa, but its dissemination is still very slow. In my view, these isolated initiatives are amplified by major communication campaigns, thus giving a false sense of widespread adoption and implementation.

Should agricultural finance be redefined with less focus on microfinance?

Agricultural finance is difficult and risky, so current thinking points towards value chain finance as an effective solution involving tripartite contracts between large-scale farmers (or farmers grouped in organisations), a financial institution and a big buyer. The buyer pays the farmer via the financial institution which, after granting the farmer a loan, can levy the loan repayment directly at the source. Value chain finance has existed for over 30 years and has helped in the development of major agricultural sectors and agricultural modernisation techniques. This system has the advantage of reassuring financial institutions with regard to agriculture but it is based on contractual relations that are hard to uphold in a fragile institutional environment. Moreover, family farms combine different types of interlinked production, so only funding one type of production via value chain finance will really not solve the overall problem of financing farms and farming households, and could even lead to serious problems (as clearly demonstrated by the historic loan default crises in the cotton sector).

Value chain finance can now be an effective tool but must be backed by family farm finance. Microfinance and networks of local agents, together with the banks that hold the capital, can adapt to the systemic nature of family farms.

Agricultural finance systems are currently quite disjointed. How can this problem be solved?

This disjointed situation actually concerns microfinance institutions that have access to farmers but lack adequate financial resources (in terms of volume and medium- and long-term duration), and also banks that are in an excess liquidity situation but have limited access to farmers. There is a real need to think in terms of sustainable agricultural finance systems while incorporating the different options and striving to strengthen the skills of all stakeholders – farmers, financial institutions, support providers (extension agents, NGOs, etc.). We are working in this direction in West Africa with Montpellier SupAgro and various partners, especially in the AGRI+ programme in Burkina Faso and Mali.

For more information visit: https://tinyurl.com/k9e7sqn

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Betty Wampfler is Professor of Development Economics at Montpellier SupAgro and researcher in CIRAD's Markets, Organizations, Institutions and Stakeholder Strategies Joint Research Unit

KENYA

Mobile based payment solution for smallholder farmers

Connected Farmer Alliance, a mobile-based payment solution developed by a public-private partnership, is transforming agri-finance for value chains such as nuts and milk in Kenya, Tanzania and Mozambique, as well as helping farmers to access credit.

Bob Koigi

Kenya Nut Company – one of the leading macadamia processors in Africa, purchasing on average 6,800 t estimated at €6.4 million each year – has grappled with the communication and logistical challenges of managing over 100,000 farmers supplying its 154 buying centres. In the past, Kenya Nut would dispatch more than 182 field staff to weigh supplies and pay farmers.

"Sometimes our staff had to walk long distances carrying large sums of money, and payments were usually done in the open, meaning people could see how much staff were carrying. During peak buying periods, this could amount to over €120,000 per day. The possibility of robbery was high, as were instances of staff misappropriating the money. As a business, we also had to shoulder too many operational costs, including bank charges on withdrawals," says Wangai Gatawa, Kenya Nut's field procurement manager.

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A win-win model

However, the Connected Farmer Alliance (CFA) mobile payment system has heralded a faster and more convenient way of working with over 20,000 Kenya Nut farmers. The system records

the payment details of farmers registered on the platform. When a farmer makes a delivery to the collection centre, the Kenya Nut staff check the nuts for quality before weighing them on a digital scale. The scale is connected to a web and mobile-based application, which sends the weight to both the weighing staff's and farmer's phone, and payment is automatically triggered to the farmer using the mobile money platform, M-Pesa.

In central Kenya, where over 6,000 farmers are registered with the system, Anthony Thuku, Kenya Nut regional branch manager says, "It is a win-win model. It is not easy trying to deal with over 500 farmers in one collection centre. Trying to reconcile records, then dispatching payments would previously take a long time and discourage farmers. But, interestingly, we have noticed reduced cases of side selling to other brokers because farmers were in urgent need of money. Mobile-based payment means farmers can concentrate on growing and selling to us quality nuts and earn good money for it."

At collection centres, the weight of farmers' produce is sent to their phones via CFA's mobile system, automatically triggering payment

Better-connected farmers

The mobile payment system has opened a world of opportunities for many smallholder farmers excluded from mainstream financial services like banking and insurance. David Irungu, CFA regional monitoring and evaluation administrator says, "Farmers often have to grapple with access to agricultural inputs, how to get credit in case of emergencies and even unpredictable payment periods, which means they cannot focus on farming quality produce. But a farmer who knows he will be paid immediately delivers his produce, and can go to a shop to access inputs on credit after showing his payment history, and then you have addressed a very vital stumbling block in the value chain."

Richard Gathogo, a 65 year-old farmer who has been growing macadamia for 25 years has a litany of woes about his previous experience with buyers. From middlemen buying his nuts too cheaply to payments that would take up to 3 months, Gathogo had almost given up on his business. However, on being introduced to CFA, he felt he had nothing to lose. "It has changed my farming and given me impetus to farm more. In all my years, I have never been paid the same day for my deliveries," he enthuses.

Gathogo, whose income has since quadrupled, states that he is now able to better plan his household expenses. Using the mobile payment system has also boosted his creditworthiness, especially with mobile money lending platforms like Safaricom's M-Shwari, as his ability to pay on time has increased his loan limit by 10 times.

Challenges on the ground

Nevertheless, whilst the CFA initiative is continuing to expand, the project has not been without its challenges. Since inception there has been some resistance to mobile payment from farmers who are attached to receiving cash. Although the problem has been addressed with training to heighten awareness of the benefits of the technology, some farmers are still apprehensive. "At the coastal area of Kenya where we source cashew nuts, we were forced to suspend the system and resort to cash because farmers would not accept to be paid through their phones and were hesitant to give out their details. They threatened to stop selling to us and we had to suspend it," states Gatawa.

Limited mobile networks in some rural areas, coupled with a sizeable number of farmers who do not own mobile phones, has also slowed uptake. In some instances, buyers have to walk long distances from the collection centres to get network coverage to trigger payments. And, while the system has proved successful with commodities such as milk and nuts, which are delivered daily, it had to be dropped for seasonal crops like mangoes and sugarcane because by the time the next season of produce was ready for harvesting, farmers had forgotten about the mobile technology and resorted to using cash.

However, Ndumberi Dairy Farmers' Cooperative Society, an association of milk farmers in Kenya has also successfully adopted the payment system, allowing its members to keep track of the milk they produce and sell, while reducing cases of milk theft with the cash system as unscrupulous traders often exploit farmers. The system also delivers timely information on good agricultural activities to boost milk quantity, quality and market prices direct to farmers' mobile phones, while allowing farmers to access inputs on credit in local agricultural shops by using their payment history from the cooperative as collateral.

"The success of the mobile payment system is, to a large extent, championed by the businesses dealing with smallholder farmers. If they do not see value or business sense to their operations, they won't pursue it, which explains why most of them failed. The case of Kenya Nut and Ndumberi milk processors is classic because it simplified their operations and enhanced relationships between them and the farmers they were working with," concludes Irungu. ■

CFA is a public-private partnership between the United States Agency for International Development, Vodafone and TechnoServe that seeks to promote commercially sustainable mobile agriculture solutions and increase productivity and revenues for 500,000 smallholder farmers across Kenya, Mozambique and Tanzania.

ZAMBIA

Zoona – innovative mobile finance

In a society that is largely financially excluded, what role do mobile financial platforms play in enhancing farmers' capacity to improve their livelihoods?

Friday Phiri

© FRIDAY PHIRI

Milambo Maambo's agro-shop use the Zoona mobile transfer platform to supply inputs to smallholder farmers

Zoona is Zambia's leading money transfer platform allowing users to receive money through a mobile phone. Critically, the service provides a secure and accessible means to finance for the unbanked population, who are predominantly smallholder farmers in rural areas; customers simply walk to a kiosk, and within 5 to 10 minutes, the transaction is complete. With a simple system, South Africa-based financial technology company, Zoona, is affording an opportunity to the even most vulnerable groups to easily send and receive money.

"Zoona has a unique approach to mobile money that makes it ideally suited for farmers' needs," says Lelemba Phiri, Zoona's chief marketing officer in Zambia. "Because it is not owned by a bank or by a cellular provider, Zoona is completely network agnostic, which means anyone can use Zoona, even people without a mobile phone."

Launched in 2008, Zoona has a long track record of serving Zambian farming communities. One of the platform's earliest customers was agribusiness company NWK Agri-Services, which used the platform to pay cotton farmers across the country. Zoona also has a long-standing relationship with Zambian Breweries whose customers use the Zoona platform to purchase stock (beer and other drinks). "This model allows Zambian Breweries to receive payments from a broad range of customers who may not have bank accounts, thus improving its service," says Phiri. "Zoona does not do payments for Zambian Breweries to farmers – but that is a model we have implemented successfully for other corporates through our bulk money transfer product."

40% of Zambia's adult population remain excluded from formal financial services

Innovation for financial inclusion

In 2009, a national Finscope financial survey revealed that 63% of the Zambian adult population was excluded from formal financial services. Of this percentage, 66% were estimated to live in rural areas and depend on traditional agriculture. While the picture has improved to about 40% as of July 2016, the majority of the rural populace remains financially excluded, hindering their potential to access credit.

But the Zoona platform looks set to change the prevailing scenario. In 2016, Zoona processed over €210 million in domestic money transfer transactions – with a significant portion of that coming from farming and rural communities which, according to Phiri, "represents a significant contribution and impact to financial inclusion."

Implementing a number of innovative solutions, such as cash-wholesaling, cash-running and electronic credit, Zoona ensures that its agents, who are independent entrepreneurs, are always liquid and able to transact – something that the firm believes other players in the market struggle with, particularly in rural areas. For example, Zoona offers a low-cost overdraft facility and enters into agreements with other business partners to ensure that their agents can go to their premises to withdraw cash when needed.

The firm's recent consumer data shows that about 20% of its more than 1.5 million active (using Zoona at least once in a 60-day period) consumers are in the farmer/provider sector or live in a rural community. This percentage is much higher for Zoona outlets (booths) operating in rural areas. According to Lucy Shakaloba, a Zoona agent operating in Monze district, about 70% of her daily transactions involve farmers. "Most of my regular customers are farmers who receive money for farming inputs from relatives in big towns, while others remotely sell their produce to Lusaka, and are paid through Zoona. I know of one farmer who collects on average 3,000 Kwacha (€280) per week from vegetable sales," says the 24 year-old teaching graduate who has opted for financial entrepreneurship to teaching.

Supporting the entire value chain

With over 1,300 active kiosks operated by independent entrepreneurs, Zoona has created over 2,500 jobs in Zambia, Malawi and Mozambique, processing over €1.5 billion in mobile money transactions. Raising over €21 million in international investment since 2009, Zoona is on the move and expanding its portfolio of financial services, and so are some of those who have rubbed shoulders with it. ›

› Milambo Maambo is an agro-dealer in Pemba district in Southern Zambia. Thanks to Zoona, he is now a government recognised supplier of inputs under the Zambian Farmer Input Support Programme (FISP) electronic voucher system, which was introduced in the 2015/16 farming season to cut some of the huge costs associated with the government subsidy programme. "My experience with Zoona enriched my CV when I applied for the FISP e-voucher," says Maambo. "More importantly, the Zoona contract increased my capital which is a requirement for the programme's designated banks to register an agro-dealer under FISP e-voucher scheme."

Over €210 million in domestic money transfer transactions was processed by Zoona during 2016

With a capital of slightly over ZK50,000 (€4,690) in 2015, Maambo earned ZK100,000 (€9,380) in a contract for supplying inputs to smallholder farmers under Zambia's Conservation Farming Unit, through the Zoona mobile transfer platform. "The advantage with Zoona is that it only requires one to have a mobile phone, and transactions can be done anywhere as long as there is network connection – no hustling involved," says the former government extension officer turned agro-dealer.

Maambo says that the mobile money platform provided a base for growth, helping him to create an easily accessible database (slightly over 5, 000 farmers), and an operating capital of more than €28,140. This, he says, has earned him respect and trust from agribusiness companies that readily supply him with stock from which he earns commission. But more importantly, he adds, "The mobile platform has helped me extend an input credit facility to smallholders. With a reliable database in my custody, I know who can and cannot afford to pay back."

Patson Chikwanda is a beneficiary of Maambo's credit facility. "In the past two seasons that I have been accessing inputs on credit, my productivity has increased because I plant and weed on time, improving my overall annual production," says the 40 year-old farmer of Simbulo village in Pemba district. Asked about one major change in his life, Chikwanda, a husband to three wives and father of 10 children, points to his newly built four-roomed iron roofed house. He is proud of this symbol of success from the last two seasons, as well as being able to easily support six of his children at school.

With the recently launched (February 2017) Sunga account – an e-wallet product that enables consumers to keep money safe at no charge and save, for example, for school fees or building a house – Zoona looks set to revolutionise Zambia's agricultural sector financial inclusion agenda and already has over 35,000 users. A key advantage of a Sunga account is that it requires no paperwork to set it up, requires no minimum balance – an account can be set up with a few kwacha (less than €1) – and there are no monthly fees.

While securing the necessary permits and licenses required to expand business services may pose a challenge, Zoona is continuing to work with partners and government regulators through its Z-Labs project to expand its financial services and develop new products for farmers and agripreneurs. Z-Labs is the innovation arm of Zoona which is working on a number of different financial services – Zoona Sunga was the first new product that they have released. The mission of Z-Labs is to propel Zoona from an over the counter money transfer business to a fully-fledged financial service provider and digital leader that delivers customer-centric products and a superior customer experience. ■

Mobile money in Malawi

Providing mobile payment services in a largely agribusiness economic environment, Zoona's kiosks are located in remote as well as urban areas to offer much needed financial services to those who need them at a fraction of the cost of existing operators. Activities in Malawi were launched by Zoona Transactions International Ltd. in October 2014 in partnership with The People's Supermarkets, which allowed agents to set up outlets in their stores. By the end of 2014, Zoona was processing more than 12,000 money transfers per month. The company has since expanded to 530 Zoona trading outlets. The company understands the challenge of the Malawian economy (the long droughts having a significant toll on yields) and the negative impact it has had on consumer income.

"Zoona was founded with the vision of helping communities thrive. We have a tremendous opportunity to use technology and partner with entrepreneurs to positively influence the lives of millions of people," states Brad Magrath, Zoona co-founder and chief people officer. In 2016, Zoona had around 350,000 90-day clients (use service at least one in 90 days).

One regular user of the Zoona payment facility is Alinnete Mark, a long-time trader in agricultural produce, who buys cereals and legumes from remote areas in central Malawi and sells them in urban trading centres. She acknowledges that the use of mobile payment has reduced the burden of having to carry bundles of cash which provides greater safety for her staff when they travel and work on their own. "My field staff do not need to travel long distances with cash. They collect the money I send via Zoona and use it at the same trading centre where they are buying the produce," she states. "This has made money transfers easier and more convenient."

Charles Mkoka

Economy

ROOTS AND TUBERS

A potential cash cow in the Caribbean

Innovative regional stakeholders are beginning to unlock the potential of traditional Caribbean food crops – roots and tubers – through value-added farming production and agro-processing initiatives.

Natalie Dookie

Root and tuber crops (RTCs) such as arrowroot, cassava, dasheen, eddoe, ginger, sweet potato, tania and yam are farmed throughout the Caribbean and remain a staple of traditional diets. Belize, Guyana, Haiti, Jamaica, Suriname and some eastern Caribbean countries are self-sufficient in RTCs, with Jamaica and St. Vincent and the Grenadines leading regional exports. However, with the capacity to create value-added products for local consumption and export, the Caribbean Community (CARICOM) has identified cassava, sweet potato and yam with the highest potential for development.

RTC crops can withstand up to 98% of hurricane disasters and have good potential even as regional climate patterns change, as planting material can be sourced locally, and farmers are familiar with RTC production. RTCs are also valued for their 'good' complex carbohydrates, which provide better glycemic

© LUKE SMITH

Slimdown 360's sweet potato pasta and instant mash products have a shelf life of 1 year

indices (food's effect on a person's blood sugar), compared to imported refined carbohydrates; they are also high in dietary fibre and low in calorie count, which are important considerations for health-conscious markets in Europe.

Adding value

RTC agro-processing across the Caribbean is predominantly focused on cassava, with less than 10% on sweet potato. The majority of processors are sole traders, partnerships and family enterprises offering a limited product range. However, a group of Caribbean entrepreneurs are investing in product development, intent on further commercialising traditional goods such as RTC flour and tapioca, as well as creating a diverse range of new products. These entrepreneurs are actively supported by research and development and training initiatives from the Caribbean Agricultural Research and Development Institute, FAO, the Inter-American Institute for Cooperation on Agriculture, and The University of the West Indies, among others.

Jethro Greene, Caribbean Farmers Network chief coordinator, says that, "In St. Vincent and the Grenadines, we embarked on an integrated approach to production and marketing of dasheen. We organised several farmers into a group, and provided training in new production techniques and on packing and grading products, which increased production by almost 500% and prices farmers were able to obtain by 200%. We are also exploring use of a joint labour pool and bulk importation of inputs, such as fertilisers, in order to increase competitiveness and profitability. These farmers were also trained in exporting processes, and they have been exporting to Europe for the past few years without any 'claim backs' [claims by the buyers that the goods were not of the required standard]. Today dasheen is now recognised [here] as the third highest export crop."

Policy processes

While the Caribbean region has a food and nutrition security policy framework which supports the growth of RTCs, there is still much work to be done on creating an agriculture investment environment. In addition, with 15 CARICOM member states, there are multiple agricultural policies and import requirements, often presenting non-tariff barriers to intra-regional trade. In order to progress the RTC value chain, the region must bridge the price gap between farmer and agro-processors, which can be done by linking price to quality and would improve good agricultural practices across the value chain.

However, sustainable RTC farming is stymied by a combination of a lack of political will and private sector investment. Governments and ministries remain slow to implement climate change initiatives, invest in agriculture and provide access to financing for farmers. Consultants, Dr Basil Springer and Robert A Reid, have been developing a proposal for an agriculture working capital model for the Caribbean enabling farmers to finance their entire production cycle. The new model would also fund 'shepherding' which enhances the chances of success for the farmer and financer by coordinating all value chain activities on behalf of smallholders, including relationships with buyers. Springer says, "The major challenge which farmers' face in the region is access to advance working capital. They require funds for inputs, packaging, marketing, transportation and shipping; and they undertake much of the primary risk. Yet farmers obtain a fixed price for their goods, and often have to wait for payment when it is sold. Traders consequently obtain a greater share of the profits. This corporate model needs to change."

Increasing productivity

Analysis of regional RTC value chains identify the need to improve low productivity and increase access to high yielding planting material which is disease resistant. In addition, there needs to be more collaboration between farmers and agro-processors, greater diversification of final products and enhanced investment in research and development, including mechanisation technologies appropriate for the smaller size of regional farms. Training of agro-processors in supply chain management and marketing concepts is also key to RTC value chain development. Public education and promotion of RTC health benefits to the regional public is also required in order to increase domestic consumption; in St. Lucia and Trinidad and Tobago, RTC products have been incorporated into school feeding programmes.

While cottage industries for cassava chips remains vibrant, regional market demand and private sector investment is driving innovation in manufacturing. The Trinidad and Tobago Bermudez Group Ltd. now offers a range of chips including cassava and dasheen, which is manufactured in Costa Rica. This demonstrates that, if the region can provide a sustainable, high quality supply of RTCs, there is demand from regional agro-processors. In fact, one of the most successful cases of import substitution using RTCs is from Jamaica's Red Stripe beer. Red Stripe has begun to substitute barley with locally grown cassava, engaging independent farmers' and cooperatives in its value chain integration process. ■

Niche products: RTC pasta and mash

In 2010, Jody White founded Slimdown 360 Ltd., which supplies low-calorie pre-packaged meals in Trinidad and Tobago, after he encountered a market gap with respect to local food product availability. After years of trials, he developed cassava and sweet potato pastas and instant mash products with a shelf life of 1 year, with no preservatives; compared to RTCs which have a shelf life of 1-4 weeks. Since its product launch in early 2017, the firm has purchased more than 10 t of RTCs, and expects this to rise to over 100 t by early 2018. Slimdown 360 is also currently exploring export opportunities in Canada and the US, which may eventually triple local RTC requirements.

The main challenge White encountered has been access to funding, as well as a large variation in RTC size, shape, colour and taste. In the long-term, the company intends to invest in backward value chain integration by working with farmers to advance techniques for higher yields.

BEE PRODUCTS

Honey exports take off in Africa

The African beekeeping sector – via recent organisation and modernisation initiatives – has created a favourable setting for honey exports while also partly meeting domestic demand.

Bénédicte Châtel

The African beekeeping sector is experiencing a boost in production and export volumes with the advent of innovative techniques. This is good news for African agriculture overall, and for the environment, as bees are the linchpin in the pollination process. The situation also augurs well for the diversification of income sources, especially for women farmers, through honey sales. Moreover, increased honey production is having a positive impact on trade balances. Nigeria only fulfils 10% of its total domestic consumption demand (380,000 t), while it annually imports €1.84 billion worth of honey, according to David Victor Musa, general manager of Barg Natural Honey (Nigeria). Overall, Africa currently consumes three times more honey than it produces.

Exports soar

In 2013, FAO estimated that Africa accounted for roughly 9% of global honey production (155,789 t), representing a 10% increase since 2000, which has since increased to 13% by 2016, states non-profit organisation ApiTrade Africa. Ethiopia (50,000 t), Tanzania (30,000 t), Angola (23,300 t) and Central African Republic (16,200 t) are amongst the world's top 20 producing countries. Interestingly, Ethiopia is also the fourth largest beeswax producer in the world.

Honey exports throughout the continent grew sharply by 613% from 2000 to 2013, which represented an increase to 3,195 t, worth €8.9 million. Whilst overall production is low in Egypt, most of it is exported (1,202 t in 2013), ahead of Ethiopia, which exported 904 t in 2013, up from just a single tonne in 2000. Zambia (388 t) also stands out, like Tanzania (210 t) and South Africa (290 t) for increasing exports. Furthermore,

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Exports of honey jumped 613% between 2000 and 2013 in Africa

© IFAD/GUY STUBBS

Africa's image as a 'natural' continent could help increase its market share in the organic honey sector

Africa could take advantage of its image as a 'natural' continent to increase its market share in the organic honey sector.

A recent continental trend

Honey has always been produced in Africa, but the sector has not been the focus of much interest due to the sparse production volumes, high prices and lack of competitive advantage over imported honey. The African Apiculture Platform, which was launched in 2014, with the support of the African Union, has called for the creation of multi-stakeholder platforms in all producing countries. So far, 25 countries have launched national platforms, including Ghana and Mali, in early 2017; all are geared towards development of the sector, especially honey production, bee health and pollination activities.

Conventional honey extraction methods in Africa are not very productive and sometimes lead to the extermination of bee colonies, especially when straw fires and fumigation are used to drive out bees and harvest their honey. According to Demisew Wakjira Akessa from the Ethiopian Ministry of Agriculture, conventional mud and clay beehives (90% of all used in this sector) generate, on average, 7 kg of honey/colony each year, temporary beehives made of suspended bars without frames generate 15 kg, while beehives with frames generate 33 kg, with a record of 80 kg/year.

13%

of global honey production came from Africa in 2016

€1.84 billion

worth of honey is imported to Nigeria annually

"In Africa, people traditionally sought honey in tree trunks, for example, and then harvested what they found," says Robert Grace Kisenyi from ApiTrade Africa. "Then bee domestication gained popularity in Africa. Kenyan top bar hives are currently the most widespread, but Langstoth hives, with vertically removable frames, are increasingly popular."

Honey harvesting is also being modernised. In Chad, spotlights are used instead of conventional fumigation to attract bees and collect their honey without the unpleasant smoke odour, while also not stressing or killing the bees. 'High-tech' beehive management is also becoming popular. In Kenya, the Swarm Database app issues a smartphone alert signal – transmitted via sensors installed on beehives – when a hive has been knocked over. This enables farmers to manage their scattered beehives remotely.

The use of more modern techniques often helps producers gain access to lucrative markets in the EU and elsewhere. However, the EU imposes stringent quality standards that force producing countries to set up national plans to control residue levels (antibiotics, pesticides, and heavy metals such as lead, arsenic, etc.). Some African countries such as Cameroon, Ethiopia, Ghana, Madagascar, Rwanda, Tanzania, Uganda and Zambia are already meeting these requirements. ■

© TOLARO GLOBAL

Tolaro Global's processing facility buys cashews from 7,000 farmers

GOOD INVESTMENT

Premium cashew nuts from Benin

Launched in northern Benin in 2010, Tolaro Global could become the top West African business exporting entirely African-produced roasted and seasoned cashews.

Claude Biao

Located 420 km from Benin's capital city, Tolaro Global's cashew processing facility in Parakou was set up in 2011 and, in its first year, processed 557 t of raw cashews. By 2016, processing had dramatically risen to 2,500 t, according to estimates from the African Cashew Alliance (ACA), and the company is now the leading cashew processor and exporter in Benin.

The processing facility buys cashews from 7,000 cashew farmers and is run by a staff of 600 people, half of whom are women, mainly recruited in Tourou communities and neighbouring villages. Employees receive healthcare and childcare benefits, in addition to fair wages and subsidised food.

2,500 t

of cashews were processed by Tolaro Global in 2016

60 kg

of cashews a year can be harvested from one tree grown under optimum conditions

With technical support provided by Technoserve, a major achievement for Tolaro Global in 2012 was to be awarded the ACA Quality and Sustainability Seal, certifying the quality of cashews produced and compliance with international cashew production and processing standards. The company was the first ACA certified factory in Africa. With input from PepsiCo and Self Help Africa to improve farming practices and introduce new cashew trees, farmers' yields have also increased by 25% over the last 5 years. The farmer project included establishing a model farm for farmers to see various techniques, including orchard layout, pruning and other agronomic practises, and four nurseries to supply improved trees. In West Africa, cashew harvests average around 3 kg per tree per year while under optimum production conditions, improved trees can provide up to 60 kg per tree per year.

By 2021, Tolaro Global plans to increase its primary processing production capacity to 20,000 t per year and create a further 1,900 jobs. This will mean sourcing raw cashews from 3,000 Beninese growers, with around €10.94 million investment in operations in Benin, including financial support from Moringa, a private equity fund, which specialises in financing sustainable agroforestry projects in Africa and Latin America. "This partnership will allow us to achieve our vision for the cashew industry in Benin. We believe that a well-developed cashew processing sector in West Africa can radically transform the region, but it takes strategic partners like Moringa to help make that happen," said Jace Rabe and Serge Kponou, Tolaro Global managing directors. Once this goal is achieved, the company expects to become the leading West African company exporting 100% 'made in Africa' roasted and seasoned cashews.

Benin's cashews are recognised for their sweet taste and better quality, and are granted a premium. With clear competitive advantages, the development of local processing, as with Tolaro Global, presents exciting new opportunities. ■

For more information visit:
https://tinyurl.com/lt4mnk8

BIG DATA

Transforming agricultural insurance

Experts met in Bonn in May 2017 for a 1-day conference about how innovations like big data are transforming agricultural and weather insurance.

Helen Castell

From satellite data to premium pricing, lessons from current insurance initiatives were shared by experts at the recent 'Scaling up Agricultural Adaptation through Insurance' event held in Bonn, Germany. "Various stakeholders were brought together to pool their expertise," said Olu Ajayi, CTA's Senior Programme Coordinator and Lead Specialist on Climate Change and Agriculture, who led a panel session at the event co-hosted by CTA, the CGIAR Research Program on Climate Change, Agriculture and Food Security and the Syngenta Foundation for Sustainable Agriculture.

Uncertainty over how climate change risks will evolve over the next decade currently limits private sector insurance provision to farmers, states Annette Detken, head of division at KfW Development Bank. She adds that, until demand for insurance is great enough to offer economies of scale, new product development will be slow.

However, by reducing the need for costly risk-adjustment, index-based products are making insurance more affordable for farmers, notes Ulrich Hess, senior advisor at German development agency, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). Improved satellite data is a 'game-changer'; now available for free online, such data is being used successfully and sustainably in insurance schemes in Africa, India and South America, Hess continues. The use of satellite data also allows claims to be paid more quickly, adds Detken.

The digital delivery of insurance policies, increasingly bundled together with input loans or including a loan specifically to cover the premium, is also cutting insurance costs. In Zambia, NWK Agri-Services offers insurance to cotton farmers who receive credit to buy coverage, delaying farmers' payment of the premium until they have income from their harvest. Around 52,000 out of the 70,000 Zambian farmers it works with took up the offer in 2016. However, lenders should cut interest rates to reflect the lower risk insured farmers present, argues Rahab Kariuki, managing director at Agriculture and Climate Risk Enterprise.

© ILRI/RICCARDO GANGALE

Insurance initiatives are helping farmers in Wajir, northern Kenya, protect their livestock and increase productivity

As the impact of extreme weather risks become more visible, there is a much stronger political will to address them, triggering several international initiatives, states Detken. For example, the G7 Initiative on Climate Risk Insurance launched in 2015, InsuResilience, aims to increase access to direct or indirect insurance coverage for up to 400 million people in developing countries by 2020. Detken adds that, with €505 million already pledged, the initiative sends a strong signal to the private sector, whose feedback has been 'very positive'.

However, for insurance use to grow, better education is required, says Kariuki, noting that perhaps only two in 10 farmers are aware of insurance and just one understands how it works. More skilled intermediaries such as technical brokers are needed, as is better training to produce qualified loss-adjusters, adds Kariuki.

Subsidies too are essential. Governments could shift existing funds for post-disaster relief towards pre-disaster insurance, argues Hess. Private sector firms could also offer 'smart subsidies' that support their own business interests. For example, initiatives where input companies have teamed up with insurers to offer African farmers free germination insurance – guaranteeing them a replacement bag of seeds if germination does not occur within 21 days – have demonstrated the benefit of insurance to farmers, many of whom then opt to buy coverage for the rest of the season, emphasises Kariuki. ■

For more information visit: CCFAS https://tinyurl.com/maot6bp and see CTA article https://tinyurl.com/y8sbryf5

INTERVIEW

Facilitating ICT agripreneurship

Ken Lohento, ICT for Agriculture Programme Coordinator at CTA, explains how the organisation is supporting young e-agribusiness start-ups through its Pitch AgriHack! initiative and the publication of *An ICT Agripreneurship Guide: A Path to Success for Young ACP Entrepreneurs*.

Susanna Cartmell-Thorp

'An ICT Agripreneurship Guide' is just one product of CTA's work to foster young agripreneurs. Why is it so important to attract youth to work in agribusiness and how do ICTs play a part in this?

CTA wishes to strengthen the engagement of youth in agribusiness and there are several reasons for this. On the one hand, business creation usually grants a positive social profile to a founder; it also can yield important revenues when it is successfully implemented. In addition, strategies involved in running a competitive business can give birth to innovations that accelerate socio-economic progress and favour the creation of new jobs. On the other hand, the increased integration of ICTs in agriculture has two implications. It contributes to the modernisation and performance of agribusiness processes and it has created a new business that we call 'ICT agripreneurship'. Young people are increasingly interested in this novel approach and CTA wants to support them.

When was 'An ICT Agripreneurship Guide' launched and what can you tell readers about it?

We launched the guidebook on 26 April 2017 at the African Agripreneurs Youth Forum, organised by the African Development Bank, CTA and other partners in Nigeria. The guidebook provides young entrepreneurs interested in offering ICT services to the agricultural sector with introductory knowledge and recommendations that can help them to successfully launch their new venture and design effective business strategies. Many young innovators do not actually know the agricultural sector, have not studied business management, and make errors that experienced entrepreneurs would naturally avoid. In addition, ICT for the agriculture sector is new and faces many challenges. This guide will give them more understanding of what needs to be done and how to design a winning business model.

© CTA

Ken Lohento manages CTA's Pitch AgriHack! initiative

CTA's AgriHack initiative is successfully supporting young e-agriculture start-ups. Can you give an example of how some of the start-ups involved are contributing to agricultural transformation?

I would like to mention three start-ups involved in Pitch AgriHack!, our e-agriculture start-up competition organised in 2016. The first is Sooretul, a Senegalese company created by Awa Caba, which is an electronic commerce platform offering expanded market access to, and improving revenues of, women cooperatives processing agricultural products. With CTA's grant, Sooretul will strengthen their services and open two points of sale. Another is AgroCenta from Ghana, founded by Francis Obirikorang, which is an online platform connecting farmers in the staple food value chain to a wider market for trade, access to truck delivery

services, etc. In March 2017, they signed their first big contract, worth €273,000, to supply a large-scale company with sorghum for processing. A younger Pitch AgriHack! finalist is Ujuzikilimo founded by Brian Bosire, 24 years old, from Kenya. Ujuzikilimo offer a soil testing service that facilitates real-time monitoring of farm zones.

What more do you feel needs to be provided in terms of government and private sector support to encourage and provide the right conditions for young entrepreneurs?

Like most young companies, e-agriculture start-ups need critical support in two areas: increased business management skills and increased access to capital. E-agriculture start-ups are addressing a market segment that is more challenging than many agricultural or ICT markets. They thus need support to better understand value chains and design successful business models targeting the appropriate market segment(s) with adequate ICT services; and facilitate acquisition of agrifood e-services customers, such as farmers, who are often unwilling to pay for such services. These businesses also need supportive policies and tax incentives. It is only under these enabling conditions that agripreneurs can fully deliver the full innovation, productivity and employment potentials in their communities and countries. ■

ICT agripreneurship

An informative guide for ambitious agricultural entrepreneurs

CTA's new handbook, *An ICT Agripreneurship Guide: A Path to Success for Young ACP Entrepreneurs*, provides a step-by-step 'road map' to establishing a successful ICT-oriented agribusiness in ACP regions. Developed by a team of expert ICT consultants, the guide offers an in-depth analysis of the most common mistakes made by young e-agriculture entrepreneurs, suggesting usable strategies and pathways to avoid such challenges in the initial stages of a start-up.

Starting a business is often a daunting prospect, especially in an area as new and rapidly changing as ICT for agriculture. However, CTA's handbook will help to encourage and support any young entrepreneurs considering establishing their own ICT agribusiness. For those who have already begun the process and seeking guidance on how to progress to the next stage, there is also a section on scaling up.

Drawing on real examples and interviews with 17 agripreneurs from a range of different ACP countries, including Jamaica, Senegal and Uganda, the handbook highlights the best practices for effectively launching an ICT agribusiness. Covering everything from agricultural value chains and stakeholders to designing effective business models and attracting funding, readers will find a host of information for both conceptualising and realising their business intentions.

An ICT Agripreneurship Guide: A Path to Success for Young ACP Entrepreneurs
CTA, 2017; 72pp.

ISBN 978-92-908-1613-3
Downloadable as a PDF file from: https://tinyurl.com/k6wwnlp

Rural communication

Mobile solutions

This working paper by CTA looks at a case study from Uganda where the government is promoting the use of ICTs to facilitate the flow of instantaneous information to rural areas. The introduction and adoption of mobile phones by rural communities is transforming communication in these areas, enabling individual smallholders and farmer groups to access market information, communicate with extension workers and receive money through their handsets.

The Mobile Phone: A Solution to Rural Agricultural Communication - A Case Study of Rakai District, Uganda
By G Bukenya
CTA 2016; 16 pp.

Downloadable as a PDF file from: https://tinyurl.com/l5zs6ls

Connecting smallholders

ICT interventions

Enhancing the ability of smallholders to access the knowledge, networks, and institutions necessary to improve their productivity, food security, and employment opportunities is a fundamental development challenge that ICTs are helping to overcome. Drawing upon a range of experiences, *Updated ICT in Agriculture* discusses the key challenges, enablers, and lessons related to using ICTs in the different subsectors of agriculture, establishing why and how it should be encouraged.

Updated ICT in Agriculture: Connecting Smallholders to Knowledge, Networks, and Institutions
World Bank Publications, 2017; 273 pp.
ISBN 978-14-6481-002-2
£36.50 • €42.20
www.worldbank.org

FOOD SYSTEMS

Advocating a multi-sectoral approach

Achieving sustainable food systems which provide nutritious diets for a healthy global population, whilst increasing self-reliance and boosting resilience to climate shocks is vital but requires effective multi-disciplinary approaches.

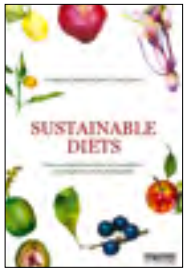
Mike Davison

While unsustainable food systems have been debated for decades, trends and events since the year 2000 have given these an urgent focus. Rising obesity, for example, has highlighted the mismatch between food consumption patterns and both human and planetary health. In seeking solutions, however, policymakers are presented with a multitude of options, often at cross-purposes, from different research disciplines and interest groups. As a result, both government and the public tend to retreat to a 'business as usual' position and little progress is made.

In coping with the complexity, the authors of *Sustainable Diets* offer an approach based on six key criteria: nutrition and public health, the environment, socio-cultural issues, food quality, economics and governance. For each of these, they assess the latest evidence in order to understand the issues, look for common ground with other criteria and critique proposed solutions. In nutrition and public health, for example, are vegetarian diets the best option or can a certain level of meat, fish and dairy products support good health without harming the environment? If so, what level of non-plant consumption is suitable, and how does this relate to socio-cultural preferences in different parts of the world?

The impact of food production and consumption on our lives and health are further illustrated by Ekatarina Dorodnykh in *Economic and Social Impacts of Food Self-reliance in the Caribbean*. Finding many areas of overlap with the sustainability debate, including health and social impacts such as obesity and unemployment, she also attempts to offer a practical focus on what might be done, estimating how a 10% substitution of food imports with locally produced foods would impact on Caribbean economies and communities.

The need to strengthen local agricultural production is also central to the FAO's 2016 review of food security and nutrition in Africa, where drought, flooding and conflict have brought food insecurity to millions. While advocating increased resilience through climate-smart agriculture, FAO urges for multi-disciplinary approaches to deliver evidence-based, sustainable nutrition solutions. Thus communication between disciplines appears key to building sustainable diets and food systems, whether at a global, regional or local level. ■



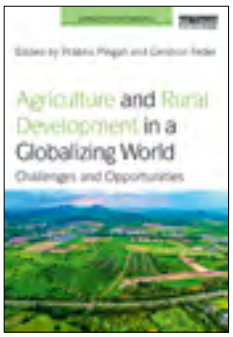
Sustainable Diets:
How Ecological Nutrition can Transform Consumption and the Food System
By P Mason & T Lang
Routledge, 2017; 354 pp.
ISBN 978-04-1574-472-0
£32.99 • €38.50
www.routledge.com

Economic and Social Impacts of Food Self-reliance in the Caribbean
By E Dorodnykh
Palgrave Macmillan, 2017; 155 pp.
ISBN 978-33-1950-187-1
£37.99 • €44
www.palgrave.com

Africa Regional Overview of Food Security and Nutrition 2016: The Challenges of Building Resilience to Shocks and Stresses
By FAO
FAO, 2017; 52 pp.
ISBN 978-92-5109-629-1
Downloadable as a PDF file from:
https://tinyurl.com/mjt42pq

Globalisation

An assessment of the multi-dimensional nature of agriculture and rural development



How do agriculture and rural development practices need to adapt to meet the needs of a world experiencing rapid globalisation and urbanisation? Such a broad but timely question demands in-depth and wide-ranging analysis, and this volume in Earthscan's Food and Agriculture series provides just that. Presenting 16 papers across five thematic areas, it opens with a discussion on agricultural intensification and technical change, including an examination of how the low adoption of modern farming inputs in sub-Saharan Africa can be addressed. If the use of inputs, such as inorganic fertiliser and improved seeds, is to increase, policies that improve farmers' access to markets, expand rural education and remove discrimination against female farmers are all deemed essential. The creation of a carefully regulated private sector is considered, by the authors, as a means to open up new land to smallholders and help develop the infrastructure necessary to achieve this.

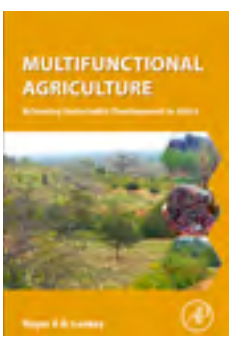
In examining the political economy of agricultural policies, the publication considers how African economic development has often differed from a classic development model that sees dependence on agricultural income replaced by manufacturing, and subsequently by service industries. The relative lack of manufacturing could, the authors suggest, be an outcome of the failure to raise agricultural productivity using appropriate policies and investments. This section on political economy also examines policies to enhance land tenure security, and the likelihood of genetically modified organisms becoming a significant source of technical progress in the developing world.

On the theme of community and rural institutions, topics addressed include: the value of index-based insurance as a cost-effective way of meeting social needs; a comparison between voluntary water trading and mandatory quotas; and the mixed success of community-driven development approaches. A section on agriculture, nutrition and health highlights the complex positive and negative linkages that exist between these areas. A final section discusses the developmental impact and future prospects of two international institutions, the World Bank and the CGIAR. ■

Agriculture and Rural Development in a Globalizing World: Challenges and Opportunities
Edited by P Pingali & G Feder
Routledge, 2017; 404 pp.
ISBN 978-11-3823-182-5
£34.50 • €40
www.routledge.com

Agroforestry

The value of trees in supporting sustainable farming systems



In 2008, the International Assessment of Agriculture, Science and Technology for Development stated that to meet the challenges of sustainable development, agriculture must advance from a one dimensional focus on food production to become multifunctional, embracing more environmental, social and economic goals. Spanning decades of work by one of the Assessment's lead authors, tree crops specialist Roger Leakey, this collection of research papers offers an extremely comprehensive case for the role of trees in restoring damaged ecosystems and providing resource-poor farmers with improved nutrition, more productive crops and new opportunities for income generation.

Working in partnership with numerous other scientific disciplines has been a hallmark of Leakey's career, and the scope of investigations documented in the volume is extraordinary. An opening series of chapters set out 'the basics' of the role of trees in agroecosystems, and their potential for enhancing crop production, income, and food and non-food products. More detailed chapters follow, covering genetic selection for added value, the process of tree domestication and techniques such as vegetative propagation and genetic characterisation. Each section concludes with an article, highlighting progress made and pointers to future work. A final section offers conclusions on how agroforestry can be used to deliver multifunctional agriculture, including a call for policymakers to recognise the multiple values of trees on farm. ■

Multifunctional Agriculture: Achieving Sustainable Development in Africa
By R Leakey *et al.*
Academic Press, 2017; 482 pp.
ISBN 978-01-2805-356-0
£60.99 • €70.50
www.elsevier.com

Should we pay to use global genetic diversity?

CHRISTINE FRISON

A question of value

Christine Frison
Christine Frison is a lawyer specialised in agrobiodiversity, biodiversity and biosafety international law and governance.

Should we pay to use global genetic diversity? To this straightforward question there is no simple answer. However, I will oversimplify my thoughts and reply in a direct manner.

To understand the question and how I answer it, it is important to distinguish three aspects: 1) What is global genetic diversity? 2) Who uses it? And 3) For what purposes? Furthermore, we must distinguish different types of 'use' of global genetic diversity.

1) What is global genetic diversity?

Are we talking about all plant varieties being grown by farmers around the world for millennia or 'modern'/improved varieties developed by high-tech breeding and/or biotechnology over the last 40 years, or wild relatives of crops growing in the wild?

2) Who uses global genetic diversity?

One needs to distinguish between small-scale farmers who feed 70% of the world's population, researchers in public institutions and private company breeders, and multinational seed and agro-chemical companies. All these stakeholders 'use' global genetic diversity, but in a different manner and, above all, for different purposes.

3) For what purposes is global genetic diversity used?

Is the purpose of accessing varieties to produce local food on a small-scale farm, or is it to produce high-tech improved varieties on thousands of hectares of monoculture, the production of which is to be sold on the global market?

4) What does 'use' cover?

A smallholder farmer growing a crop mainly for subsistence is making a very different 'use' of global diversity from a multinational seed company breeding a variety that will be protected by intellectual property rights and sold in large quantities on the market. Conservation activities and breeding programmes on orphan crops, for example by public institutions which make these varieties available to farmers free of charge, is yet another different form of 'use.'

Depending on the answers to all these questions, my answer will be a clear 'yes' or a clear 'no' to the question posed in the title of this opinion note.

If the use of global genetic diversity consists of the everyday cultivation by small-scale farmers in developing countries, who still rely for the great majority of their seed on informal seed exchange systems of local and diverse varieties, then my answer is a clear no. Smallholder farmers should not pay for the use of the genetic diversity they have developed, conserved, used and exchanged over millennia. These small-scale farmers should rather be supported by states, as part of their duty to respect the right to food and achieve food security, through, *inter alia*, national and international breeding programmes focused on local needs and crops, working in partnership with small-scale farmers. Furthermore, I believe states should urgently invest in the conservation and sustainable use of global genetic diversity to limit the future cost of predictable food production crises resulting from climate hazards and from agrobiodiversity erosion.

If the use of global genetic diversity covers accessing traditional varieties, improving them and then putting the improved variety on the global market, then my answer is a clear yes. Companies accessing genetic resources should pay a fair share to the Global Seed Commons created by the International Treaty on Plant Genetic Resources for Food and Agriculture. And farmers from developed countries who choose to grow these improved varieties should pay fair royalties to the intellectual property right holder of these improved varieties.

The most important question, in my view, would rather be: what kind of policies for food and agriculture should be adopted for a sustainable future? My personal view on this question is that we urgently need to stop imposing our 'modern' way of conceiving food production and using genetic diversity, restricted to a commercial value, as the only way forward. Today's agrobiodiversity results from thousands of years of very diverse agricultural practices, which express the many different (social, cultural, spiritual, etc.) values associated to seeds around the world. We need to allow each farmer in the world to choose what type of farming they want to conduct and, most of all, we need to protect informal/small-scale farmers' systems, as such farmers constitute the vast majority of farmers in the world and feed a majority of the world's population. ■

PAUL NEATE

More complex than it seems

Paul Neate
Paul Neate, Senior Programme Coordinator, Communications at CTA.

Should we pay to use global genetic diversity? My first reaction to this question was an unequivocal 'yes'.

Genetic diversity is expensive to maintain and has value in use. Even in traditional seed systems, where farmers are free to keep and reuse their own seed, there are costs involved in acquiring a new variety. No money may change hands, but a farmer who doesn't offer something in return for the seeds they acquire – seeds of a crop farmers are known for, agronomic knowledge – will soon be shut out of the informal trading system.

But talking to some colleagues made me think about it some more. In particular, what would we be paying for, and who should be paid? And how far back do we go in considering who is the 'owner' of these genetic resources?

A recent study (Khoury *et al.*, 2016) found that, globally, 'foreign crops' – i.e. those that originate from elsewhere – account for nearly 70% of food supplies and the use of foreign crops has increased significantly over the last 50 years.

Farmers and herders have always taken their crops and livestock with them as they colonised new territory. But the global movement of crops (and livestock) from their centres of origin to new 'homes' really got going in the 15th century, with the 'discovery' of the Americas and increasing global trade between Europe and other parts of the world. So the coffee growing in Brazil originates from Ethiopia, the tomatoes growing in Spain from Peru and its neighbouring countries, and the maize that grows just about everywhere from Mexico. In each case, however, a particular variety may have passed through many hands in many countries to become what it is now.

So, who (or which country) should be 'paid' for the use of any particular genetic resource?

And how much? The genetic complexity of crop cultivars has increased dramatically over the years. For example, a bread wheat cultivar grown in the Yaqui Valley of Mexico that was released in 1962 – Penjamo – had a total of 69 ancestors in its pedigree. Compare that with one released in 1989 – Rayan – which had a total of 4,839 ancestors in its pedigree! (Smale *et al.*, 2000). Where did each of those ancestors originate? Or do you take the view that they all originated from somewhere in the Fertile Crescent, back in the mists of time, so any payment should go to Iraq, Jordan, Lebanon, Syria ...? And how much of the value of the 'final product' do you ascribe to each of those ancestors?

And where is the value coming from? Does an undocumented wild relative of wheat growing somewhere in Iraq have value? (that's a bit like the question, "If a tree falls in a forest and no one is around to hear it, does it make a sound?"). I would argue that it gains value only once it has been collected and characterised – until we know about its characteristics, such as drought tolerance or disease resistance, there is little reason to plant it or incorporate it in a breeding programme. In that case, should we be paying the person/organisation that characterises the plant (which is a considerable investment in itself), or the country where the plant was collected?

Ow, my brain hurts! What started out as a seemingly simple question with a simple answer got more and more confusing the more I thought about it. ■

References:
Khoury et al., 2016. Origins of Food Crops Connect Countries Worldwide. Proceedings of the Royal Society. Available at: https://tinyurl.com/zgmsf8c
Smale et al., 2000. Dimensions of Diversity in CIMMYT Bread Wheat from 1965 to 2000. International Maize and Wheat Improvement Center (CIMMYT), Mexico.

Poll

Should we pay to use global genetic diversity?

42%
Companies that access global genetic resources must pay to use them

33%
Smallholders should not pay to use the diversity they develop and conserve

20%
States must pay to conserve global genetic diversity

5%
Farmers must pay to use improved varieties developed by plant breeders

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In the next issue

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- Examine longitudinal change resulting from the pursuit of different pathways of agricultural commercialisation; and
- Analyse key policy issues and implications associated with these agricultural commercialisation types and pathways in different settings.

Focus Countries:
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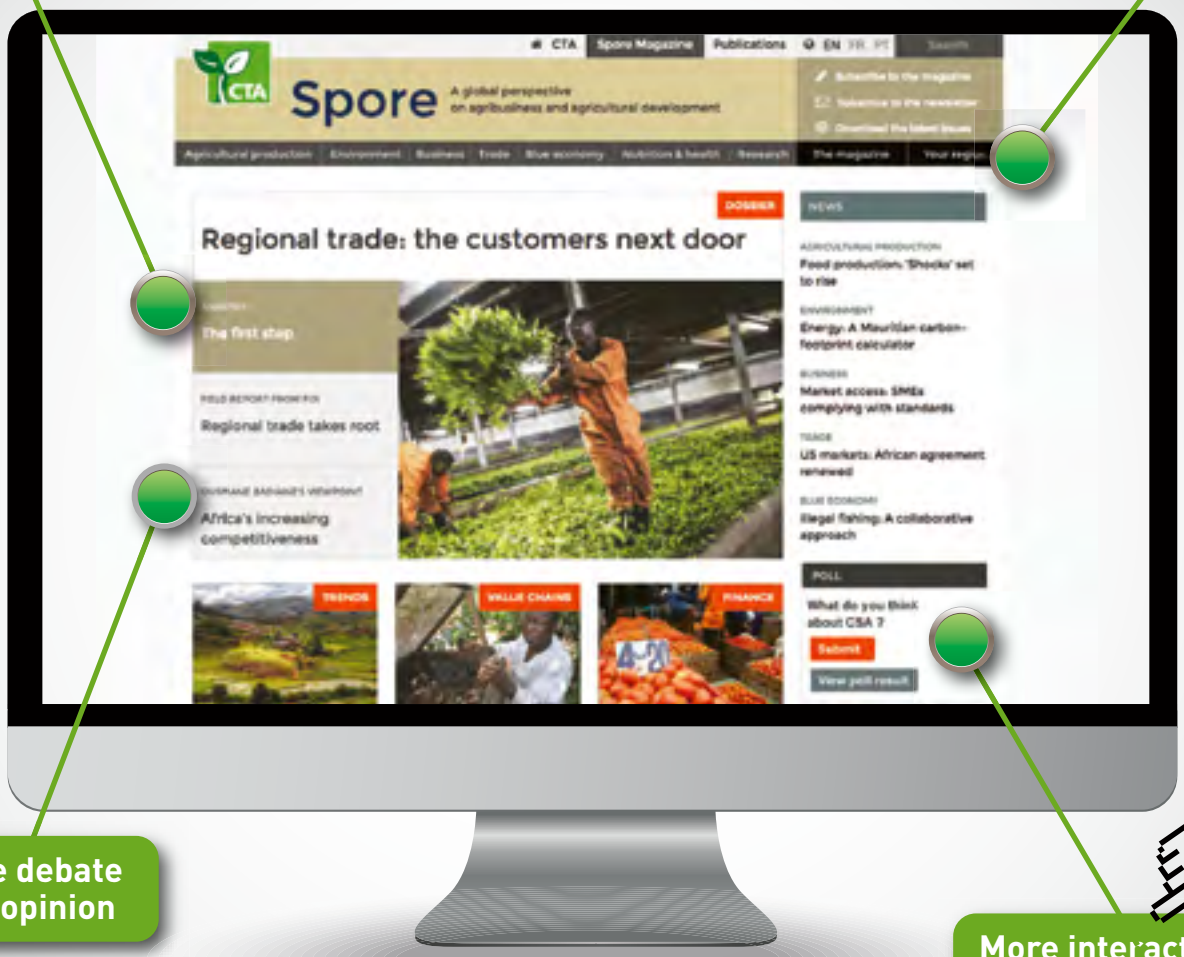

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