FRAGILE STATES
Leveraging agriculture to build resilience

INTERVIEW
Michael Hailu explains how digitalisation could reduce agriculture's gender gap

FARM MAPPING
Geo-referencing farms to boost yields in Uganda

N°190 | September - November 2018

SPORE

spore.cta.int

Farm data

SERVING SMALLHOLDER FARMERS IN A DIGITAL AGE

A global perspective on agribusiness and sustainable agriculture

RURAL DEVELOPMENT FOR A BETTER WORLD

Brussels Development Briefings

Sensitising the development community on current and emerging ACP-EU policy relating to rural development issues

www.brusselsbriefings.net

The Brussels Development Briefings are a joint initiative of CTA, European Commission (DG DEVCO), the ACP Secretariat and ACP Group of Ambassadors, CONCORD and various media.

SPORE N°190

EDITORIAL

ICTs empowering women

Michael Hailu, director - CTA

Across ACP countries, women face serious challenges in establishing successful agribusinesses, including access to markets, market intelligence, finance and other business services. Women also often lack the technical, management and leadership skills needed to drive an enterprise forward. Empowering women to overcome these challenges, as well as promoting youth entrepreneurship and employment, are key to CTA's work. And ICTs can be a game changer in creating an enabling environment for women and youth.

VALUE4HER--a new joint initiative between CTA, the Africa Women Innovation and Entrepreneurship Forum (AWIEF) and the African Women in Agribusiness Network (AWAN) will establish an agribusiness intelligence network harnessing the power of ICTs to foster better links with markets, supply chains and other service providers, including financing partners.

VALUE4HER will help women to develop agribusinesses and to derive more income from agri-food markets. As Irene Ochem, founder and CEO of AWIEF put it at the launch of the project in Nairobi, Kenya, in July 2018, "We want to bring in more young women to be job creators and not just job seekers." To highlight the market practices and policies that will enable women to succeed in agribusiness, CTA and AWIEF will convene a high-level panel at the 4th Africa Women Innovation and Entrepreneurship Forum to be held in Cape Town, South Africa, in November 2018.

Transforming the agriculture sector through digitalisation and promoting young women's entrepreneurship is also an integral part of CTA's 2018 Pitch AgriHack competition. The contest has attracted over 300 applications from young e-agripreneurs. The 26 finalists, mostly women, will receive training during the 2018 African Green Revolution Forum in Kigali, Rwanda, where they will also have a unique opportunity to interact with business leaders and policymakers. The winners will receive prizes and follow up business coaching opportunities. For more information, see https://tinyurl.com/y9ncm45w

Digitalisation is a strong theme in this edition of Spore, and I believe a critical opportunity that must also be harnessed at the policy level to truly transform agriculture. We are also pleased to feature interviews and articles that highlight women's empowerment, including from Dr Maxime Houinato of UN Women who stresses that women cannot be ignored if agriculture is to be transformed. He emphasises that women play a vital role in adopting new climate-resilient farming practices, a theme that is also featured in our article on the role of agriculture in building resilience in fragile states.

COVER PICTURE: © KING BAUDOUIN AFRICAN DEVELOPMENT PRIZE

FRAGILE STATES

Leveraging agriculture to build resilience

With global undernourishment on the rise since 2014, the international community has identified agricultural development as an effective tool to boost the resilience of vulnerable communities in fragile states.

Stephanie Lynch

The term 'fragile state' is commonly used by the development community, yet there is no universally agreed definition of fragility when it is applied in this context.

(OECD) defines state fragility as, "The combination of exposure to risk and the insufficient coping capacity of the state, system and/or communities to manage, absorb or mitigate those risks." The two most common forms of risk described in this definition are climate shocks (severe drought, flooding, etc.) and conflict.

Symptoms of fragility include high levels of poverty and displacement, the breakdown of institutions, corruption, poor infrastructure, low productivity, high indebtedness and violence. If unresolved, state fragility can lead to humanitarian emergencies and food crises. In 2017, nearly 124 million people across 51 countries and territories worldwide faced crisis levels of food insecurity and required urgent humanitarian action. In Africa, conflict and instability were responsible for the acute food insecurity of 37 million people in 11 countries last year.

While development organisations use fragility to label high-risk states in need of urgent assistance, James Putzel, professor of development studies at the London School of Economics, argues that categorising states as 'fragile' risks perpetuating the assumption that such countries are inherently poor and conflict prone. At the June 2018 Brussels Development Briefing on 'Agriculture as an engine of economic reconstruction and development in fragile countries' (https://tinyurl.com/ybzz76h6), organised by CTA and partners, Putzel sought to remind participants that, "State fragility is a temporal condition not a static category." The focus should therefore be on identifying the factors that cause states to become more fragile (that is, more vulnerable to violence) or, conversely, more resilient.

Agriculture's potential for peacebuilding

In recent years, agriculture has become increasingly recognised as an entry point for building peace and resilience in fragile states. In 2017, the EU's communication on *A Strategic Approach to Resilience in the EU's External Action* (https://tinyurl.com/y9c6xveb) outlined the need to move away from crisis containment to a more structural, long-term approach to vulnerabilities. As the international community has begun to broaden its response to crises and explore long-term solutions for economic growth and political stability, the potential of agriculture has been realised. "In doing humanitarian work we realised that food is not only saving lives, it is also a good tool for development, as well as for peacebuilding," explains Bing Zhao, Purchase for Progress (P4P) director and global coordinator at WFP.

With up to two-thirds of employment and one-third of GDP in countries experiencing prolonged crises linked to agriculture, investment in the sector can be transformative for the resilience of vulnerable populations. According to Dr Alexandros Ragoussis of the International Finance Corporation (IFC), the private sector development arm of the World Bank Group, "Agriculture is two to four times more effective in lifting people out of extreme poverty than investment in any other sector of economic activity."

© PABLO TOSCO/OXFAM INTERNATIONAL

The agricultural sector often provides up to two-thirds of employment in fragile states

Potatoes provide promise in Dominica

In the aftermath of hurricane Maria, which devastated Dominica's agriculture and fisheries sectors in September 2017, the government and international community have invested significant resources to restore crop cultivation. Shortly after the hurricane hit, the Dominican government, with support from the World University Service of Canada's PROPEL initiative, distributed fertiliser and two containers of seeds to farmers for the production of short-term crops, such as white potatoes.

Despite the devastation left by hurricane Maria, the seeds and fertiliser have successfully boosted yields. "We are seeing a very, very big bumper crop of white potatoes this year," explains Dominica's minister for agriculture, Hon. Johnson Drigo. Octavia Hunter, president of the North Eastern Women Farmers Group, received eight 45 kg bags of potato seed and fertiliser from PROPEL in 2017. "All in all, it was a very good harvest... yesterday we harvested 18 trays at about 80 lbs [36 kg] per tray and... I might get another 10 trays today," she says.

The high resilience of white potatoes has been acknowledged by the government, and Reginald Thomas, permanent secretary in the Ministry of Agriculture states, "We will try to build it into our resilience strategy as we look to actually have food production in the event of a storm or some other event" (see *Spore* article, *Sowing the Seeds of Climate-resilient Agriculture in the Caribbean*: https://tinyurl.com/ybtqxq6h).

In South Sudan's Equitoria region, Cordaid has been working with two agro-pastoralist communities, who frequently fought over land for cattle grazing, to form a joint committee made up of youth, women and farmers from both communities. Together they have cultivated 12 ha of land and built a warehouse to store produce. As a result of these activities they are now producing surplus food, which they market to traders in Uganda. The successful collaboration between these two warring communities reveals the potential of agricultural development for peace building; as Cordaid programme manager, Harma Rademaker says, "Dialogue and working together can restore distorted relationships between conflicting communities."

Increasing capacities for risk mitigation

To prevent fragile situations descending into crises and ensure the sustainable recovery of vulnerable populations, rural communities need the capacity to monitor and predict crisis and disaster risks, as well as to develop strategies to help minimise the impact of such risks on food production. "Building the capacities of people and communities who are vulnerable is the basis of our work. When people acquire more knowledge and learn how to deal with disaster risks, they are better able to cope and restore their livelihoods in the case of severe drought, for example," explains Rademaker.

Cordaid's Community Managed Disaster Risk Reduction (CMDRR) programme – which supports communities to design joint action plans for increased resilience – has helped ›

› 2,350 conflict-affected households in South Sudan to restore their agricultural production and establish over 100 water distribution points for drinking and domestic use. The Somalia Resilience Program (SomReP), similarly focuses on capacity building and community-led development planning to enhance the resilience of vulnerable households across Somalia. A study carried out by World Vision, one of seven NGOs involved in SomReP, found two defining characteristics of Somali households that qualified as having better food security and better capacity to cope in times of crisis. Firstly, resilient households tended to be members of a savings group scheme and, secondly, they usually had access to early warning information.

Large-scale displacement as a result of recurring drought and conflict have resulted in widespread food insecurity in Somalia, yet agriculture continues to make up 75% of the country's GDP and provide employment for 46% of the population. In addition to SomReP, the Rome-based Agencies Resilience Initiative made up of WFP, FAO and the International Fund for Agricultural Development, seeks to capitalise on the central role of agriculture to increase the country's resilience and improve food security. Among other support, the initiative provides rural Somali communities with training and advice in sustainable crop and livestock production and post-harvest management, as well as vocational skills training to diversify their income. As a result of these activities, beneficiaries reported income increases of 118%, with 38% stating that their resilience had increased and they were better able to cope with the prolonged drought.

Supporting Somalia's transition towards stability

The EU recently pledged to provide an additional €200 million to support Somalia's stabilisation at the Somalia Partnership Forum, which brought over 60 delegates together in Brussels during July 2018. Drought and conflict have forced people to abandon their homes and created widespread food insecurity in the country. However, warnings of an impending famine in early 2017 prompted emergency food assistance, which has reached around 2.5 million people a month since April 2017 and helped to mitigate the crisis.

With the increased funding, the EU aims to step up development, as well as humanitarian aid and peacekeeping operations to help Somalia stabilise and achieve food security. During the forum, the president of Somalia, Mohamed Abdullahi Mohamed, stated the government's plan to think more long-term about economic growth and development: "The federal government of Somalia is fully committed to implement the Political Roadmap 2020, a transition plan for security and economic reform, and reach out to the whole of Somalia for reconciliation and dialogue."

Connecting farmers to markets

With increased capacity to grow surplus produce, farmers need access to finance and markets to add value to their products and further increase their incomes. However, in fragile states, neither finance nor domestic trade is forthcoming. Through the World Bank, IFC takes a two-pronged approach to develop more resilient and investible agriculture sectors in fragile countries. Under the Global Agriculture and Food Security Program, the World Bank, along with six development partners, have mobilised donor resources of €1.35 billion to address farmers' credit constraints. "But money alone is not going to drive change," acknowledges Ragoussis. In addition to financing, IFC therefore supports farmers and cooperatives with extensive advisory services, as well as access to international markets. The organisation guarantees a three times greater share of cross-border trade to fragile and conflict-affected states compared to any other low income context.

The provision of a ready market for smallholder farmers is also at the heart of WFP's P4P programme, which – since its launch in 2008 – has bought €214 million worth of food from smallholders. "We are of the conviction that only by helping smallholders in the value chain and enabling them to participate in markets, can they be empowered and incentivised to help create a food system that is sustainable and inclusive," explains Zhao.

Over the last 10 years, the P4P programme has supported more than 2 million smallholders in over 60 countries, including Zambian farmer Harriet Chabala, who received an equipment loan from her local cooperative in recognition of her entrepreneurial potential and consistently reliable supply of beans to WFP. Chabala used the loan to buy a tricycle, which can navigate the poor quality roads, enabling her to transport produce and people between towns and markets for a fee. With the increased income from the tricycle and support from WFP, Chabala expects to repay the loan within a year and has increased her bean production by 50% over 2 years.

Supporting farmer cooperatives

By targeting cooperatives, the Confederation of Agricultural Producer Associations for Development (CAPAD) seeks to empower farmers and improve their participation in the marketplace. The organisation grew out of the Burundi civil war in an attempt to help displaced farmers return to cultivating the land. Since CAPAD was launched in 2000, the situation in Burundi has not stabilised with 2.6 million people assessed as living a humanitarian crisis between October and December 2017. However, according to Wageningen University and Research the introduction of efficient and well-integrated farming methods has the potential to triple crop production, particularly if farmers are encouraged to invest through mutual cooperation and knowledge sharing.

CAPAD brings together 117,000 agricultural households in Burundi to improve their access to seeds and credit so that they can invest in increasing their productivity and improving their ability to deal with shock situations. Between 2002 and 2014, CAPAD has helped to increase smallholders' yields by 30-50% and contributed to the

© WORLD VISION

socio-economic development of more than 12,000 displaced women and young men through the provision of temporary and permanent jobs.

"Agriculture is two to four times more effective in lifting people out of extreme poverty than investment in any other sector of economic activity"

Dr Annick Sezibera, CAPAD executive secretary, attributes this success, in part, to the support that the organisation has received from its partners, including CTA. "CAPAD shows us how farmers' organisations can contribute to peace restoration and economic development through aggregated production," explains Isolina Boto, Manager of CTA's Brussels office. Building on their partnership, a new collaboration between CTA and AgriCord will support CAPAD to register its members using ICT-enabled tools to enable them to digitally map cooperatives, as well as the crops they produce and sell. With better knowledge of their members' activities CAPAD can improve the use of seeds and fertilisers and increase access to new markets and funding.

Engaging local governments

The political instability of many fragile states makes collaboration with local authorities and governments particularly challenging. Sezibera emphasises that, in addition to strong partnerships, CAPAD's ability to remain politically neutral, whilst at the same time maintaining regular dialogue with the government, has been a determining factor in its success. This stance has enabled the organisation to advocate legislation and policies that support agriculture, but resist being manipulated by political parties and avoid expulsion from Burundi during the crisis in 2015, when most other civil society organisations were forced to leave.

Maintaining communication with local authorities in fragile states enables organisations to stay up-to-date with the political situation and anticipate any conflicts so that they can develop strategies to adapt to the changing environment. If possible, it is also beneficial to work with governments to develop contingency action plans for disaster management, as well as advocate and influence national policies, practices and investments. Advocacy is a key component of Cordaid's CMDRR programme, as Rademaker explains, "We always work with local government because it is important to get their support."

The way forward

Smallholder farmers are among the most vulnerable to climate shocks and weather-related disasters, poor governance, conflicts and market fluctuations. As the primary producers of most of the world's food it is essential that they are better supported to withstand such pressures to help mitigate the risk of food crises. "We need to understand better what is specific about fragility that agriculture can address in an inclusive way and support projects which promote internal integration. It is critical to promote long-term investment and markets, which benefit smallholders in fragile states," emphasises Boto.

The Centre for EU Studies 2017 report on *Improving European Coordination in Fragile States* (https://tinyurl.com/y8soxtus), concludes that development partners need to bridge the gap between humanitarian and development strategies to support national strategies for resilience based on coordinated needs assessments and planning. Agriculture should play a central role in such strategies to help boost economic growth and alleviate poverty in fragile countries, through the application of risk sensitive technologies and sustainable practices. ■

Access to early warning information has helped to increase the resilience of Somali farming households

© ZABBAAN HOLDING

Zabbaan produces between 10,000 and 20,000 bottles of juice a day

SUSTAINABLE JUICE

Mali: squeezing value from wild plants

In 2016, Aïssata Diakité launched her company, Zabbaan Holding, which processes juice from plants grown locally in central Mali by over 5,000 farmers.

Soumaila Diarra

Mopti region holds a special significance for 27-year-old Aïssata Diakité. Not only was she born there, but the region is also home to Zabbaan Holding, her company that makes juices from bush plants. The business is even named after a local plant – zaban – which looks like passion fruit and produces sweet juice with an acidic hit that is extremely popular with children.

Diakité left the countryside to study for her baccalaureate in Mali's capital, Bamako, before heading to Amiens, France, to complete an agribusiness course. But the place where she grew up was instrumental in her decision to become an agribusiness entrepreneur before setting up her own 'ethical' food processing company. "My business reflects my career path, my environment and my passion," she says.

5,000
smallholder farmers supply Zabbaan Holding

After completing her agribusiness degree, Diakité was encouraged by her family to look for a stable job. She landed a position at Afnor, the French certification body that certifies products to EU regulatory standards and issues the CE marking, which shows that a product complies with the essential requirements of the relevant European health, safety and environmental protection legislation. After 9 months, she decided to branch out on her own, turning the home-made juice recipe she had refined during her student days into a viable business.

Zabbaan Holding was launched in 2016, with initial capital of €200,000 – built up from her own savings and funding from a Malian State investment fund (Fonds de garantie du secteur privé du Mali) – selling a limited selection of juices. Diakité then secured funding from a British investment fund, as well as support from Mali's private sector guarantee fund, allowing her company to develop a new range of fruit, leaf, flower and stem-based juice products, including 'The Prince's Secret'

(kinkéliba, ginger, hibiscus and baobab), 'The Duke's Secret' (zaban and baobab), and 'The Queen's Secret' (hibiscus, mango and baobab).

All of the juices are made from wild plants from the African savannah, most of which have been used in traditional medicine for centuries. "Zabbaan Holding operates throughout the agricultural value chain," explains Diakité. "We have more than 5,000 farmers across Mali supplying us, and we currently employ 65 part-time staff, including 35 women, to bolster our workforce during the fruit-growing season."

Upstream of the value chain, the company guarantees product traceability by working with Afnor, which ensures that farmers' cooperatives and the company's suppliers are compliant with EU standards. In 2018, Diakité set up Zabbaan Equity to help farmers become better organised to reduce loss, and to deliver training in fruit picking and storage. The organisation spans farmers' cooperatives, federations and partner consortia within the company's supplier network. Its ultimate purpose is to help farmers ensure their produce is not rejected due to issues of non-compliance with required quality requirements, for instance.

Zabbaan Holding is currently developing its own labels, in conjunction with Afnor Certification, to strengthen its presence on the international market. "The label testifies that the products are traceable, sustainably and fairly produced, and nutritious," explains Diakité. "It's about deploying our own processes, practices and methods throughout the value chain."

The company's factory in Bamako produces between 10,000 and 20,000 bottles a day, selling its output across the Economic Community of West African States and Europe. "We work with delicatessens and restaurants in France," adds Diakité.

The company's success has not come easily. Other than the fruit, almost everything else – including bottles and labels – is imported from Europe. But it would take a lot more than that to discourage Diakité. "Difficulty is part and parcel of being an entrepreneur. Knowing how to grasp opportunities and surround yourself with the right people is vital." ■

ENCOURAGING INNOVATION

Spicing up Rwanda's exports

With innovative products such as chili pepper oil and plantain wine, a Rwandan agri-processing enterprise is gaining global attention.

Aimable Twahirwa

Rwandan entrepreneur, Sina Gerard, set up a small shop in the Rulindo district of north-east Rwanda in 1983, selling fresh and baked goods produced on his family farm. Ten years later, after saving enough from this initial enterprise, he registered his own agri-processing company called Urwibutso – meaning 'something to remember – in tribute to the baked doughnuts he used to sell. Today, the company employs 280 full-time staff and works with over 3,000 local farmers who supply the company with produce for processing.

Urwibutso's centrepiece is 'Akabanga' – a chili pepper oil that is sold throughout Rwanda and has gained global attention, with export of the product beginning in 2003. The company produces 127 t of Akabanga annually, 15% of which is sold to export markets. Kenya and Uganda comprise the product's main export markets within Africa, while exports outside of the continent are shipped primarily to Europe and the Middle East.

Aside from chili pepper oil, Urwibutso has diversified its output, establishing commercial production of cereal-based flour, yoghurt, packaged peanuts, and banana and plantain wine. The entrepreneur's push for innovation has also encouraged local farmers to produe non-staples such as apples, grapes and strawberries, which Urwibutso uses for processing – providing a stable market that helps to stimulate the local agricultural economy. Currently, the company is working on concentrated juice for the European market, Gerard explains.

© ZOONAR GMBH/ALAMY STOCK PHOTO

In Rwanda, farmers are supplying Urwibutso Enterprise with chili for processing into chili pepper oil for global export

Urwibutso provides local farmers with free seeds, fertiliser and training in best agricultural practices, through five full-time agronomists employed by the company. "I work with all the farmers in this village. I make a profit out of their sweat, so I had to find a way of giving back to them," says Gerard. ■

DIGITAL TRACEABILITY

Reigniting Kenya's international trade

A digital traceability system is helping to rebuild Kenya's horticulture sector, providing precise accountability from field to export.

Bob Koigi

Over 3,000 Kenyan farmers of fruits and vegetables contracted for export – the majority of them smallholders – have embraced a digital cloud-based system that tracks produce from farm to fork, ensuring accountability to consumers while reducing rejections from international markets. Known as the National Horticulture Traceability System, the innovation was introduced by the Ministry of Agriculture with financial support from USAID in September 2016.

The system was developed after stringent standards for exports into the EU led to a wave of Kenyan produce being intercepted at EU borders and subsequent import cancellations in 2013 – French beans and peas, in particular, were found to contain high residues of agrochemicals and pests. Failing to heed warnings from the EU, Kenya was hit with a 10% mandatory inspection order for beans and peas at all entry points. "That was one of the most damaging moments for the horticulture industry. It meant that a minimum of 10% of our produce had to be checked. It had such a huge cost implication because our exporters were forced to pay for these inspections," says Jane Ngige, CEO of the Kenya Horticulture Council. As a result, in 2013 alone, 50% of all Kenyan small-scale farmers lost their jobs due to exporters terminating their contracts, and the horticulture industry lost €29 million in pesticide-testing costs.

90% reduction in produce interceptions thanks to digital traceability

The Traceability System comprises three elements: a mobile application that captures farmers' details and farm operations; a web reporting portal for the exchange of information among industry players, including regulatory bodies; and a barcode-printing function, which, when scanned, gives access to all of the stored information regarding the produce and the individual farmer.

Once a farmer delivers the produce at a collection point, the system captures their details – including name, farm location, inputs used and information on planting and harvesting. The system then records details of the produce delivered, including its quality at the time of delivery. This generates a tag with a unique, traceable code that is embedded on each batch of produce. The system has also allowed agronomists, who visit farmers to track their farming activities, to shorten their visiting time from an average of 2 hours to just 20 minutes.

© BOB KOIGI

In Kenya, a digital cloud-based system is helping to reduce rejections of produce for international export, particularly for French beans and peas

"Traceability is about accountability and transparency. We developed this system to ensure that we can easily, promptly and accurately trace a problem to the exact grower, while assuring the markets of our commitment to good agricultural practices throughout the value chain," says Steve New, chief of party at The Kenya Agricultural Value Chain Enterprise, which assisted the programme in rolling out the app to farmers.

Patrick Kirimi, a smallholder farmer who has been growing French beans for export for the last 8 years, was among those heavily affected by the 2013 interceptions. "We were told one day that our produce would no longer be exported because it had a lot of chemicals," he recalls. He was later introduced to the traceability system through a farmer group. "I immediately warmed to it – especially after learning that each individual farmer was responsible for what they grew and would be held liable individually in case the produce was bad. It also means I can easily track my produce as it grows to ensure it meets international standards," he says.

Ngige says the system has reduced interceptions by over 90%, attributing this to the industry's opening up of the entire value chain to the buyers, who are able to track how food is being grown and moved right to their shelves. ■

SMS ADVICE

Digitising agricultural extension services

A new app is extending technical services to African smallholders, increasing their access to quality inputs and aiding learning 'on the job'.

Benson Rioba

In Kenya, Nigeria and Tanzania, a digital decision-support platform is providing small-scale farmers with technical advice and increasing their productivity. Developed by technical services provision company USOMI Limited in Kenya, the Lulu® app simplifies access to inputs and extension services. Available on mobile and web devices, Lulu® allows farmers to get real-time, tailored information regarding their farming queries, and provides timed instructions regarding crop and livestock management during critical stages of development.

USOMI states that the app was born out of frustration experienced by farmers with regard to accessing markets and technical services. With most agrovet shops located in urban and peri-urban areas, rural farmers often struggle to obtain the inputs they require to optimise their production, and poor infrastructure and high transactional costs limit the reach of agri-retailers. However, via Lulu®, farmers can order inputs remotely and pay for them using their mobiles. The items are then sourced from accredited suppliers and delivered to the farmer's home or the nearest collection centre.

© CECILIA SCHUBERT

Extension services via SMS provide farmers with fast, location- and farmer-specific information across a range of agricultural activities

By subscribing to the app's e-extension services, registered farmers are also provided with targeted instructions, via SMS messages, sent to coincide with specific cropping cycles and/or animal development stages. The information they receive describes, for example, what to feed lactating cows and how to take care of chicks until they reach maturity, which allows novice farmers to receive training 'on the job'.

"This app helps me to efficiently manage my heifers, since I can tell when my cows are sick, on heat or pregnant by entering information into the app," says Timothy Kinuthia, a dairy farmer based in Nyeri, Kenya. Since receiving livestock management advice through the app, Kinuthia has increased his milk yields by over 20%. "I used to get 180 l of milk per day from my eight heifers, but now am at 230 l per day," he explains.

In Kenya, farmers pay KSh 1,000 (€8.50) per month to use the app, but in Nigeria and Tanzania, users are still accessing the app for free whilst USOMI seeks to scale up its customer base in the two countries. About 3,000 farmers are currently using the app in Kenya, Nigeria and Tanzania and USOMI plans to launch Lulu® in Malawi, Rwanda and Uganda later in 2018. ■

Grazing app

Drought-spotting satellites

A MOBILE APP, which uses satellite data to produce detailed grazing maps to specify grass conditions and surface water levels has been released in Eastern Africa. The technology means herders no longer have to rely on word of mouth to find pasture for their animals. Launched in February 2018, Afriscout has been developed by Project Concern International, to increase herders' resilience to worsening droughts and help protect their incomes. Users can also upload information about local predators and livestock diseases to the app. Already accessed by 660,000 people in Ethiopia and Tanzania, the app has received an additional 3,000 downloads in Kenya, and there are plans to deploy the technology in Niger.

Organic fertiliser

Soil solutions

IN KENYA, a social enterprise is importing, marketing and distributing organic bio-fertilisers made from plant and animal waste in the Philippines. Clients can order products from Wanda Organic Ltd by sending an SMS from their phone, and farmers in Machakos and Makueni counties are reporting up to 30% yield increases. "Productivity from my fruit trees has improved greatly," says Riya Allen, a Wanda Organic client. "Access to fertiliser is faster than it has ever been and it's all at the touch of a button," she adds. Unlike commonly used synthetic fertilisers, Wanda Organic's products contain micro-organisms and organic materials that are non-toxic. The eco-friendly fertiliser works to replenish soil nutrients for increased yields and to reduce crop diseases.

REDUCING WEATHER IMPACTS

Modernising climate adaptation in the Caribbean

New climate-smart tools and structures are expected to increase crop production and diversity in the Caribbean, leading to a more sustainable regional food supply and greater food security.

Natalie Dookie

To reduce the impacts of climate-related weather events and sea level rise, Caribbean farmers have been provided with access to climate-smart technology and technical assistance. Through a USAID-funded Rallying the Region to Action on Climate Change (RRACC) project, in Antigua, greenhouses equipped with rainwater infrastructure have been installed whilst, in Barbuda, a water catchment area and a storage drip irrigation system have been constructed.

"Hydroponic greenhouse technology was one example of the climate-smart approaches that Antigua and Barbuda embraced," says Linda Taglialatela, US Ambassador in Barbados, the Eastern Caribbean and the Organisation of Eastern Caribbean States. As part of the RRACC project, which started in 2011, local community partners, farmers, and other stakeholders were also able to learn how to reduce crop losses and improve water usage in extremely dry conditions. "Together with the Ministry of Agriculture, Land, Fisheries and Barbuda Affairs, we trained over 100 farmers in greenhouse farming and organic methods of increasing yields and reducing pests," states Taglialatela.

The development of drainage systems and seawall improvements also enhanced communities' resilience in Dominica to climate events, including the tropical storm Erika, which hit in 2017. "During the storm, these measures effectively diverted floodwater away from the [Meru] community and dramatically reduced the scale of flooding," says Taglialatela. A model farm has also been constructed in Dominica to demonstrate innovative renewable energy and water conservation methods to farmers to increase food and energy resources during times of scarcity.

The first climate-smart greenhouse in the Caribbean, which integrates agriculture and technology, is under development in Saint Lucia. Having won the 2017 Idea Stage of Caribbean Tech Entrepreneurship Programme, creators Keigan Mayers and Jade Hutchinson received a €42,700 grant from UNDP-Global Environmental Finance, and a partnership with the Saint Lucia Coalition of Service Industries to bring their project to life. The prototype will be launched in September 2018, providing farmers with a controlled micro-environment where they can manipulate temperature, humidity, sunlight and other atmospheric conditions. Automated data collection via sensors will also allow the entrepreneurs to develop a database of information on the greenhouses, and the farm management system will analyse this data in order to provide recommendations to farmers on how to achieve optimal crop yields.

"Tropical climates experience high temperatures during the day and do not sufficiently cool at night, providing less than optimal growing conditions. We have overcome this by including sealable vents for natural ventilation during the day, and air-conditioning at night to reduce ambient temperatures inside the greenhouse," says Hutchinson. "We also want to improve climate-resilient agriculture by building greenhouses that can withstand hurricanes, thus helping farmers to protect crops and reduce losses. Our approach was to design an easily deconstructable greenhouse which will allow the farmer to re-commence crop production and bounce back quickly," he explains.

As part of the project, the team is also creating a curriculum which will become a National Vocational Qualification for climate-smart agriculture, eventually leading to a Caribbean certification. They hope to encourage more young people in Saint Lucia to choose agriculture as a career by incorporating technological advances to make it more attractive and less laborious. ■

© HORIZONS WWP/TRVL/ALAMY STOCK PHOTO

Climate-smart greenhouse technology in the Caribbean is helping farmers to protect their crops during extreme weather events and times of scarcity

Soil resilience

Award-winning grass

IN TRINIDAD AND TOBAGO, the planting of vetiver grass is helping to reduce soil erosion and landslides on hilly areas. The plant has roots which can penetrate up to 3 m into the ground, making the soil more stable. Through the Vetiver Education and Empowerment Project, 25,000 vetiver plants have been sown in 15 locations. Four nurseries have also been established and 50 local individuals have been taught how to plant the grass. The young entrepreneur who developed the project, Jonathan Barcant, received a Commonwealth Youth Award in April 2018 for implementing this strategy, which he says has fostered, "togetherness" and "a sense of empowerment" in the communities where it has been adopted.

CSA profiles

Climate-proofing agriculture

A DETAILED GUIDE to the opportunities for investment in climate-smart agriculture (CSA) was launched in May 2018. Developed by the International Center for Tropical Agriculture, the guide includes case studies from 14 African countries and provides an overview of the specific agricultural challenges faced by each region, as well as the successful CSA-based solutions. The guide also offers a list of potential funding sources for CSA activities – with information relevant to both fund-seekers and potential investors. "With these guidelines, we are now better equipped to make financing decisions to climate-proof African agriculture," says Ademola Braimoh, CSA coordinator at the World Bank – a partner organisation of the project.

SMART FARMING

Promoting climate resilience through policy

Three policies have been launched in Zimbabwe to increase awareness of climate-smart farming techniques, and promote climate-friendly practices among young people.

Busani Bafana

To increase Zimbabwe's resistance to climate pressures and help the country meet international carbon-cutting pledges, a trio of climate policies were launched in June 2018. The Climate-Smart Agriculture (CSA) Policy focuses on ensuring that farmers adopt climate-hardy farming practices, while the National Climate Policy aims to guide businesses on becoming greener. A Child Friendly Climate Policy has also been developed to educate school children about climate-friendly practices, such as the protection of forests and wetlands.

In a country plagued by low rainfall, poor soils and high temperatures, young Zimbabwean farmers are turning to precision agriculture techniques in order to set up successful agribusinesses. Precision agriculture involves more accurate and controlled cultivation of crops and livestock, and is one of the farming approaches being promoted by Zimbabwe's CSA Policy.

Already adopting this approach are brothers Prosper and Prince Chikwara, who operate a horticulture farm 20 km outside of Bulawayo city. The young farmers have implemented techniques such as soil mapping using geographical information systems and drip irrigation. "After we introduced technology, we increased our production and income by 30%," says Prosper, who also explains that the farm is using hybrid seeds to grow cabbages, sweet peppers, onions and oilseed rape.

Development of the National Climate Policy is expected to motivate Zimbabwe's industries to invest in low-carbon development. For example, one of the country's international financial services group, Old Mutual, is already investing in climate-smart technologies, such as solar panels, to move away from fossil fuels and generate at least 50 MW of energy in Gwanda and Chipinge towns under a multi-million-dollar investment.

© BUSANI BAFANA

In Zimbabwe, brothers Prosper and Prince Chikwara are using precision farming techniques at their horticulture farm, as promoted through a new CSA Policy

Another output of the National Climate Policy is a CSA manual, which has been developed to improve agricultural education at colleges and among extension workers all over the country. The CSA manual recommends climate-smart farming techniques, such as intercropping, crop rotation and integrated crop-livestock management. "Farmers will have knowledge of climate-smart farming and through the National Climate Policy, measures will be taken for everyone to become more climate resilient," says Tatenda Mutasa, climate change scientist at the Ministry of Environment, Water and Climate. ■

MICHAEL HAILU

"We have to redouble our efforts to focus on women's empowerment"

Following the European Development Days (EDDs), *Spore* speaks with CTA Director, Michael Hailu, to get his take on reducing the gender gap in agriculture, through digitalisation in particular.

Susanna Cartmell-Thorp

The EDDs bring the development community together to share ideas and experiences and this year focused on placing women at the forefront of development. How is this important theme integrated into CTA's refreshed strategy?

We have always had a gender strategy in CTA, but in our refreshed strategy, women's empowerment is even more prominent. We have identified three intervention areas in our refreshed strategy: youth entrepreneurship and employment; digitalisation to enhance the productivity and profitability of agricultural value chains; and building climate resilience through climate-smart innovations and policies. Cutting across all these is gender and women's empowerment; so, in everything we do, we really emphasise the gender element – more so than we did in the past. In the digitalisation agenda, for instance, it's not always easy to get young women involved in ICT innovations and when we run the Pitch AgriHack competitions we often find that women are not that well represented. So we are making a special effort to promote women's empowerment and engage more women in our initiatives.

Can you give an example of one woman who is particularly inspiring and who represents a good role model to other young women?

Many of the young agipreneurs who take part in Pitch Agrihack have become very successful women. Awa Caba from Sooretul, for example, has been supported by several of our initiatives (see *Spore* article, *With Sooretul Local Products are Just a Click Away*: https://tinyurl.com/y8dx9rwq). She has set up an e-commerce platform in Senegal that is helping smallholder women producers to access lucrative markets, which is a big challenge for rural women. Her platform is helping producers sell processed local foods, not only to clients in Dakar, but also to the large diaspora market.

From Botswana, Naledi Mogwe has set up mAgri, which provides services such as weather information, agronomic tips, financial services and market prices to smallholder producers. It has over 400,000 users and its goal is to reach the underserved community in Botswana – especially smallholders. mAgri has been successful enough to venture outside of Botswana and is looking at breaking into West African markets, so CTA has been supporting mAgri in building the capacity of its staff and exposing them to opportunities. For example, Naledi was with us at the EDDs and said she found the experience "eye opening and insightful", as she had the opportunity to network and link up with potential investors.

Access to finance is one of the biggest barriers to success for young agripreneurs, particularly women. What are the most promising innovations and programmes that are helping to overcome this challenge?

One of the main constraints regarding women's access to finance is their lack of collateral. Many women don't own their own land, and their property is normally registered in the name of their husband, so they cannot provide collateral to obtain loans. However, there are innovations in ICTs that allow women to build up a personal profile to help them to get loans. FarmDrive, for example,

© CTA

Michael Hailu explains what CTA is doing to reduce the gender gap in agriculture's digitalisation

developed by a women-led start-up in Kenya, has developed an alternative credit scoring system for women farmers. With this kind of scoring, they can go to the banks and obtain credit. CTA has been supporting FarmDrive to further develop their business.

How can the development of big data help organisations provide better services to farmers in ACP regions?

Data for agriculture is a big part of our work. We have been working with farmers' organisations, supporting projects in Uganda, Southern Africa and other places. We have worked to help farmers' organisations and cooperatives digitally profile their members so that they can become more business-oriented and better managed. Once they have a good record of their members, they know what they produce and what is coming to market. So it's really improving management of the cooperatives, as well as building the profile of farmers so that they can use that data to be able to go and apply for credit and access other services.

In Uganda, we have a project with Igara Growers Tea Factory, which is owned by 6,000 farmers (see *Farm Mapping Increases Incomes for Tea Farmers* in this edition). Igara Tea provides inputs to farmers like fertilisers. When the farmers bring their tea to the cooperative, the price for the inputs is deducted from their payment. However, what happened in the past was that the cooperative did not maintain a good record of which farmers owned which land, or what they produced. As a result, some farmers were recording their plots in different names; this was unfortunate and meant that the cooperative was actually losing money and struggled to maintain a viable business. But, with CTA's support, they have not only been able to digitally profile their farmers, but they now have geo-referenced data on where the farms are, the age of the different tea plantations, how much to expect from each farm, etc. Having access to such information has really improved their management and profitability.

There is huge potential for digitalisation to empower farmers, but what are the challenges? And how can women farmers be guaranteed to benefit from digitalisation?

There are many challenges to digitalisation. Once an innovation has been introduced, how do you then make it sustainable so that it can pay for itself in the long run? How do you develop support mechanisms, like businesses that can support this kind of innovation? So, to a certain extent, you need institutions like CTA to provide support for these kind of activities but, in the long run, to make them sustainable, we really have to develop viable business models.

In terms of capacity, we have realised that women in particular are not always taking advantage of technical innovations due to a number of factors. Women don't use ICT innovations as much as men because of cultural and social reasons, or because of a lack of skills and low education levels, as well as ICT policies that don't have a strong gender element to them.

A key part of CTA's activities, traditionally, has been to share knowledge and experiences. Is it important that CTA plays a supporting role in helping share successful business models and scaling them up?

Absolutely, that's one of the key contributions CTA makes. In July 2018, we brought together all of the small entrepreneurs, who are operating agricultural drone businesses from across the seven ACP countries we are working with, to explore how they are developing their business models. We also brought in a business development expert from Ernst & Young to help the entrepreneurs refine their business models and learn from each other. We really hope that we can continue to work in the area of business development because I think it's a big challenge but offers huge opportunities for entrepreneurship and jobs for young people.

Do you have any key takeaway messages from the EDD event that you would like to share with Spore readers?

The key message is that women's empowerment is critical and a lot more work still needs to be done to level the playing field so that they can equally participate and have their voices heard. We have to redouble our efforts to focus more on women's empowerment and ensure that women are benefiting from the interventions we promote and the innovations we support. The EDD has put a spotlight on gender and women's empowerment and CTA is happy to be part of that. ■

MAXIME HOUINATO

"To change agriculture, we can't ignore women"

Dr Maxime Houinato, the Mali representative for UN Women stresses how women play a vital role in adopting new climate-resilient farming practices.

Vincent Defait

The Women's Agriculture and Sustainable Development (AgriFed) programme aims to help small-scale farmers adapt to climate change. What climate-smart solutions does it promote?

AgriFed disseminates climate-smart agriculture solutions through climate-smart agriculture best practice immersion centres, which showcase agricultural best practice and innovative technical packages (training in climate-resilient agro-ecological practices). Through this programme, our aim is to promote sustainable farmland management (for example, by restoring degraded land and introducing innovative agro-forestry practices), and to help women's groups become better organised and encourage women farmers to share their experiences.

Why is it so important to support women farmers in the adoption of sustainable agricultural techniques?

Women are heavily involved in agriculture but largely invisible. As a marginalised workforce, they're especially vulnerable to climate change and to social, economic and political instability. In 2015, there were around 7 million women involved in agriculture in Mali – 49% of the farming population. So we can't ignore them, especially if we want significant numbers of farmers to switch to sustainable farming practices.

Moreover, there's potential for significant growth in vegetable production. In 2014-2015, some 70.2% of vegetable growers were women. It's a productive pursuit even in small spaces, provided that plots are properly equipped and managed. Yet vegetable production doesn't enjoy the same level of government support as other sectors, such as cotton and cereal crops.

By training women to use modern, sustainable vegetable growing systems, we can help them boost their output and make a real difference to nutritional standards across Mali. By the same token, these women will enjoy a better standard of living for themselves and their families because they'll earn more income from selling their produce.

How has UN Women been working to overcome the challenge women farmers face in accessing finance?

Women farmers need to be financially literate, so AgriFed is teaching them how loans work and how to apply for them, and also how to negotiate with financial institutions. One of the savings mobilisation strategies we're using is the 'tontine' system, whereby women's groups pay contributions to a central fund and lend money to individual members in turn. Systems like this are already up and running in some villages.

We've also launched the Buy from Women platform, a data-driven, mobile-enabled supply chain system that connects women farmers to information, finance and markets. Financial institutions can also use the platform to access real-time information about registered women's groups and individual entrepreneurs, such as production forecasts, customer lists, formal orders and revenue. Potential backers can examine this information, along with the beneficiaries' business plans, to inform financing decisions.

© UN WOMEN/PATTERSON SIEMA

Dr Maxime Houinato speaks on the importance of supporting Malian women farmers to take up sustainable agriculture

Yet most women's organisations still struggle to access finance because they have no collateral or credit history. That's why the programme has set up a support scheme to identify how much finance women farmers need and how much they are able to repay, help them to draw up basic business development plans that are adapted to their needs, and improve their financial literacy and business acumen.

UN Women is currently in talks with the National Agricultural Development Bank of Mali and the First Microfinance Agency to devise a range of products suited to women farmers' needs. Financial institutions will have access to gender-sensitive analysis tools and will be invited to training sessions explaining how to use the tools, and the products will be offered to AgriFed beneficiaries on preferential terms. ■

SPORE

Dossier

FARM DATA: SERVING SMALLHOLDER FARMERS IN A DIGITAL AGE

Increasing amounts of agricultural data are being produced at faster speeds, using a greater variety of technologies and innovations than ever before. But what is the value of information sharing for smallholders, and what are the risks?

DATA4AG

Profiling presents opportunities for smallholders

Aggregating information about farm location and production in farmer profiles helps companies to tailor their support for smallholders, but how can this data be securely managed and transferred to farmers for their benefit?

The gathering of farmer- and field-based data is enabling providers to deliver tailored and timely services to smallholders

Sophie Reeve

To bring about agricultural transformation and the improvement of food systems, governments and their partners have collected data about farmers for decades. More recently, agribusinesses, mobile network operators and financial service providers have done the same to understand farmer needs for agricultural inputs, information services, market linkages and finance. As such, data on and for farmers and their products has become a growth area, driving expectations and investments in big data, blockchain technology, precision agriculture and e-extension.

Among other outcomes, data-driven agriculture or 'Data4Ag' is expected to increase agricultural production and productivity, help farmers adapt to or mitigate the effects of climate change, and bring about more economic and efficient use of natural resources. But if smallholder farmers are to truly benefit from the data revolution and open datasets, increased access to comprehensible information through targeted and context-specific services will be necessary.

To enable providers to deliver tailored and timely services, innovations and initiatives are underway to gather farmer- and field-based data, such as their name, age, gender, location, commodity grown, and production levels, to build smallholder profiles. The way that farmer profiles are compiled, stored, analysed and utilised using advanced digital technologies can drive whether, and how quickly, agricultural development is able to end poverty and hunger among rural populations.

Managing cooperative members

In Africa, farmer organisations and cooperatives are in the best position to build and maintain farmer profiles, with more than 40% of households belonging to a cooperative society. According to Stephane Boyera, CEO of SBC4D – a French consulting company – "The value of these profiles, apart from enabling specialised services for farmers, can also benefit other stakeholders, such as cooperatives and farmer organisations themselves."

In eight countries across Africa and the Pacific, CTA has worked with the Southern African Confederation of Agricultural Unions, the East Africa Farmers Federation (EAFF), Igara Growers Tea Factory Ltd (IGTF), the National Union of Coffee Agribusiness and Farm Enterprises and Agriterra to capture profile information of smallholder farmers, to better enable local farmer organisations to map their ›

© JAKE LYELL/ALAMY STOCK PHOTO

Reaching farmers with modern research

To bridge the information gap between farmers and scientists, Kenya's premier research institution, the Kenya Agricultural & Livestock Research Organization (KALRO), is on a mission to reach vast numbers of smallholders with relevant research through the use of ICTs. The organisation was established in 1986 to increase productivity and competitiveness in the agricultural sector, which represents a source of livelihood for over 70% of the population. But there has been a disconnect between the expanse of research and data accumulated by the institution, and the impact that this information has had for smallholders in the country.

"Despite KALRO having 600 researchers producing extensive research on some of the most pressing agricultural problems in Kenya, this research still gathers dust in our repositories. We have therefore become very assertive in using technology to disseminate this information," says Boniface Akuku, ICT director at KALRO. Such efforts include the rolling out of three mobile applications last year – Indigenous Chicken, Range Pasture Seed Production and Dryland Crops – which were downloaded 600 times within a month of their launch. "We didn't publicise them a lot but were impressed by the interest among farmers. We decided to increase the number of apps this year and have introduced 14 new ones based on the kinds of information the farmers expressed an interest in," Akuku explains.

The latest applications range from avocado, banana and cassava production, to reporting and mapping of the fall armyworm, and controlling Maize Lethal Necrosis Disease. The apps, which are available on Google Playstore, only require internet connectivity to be downloaded, after which they can be accessed offline. They have been effective in reducing the distance farmers have to travel to acquire agricultural information, while aiding KALRO's understanding of the data farmers require through the feedback platform provided in each app.

"KALRO has 51 centres with each specialising in an aspect of agriculture, whether that be indigenous chickens or horticulture. One farmer recently told us how he used to travel for 2 days to reach one of our centres to access information on chickens. He no longer needs to do that, thanks to the app which he has downloaded," Akuku says.

Bob Koigi

› members' locations for enhanced management of their operations. "Through the farmer profiling experience, we were able to map tea leaf collection points and where our farmers come from. So, we are going to use the collected data to group farmers around appropriate leaf collection centres for convenient management of our members," states Onesimus Matsiko, IGTF general manager, which carried out farmer profiling with CTA in 2017–2018 (see *Farm Mapping Increases Incomes for Tea Farmers* in this edition). Chris Addison, who coordinates the CTA Data4Ag project, points out that, "The digitalisation of agriculture is based on the new opportunities for collecting and sharing data and the farmer-led enterprises/cooperatives are best placed to bring the benefits to the smallholder." This data can bring access to credit, targeted inputs and advice, improves logistics and access to markets.

The storage and management of data is also proving beneficial for the operations of Women in Business Development Incorporated (WIBDI), an NGO in Samoa. Since 2016, WIBDI has run a training programme for young people which focuses on organic farming practices, business planning and budgeting, but during the early stages, WIBDI had difficulty tracking student progress. With CTA's support, the NGO developed an online tool to improve their management. "Thanks to the software that we have developed, the Academy is better able to manage information about the students," says Faumuina Felolini Maria Tafuna'I, WIBDI's project manager (see *Responding to Market Demand with Farmer Data* in this edition).

Cloud-based credit services

Greater access to, and management of, farmer information is also enabling farmer organisations to improve access to new markets, buyers and financial services for their members, enabling them to sell more crops and increase their incomes. Such is the case for farmers using eGranary – a mobile app created by Kenyan start-up Intelipro – which uses farm-level data to build automated risk profiles for farmers. Credit providers use these profiles to determine various microfinance parameters. The technology, which is rolled out to farmers by the EAFF and represents about 20 million farmers in the region, is accessed using USSD technology; similar to SMS, the technology serves as a platform between mobile phones and the computer software of a service provider to send and receive text messages. Farmers log the metrics of their production into the platform, including the size of their farm, the crops grown and how much they pay their workers. Based on this information, and using advanced analytics, the app works out what inputs they need to maximise their yield, such as quality seed and fertiliser, and these are made available to them in the form of credits disbursed by the credit provider.

At just a year old, the platform has 25,000 users and applicants have so far received €130,000 in credit. Speaking on the future direction of the technology, Leonida Mutuku, the 28-year-old creator of eGranary, says, "The current version of the product supports farmers with financial services, but where we are going is to help them improve productivity through the data we aggregate. The next step is to give them real intelligence that will assist them in improving their farms."

In Fiji's Ra Province, an International Trade Centre project has profiled and mapped over 26,000 farmers and linked 650 cassava and taro farmers to international retail and distribution networks in Australia and New Zealand. Using a system called the Cloud-based Master Agriculture Database, which incorporates a suite of mapping, profiling and mobile communication applications, buyers, development banks and financing institutions can physically locate smallholder farmers within the supply chain, and review their track record of skills development and certifications before providing them with any contracts or credit.

Satellites for targeted services

In Uganda, CTA's Market-led User-owned ICT4Ag-enabled Information Service (MUIIS) project is harnessing satellite data to help farmers increase their productivity and earnings. The project has enlisted 200 service agents to profile farmers and encourage them to sign up to an SMS service, which delivers agronomic tips, weather alerts and index-based insurance. Geared to support extension and advisory services to maize, bean, sesame and soybean farmers in particular, the project has ambitious goals to increase the crop yields of some 200,000 farmers by at least 25%, and to increase their incomes by at least 20%.

Prior to the launch of MUIIS in March 2017, over 30,000 farmers had been profiled and their details registered to the project's app. This has enabled the project to send targeted SMS messages to subscribed farmers that are tailored to their individual needs – as defined by their profiles. For example, the weather alerts are specific to farmers' geographic location and the agronomic tips relate to the crops they specified when they subscribed.

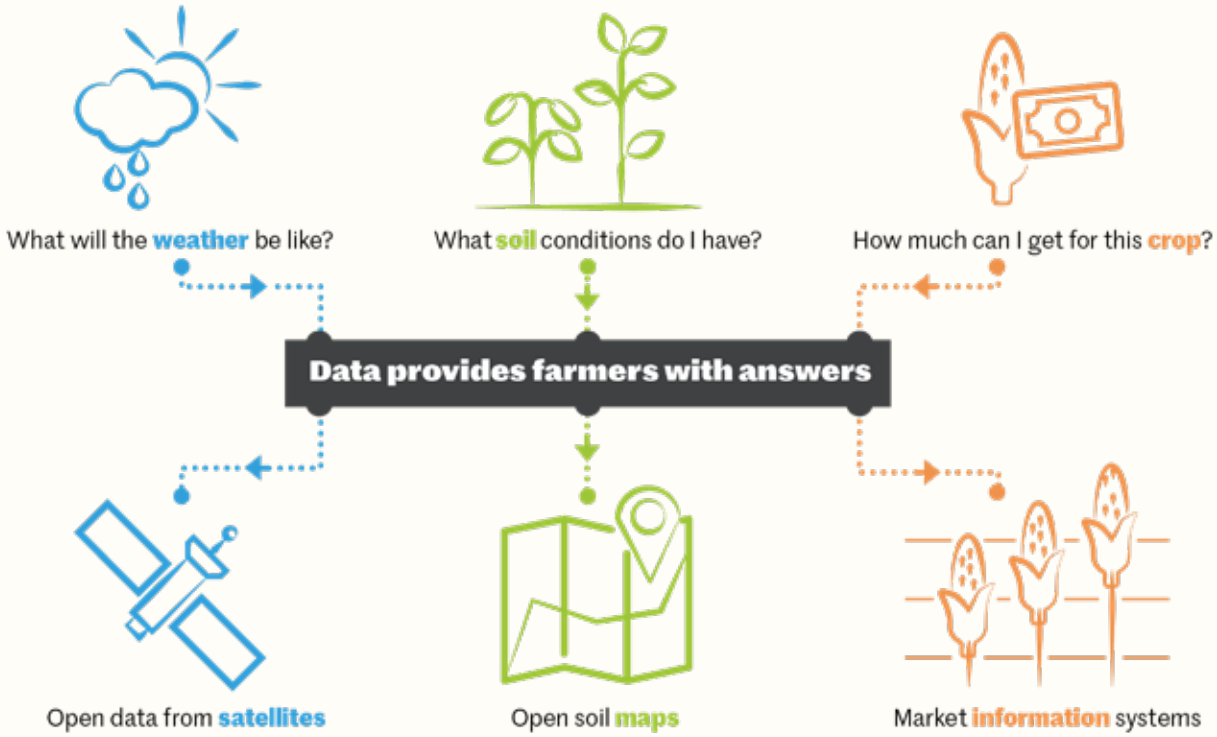
"In the first season, we were able to get an idea of which farmers were prone to particular pest and disease attacks because we knew their locations," says Ronald Rwakigumba of Mercy Corps, one of the companies working with the project to digitally profile farmers. "We were able to advise the farmers on which pesticide to use and how to apply it to address the fall armyworm," he continues.

Data-driven agriculture is expected to bring about a more economic and efficient use of natural resources

Agriculture insurance start-up, Pula, is also using satellite data to provide insurance to farmers in Africa when the rains fail. The price of the insurance is included in the cost of the seed. Each seed package contains a specific number for the farmer to text; they are then attributed to a specific pixel on the satellite to determine their location. This system allows Pula to use satellite data to track the clouds for the crucial first 3 weeks following planting, instead of relying on multiple farm visit. If there is no rain, Pula will replace farmers' seed. In 2017, the company facilitated insurance coverage to

Data is empowering farmers to make smart decisions

With access to the right data, farmers are able to increase their productivity and incomes



SOURCE: MCKINSEY GLOBAL INSTITUTE (2011) BIG DATA: THE NEXT FRONTIER FOR INNOVATION, COMPETITION, AND PRODUCTIVITY; OPEN DATA BAROMETER (2016) ODB GLOBAL REPORT THIRD EDITION

more than 600,000 farmers in Ethiopia, Kenya, Malawi, Nigeria, Rwanda, Tanzania, Uganda and Zambia. "Pula offers farmers a safety net that reduces risk and makes higher-yielding inputs and insurance affordable," says Michael Schlein, president and CEO of Accion Venture Lab, which provides financial support to Pula.

Improving livelihoods with livestock data

In Ethiopia and Tanzania, the African Dairy Genetic Gains (ADGG) programme, led by the International Livestock Research Institute, is collecting farm-level data to help smallholder farmers enhance the productivity and profitability of their dairy cows and herds. Farmers upload their cows' milking, breeding and feeding records to the ADGG platform, which can be accessed via mobile and web devices. The data for each individual animal is then analysed and fed back to farmers with actionable advice so that farmers can make informed management decisions. For example, a growth curve for each cow is created by the app once its age and weight details have been uploaded. As the farmer continues to update this information, they are notified if the animal falls below its expected weight and treatment advice is provided. Since the programme was launched in mid-2016, it has engaged 78,000 farmers, and so far, more than 2 million advice messages have been sent to farmers in the two countries.

Tailored livestock information is also being provided to farmers subscribed to USOMI Limited's Lulu® app in Kenya, Nigeria and Tanzania. Via the app, farmers receive feedback on agriculture-related queries in real-time, as well as instructions regarding crop and livestock management during stages of critical development. The information describes, for example, what to feed lactating cows, and allows novice farmers to receive training 'on the job'. About 3,000 farmers are currently using the app and USOMI plans to launch Lulu® in Malawi, Rwanda and Uganda later in 2018 (see *Agricultural Extension Services* in this edition).

Responsible data

Although an increase in ICTs, open data and data-driven agriculture presents many opportunities across the sector, imbalances still remain regarding access to such information. The spread of precision agriculture, which provides farmers with information and farm management advice to improve their ›

› decision-making and optimise their yields, has been enabled by growing access to sensors in machinery, satellite imagery, and the availability of connected computers and smartphones. However, the *Responsible Data in Agriculture* report by Global Open Data for Agriculture and Nutrition (GODAN) highlights that, "most precision farming applications are employed in highly capital-intensive farming systems and most of the access to technologies and data remains in the hands of a few, large-scale farmers and service providers."

To overcome the issue of reaching remote smallholders with relevant and timely agricultural data, another GODAN report, *Digital and Data-Driven Agriculture*, recommends that appropriate policies to encourage the extension of hardware and software systems – that can deliver such data to rural areas – are developed. The authors further note that the necessary infrastructure and connectivity to run these systems must also be provided.

Data can bring access to credit, targeted inputs and advice, improved logistics and access to markets

Farm information gathered from sensors and hi-tech farm equipment, alongside satellite imagery, census data and geospatial data, can provide a lot of information about a farm and its activities – and not necessarily with the active consent of the farmer. Hence, another challenge for farmers lies in ensuring that their shared information, particularly their profile information, is not misused by third parties for monetary gain or to achieve an unfair competitive advantage. Farmers need to be made aware that the data they provide can be bought and sold.

"Manufacturers of farming equipment, criticised in the recent past because of the lack of formal protection of farmer data gathered through sensors incorporated in their equipment, have reacted, in developing their own code of ethics, such as the EU Code of Conduct on Agricultural Data Sharing by Contractual Agreement. This approach has been endorsed by over 3,000 manufacturers of various types of equipment, sold in Europe, but also across the developing world (including in ACP countries)," explains André Laperrière, executive director of GODAN. "These codes of conduct, while still not standardised/generalised, point at where markets are going, so we are optimistic that more and more farmer data will be better protected, and as they themselves become more aware of the value of their data, they will also insist on it" (see *Data on all Levels is Very Valuable to the Value Chain* in this edition). ■

Drones and precision agriculture

The full potential of drones to transform agriculture is just beginning to be realised

Drones enable farmers to **identify problem areas** and adjust their water or input application accordingly.

The use of drones for predictive weather modelling and precision agriculture could reduce weather-related **crop losses by 25%**.

The global agricultural market for drones is currently worth **€27.6 billion**.

SOURCE: IBM AND PWC

INTERVIEW

André Laperrière: "Data on all levels is very valuable to the value chain"

Alex Miller

The Executive Director of the Secretariat for Global Open Data for Agriculture and Nutrition (GODAN) is André Laperrière. Here, he describes what GODAN has to do to raise awareness about the potential of agricultural data and how to get policymakers and donors on-board.

How can the use of big data bring value to farmers in terms of profitability, productivity and building resilience?

Big data is very important and thanks to research and many initiatives arising from both civil society and the private sector, a number of products have been developed that bring big data right into the hands of farmers, no matter where they are, as long as they have a connection to the internet. For those with direct access, there are specialised, user-friendly applications that rely heavily on big data, which allow people to use their phones to get general data like weather information or agriculture-related data, or to get involved with the source of the big data itself. For example, with pest infestations or plant diseases, the system typically allows the user to take a photo of the infestation with their phone and, within a matter of seconds, it comes back to the farmer with an identification and with suggestions about how to resolve their issue.

What are the challenges when using farmers' data and what influence do these challenges have on policymakers and donors?

In terms of the end user, there are many challenges to making good use of farmers' data. One issue is that not all of the data that could be relevant to farmers is accessible to them. Sometimes in remote areas, being able to tap into online data can also be a challenge. The third level of challenges concerns privacy; a balance needs to be struck between how to tap into as much data as possible, whilst keeping in mind the privacy needs of the farmers. Data needs to be kept anonymous and it needs to protect the privacy of the individuals concerned. There has to be a win-win situation for farmers, as well as policymakers and donors.

Last year the Nairobi Declaration, initially signed by nine African governments and subsequently signed by two more, put nutrition and agricultural data into the public domain to combat food insecurity. What opportunities does this create?

Governments are now acknowledging that the data they compile about their citizens is basically funded by taxpayers and therefore belongs in the public domain. Secondly, they are also acknowledging that farmers can benefit a great deal from information compiled by researchers and academics, also known as higher-level data, which can help contribute towards higher yields and improved profitability. Weather data and market data help farmers buy their inputs at the cheapest prices and sell their produce at the best prices. Big companies are telling GODAN that they are constantly looking for new suppliers and data about the efficiency and resilience of small-scale producers to help them make informed business decisions. Data on all levels is very valuable to the value chain.

In the future, what needs to be done by GODAN and other institutions to raise awareness about the potential of agricultural data?

Our challenge at GODAN is to make sure that relevant data is available in a timely manner and in a format that works best for the farmer. For this purpose, we are working with more governments to implement policy roadmaps that will facilitate the dissemination of such data. We are also working with the private sector to help them contribute to this effort, because data stimulates business along the agricultural value chain. We also need to continue to expand our reach; we now have around 760 organisations and governments as partners around the world, who are increasingly aware of the importance of data and the need to make it more available to farmers. There are many more entities out there that need to be brought on-board, so we need to pursue our advocacy efforts whilst continuing to work with governments to make sure that we do all of this in a sustainable manner.

© GODAN

André Laperrière of GODAN speaks about the value of big data and the role policymakers and donors have in making agricultural data widely available

SAMOA

Responding to market demand with farmer data

A Samoan NGO has mapped small coconut farms to get a better understanding of farmers' production capacity. It has also developed applications to provide farmers with local trading opportunities.

Vincent Defait

How can we meet market demand without knowing the exact production capacity of the local farms? This was the question that Samoa-based NGO, Women in Business Development Incorporated (WIBDI), wanted to answer. Their solution, involving collecting and sharing data, came in part from a collaboration with the Samoan technical services company, Skyeye. Using drones, the NGO's certified organic farms were mapped in 2016, their boundaries marked out and their coconut trees counted. In total, 37,933 ha were surveyed and 428,188 coconut trees counted. Out of the 796 certified organic farms in the WIBDI network, the 420 largest were covered by Skyeye.

Now, the NGO, which is one of Samoa's main exporters of coconut oil, has an accurate database of its members, their farms and their production capacities. "The WIBDI database is central to the organisation's operations as it holds all the detailed baseline information on farmers and their locations, as well as information on the produce grown at each farm, the amount of cultivated land and other important details for quality control and organic certification purposes," explains Alberta Vitale, WIBDI's associate director. "The records on cultivated land and crops grown are critical for marketing to provide WIBDI with an accurate count of the availability of goods to respond to market demand. For instance, niche markets may require tonnes of coconut oil from WIBDI, and in order to respond positively to the markets, the organisation will need to have a detailed count on how much produce is available on farm and how much can be supplied to the markets, taking into consideration

© CTA

climate change factors that could potentially affect the supply of raw materials," Vitale continues.

A visual count of coconut trees

To establish the WIBDI database, Skyeye was able to use GPS to locate the farms. The drones then made it possible to produce maps using a Geographic Information System (GIS). After determining field boundaries of the farms in collaboration with local farmers, and using the drone information to determine the number of coconut trees, these details were added to the GIS map. "With the high-resolution drone imagery, we are able to see individual coconut trees clearly, allowing us to conduct a visual count of total tree numbers," explains Ephraim Reynolds, a GIS technician for Skyeye.

In order to meet the market demand for coconut products in Samoa, a local NGO has created a database to record an accurate count of the availability of goods

The company used a GIS tool known as Web Feature Services, which allows users to access and update information. In this way, the digital map of coconut trees can be updated according to the maturity of the trees, which, among other benefits, makes it possible to better predict yields and organise work in the fields.

"The available data has provided me with knowledge on how I can map out the different crops to grow on my family land, taking into account the huge amount of uncultivated land that's available for development and the market demand locally for fresh produce and value-added goods," says Oneone Suaesi, a 21-year-old farmer and graduate of WIBDI's Organic Warriors Academy (OWA), a training programme in organic farming practices launched in 2016, with the aim of teaching young people how to turn their farms into businesses.

Integrating ICTs into operations

WIBDI, which is currently active in 201 Samoan villages and is helping to promote organic farming businesses with an annual income of over WS$ 600,000 (€193,000), has also received support from CTA to integrate ICTs into the day-to-day management of its operations. Thanks to an online tool developed with CTA, the NGO was better able to track the progress of young people involved in the WIBDI programme, Engaging Youth in Samoa in Organic Farming and Menus: A Farm-to-Table Value Chain Approach, which trains young people, among others, in the use of ICTs in the agri-food sector. In addition, CTA has also supported WIBDI in developing a data system to manage its organic certification scheme, which has certified 796 farms in Samoa.

With the use of smartphones and tablets, WIBDI has also been able to support the rollout of a system enabling farmers to find commercial outlets in hotels and restaurants. More specifically, 'From the Organic Farm to the Table' is an app that enables users to identify restaurants supplied with organic produce and view the profile of their producers. "The farm to table app provides a great pathway for marketing agritourism sites, restaurants and farmers' locations in Samoa and connecting local people and tourists to WIBDI," Vitale says. "The app has enabled me to get in touch with WIBDI and to facilitate the sales of my produce to the local markets," confirms Solomona Afualo, a 26-year-old graduate of OWA.

In the field, WIBDI representatives are equipped with tablets on which the applications are installed, and which make their work of collecting and updating information more efficient and less time consuming. By having access to the farm-level and field-based data of their members, WIBDI is in a better position to support them and to link them with external service providers wanting to collaborate with their members.

Challenges remain

Despite significant progress in WIBDI's ability to positively respond to market demand, and the undeniable impacts that the NGO's work has had on Samoan agriculture, a number of challenges remain. The first of these is smallholder farmers' access to smartphones, which are essential to enable them to use the WIBDI applications. Then there is the need to provide training to farmers in how to use their smartphones. "Farmers will be encouraged through savings and financial literacy training to save enough money to upgrade to smartphones, which will give them easy access to the use of data," says Vitale. ■

UGANDA

Farm mapping increases incomes for tea farmers

To ensure improved operations of a smallholder tea company in Uganda, and boost yields for farmers, an innovative garden geo-referencing project is working to gather local data.

Bob Koigi

© CHARLIE PYE-SMITH

In south-western Uganda, where tea cultivation is the mainstay of the local economy, Igara Growers Tea Factory Ltd (IGTF) is providing a guaranteed, year-round market to 7,000 smallholder farmers, 20% of whom are women. The factory receives up to 250 t of fresh leaves on a daily basis, which it transforms into 50 t of tea. In the process, the factory has created 700 local jobs at its two facilities.

To achieve high yields and incomes from tea leaf production, farmers require the timely access of inputs – like fertilisers and agrochemicals – and regular payment from the local factories they supply. In the absence of reliable income, tens of thousands of smallholder farmers often peddle their produce to the highest bidder – a move that is not only against the contract they have with the factory, but also renders farmers vulnerable to insufficient income and unable to afford inputs for the next planting season.

> "To date, we have managed to profile about 4,500 farmers and mapped approximately 5,200 farms"

However, since 1995 when the company was established, IGTF shareholder farmers have been entitled to receive inputs, which they receive on credit and repay at a later date. But as the number of IGTF farmers grew, so too did the challenges. Poor record keeping by IGTF, for instance, meant they did not know the exact number of farmers they were working with and, thus, could not account for all the inputs being distributed to their members. In some cases, family members would often register the same land under different names and claim ownership in order to also receive the inputs. "Record keeping was a serious problem. We didn't have accurate records about the ownership and location of the tea gardens. We weren't sure who was with us and who wasn't, and we realised we needed to strengthen our database," says Onesimus Matsiko, IGTF general manager.

In addition, as demand for fresh tea leaves among processors skyrocketed, farmers would sometimes sell their leaves to competitors after receiving inputs from IGTF, lured by higher prices, which led to them abandoning outstanding IGTF loan repayments. The loan defaulting problem was so severe that, at one point, the company's accumulated debt rose to €214,000; an amount equivalent to how much the company would spend in purchasing all of the inputs to supply their farmers for one season.

Igara Growers Tea Factory Ltd in Uganda has implemented a geo-referencing and farm mapping initiative to profile its farmer members

Farmer profiling for profits

In 2017, with funding from CTA, IGTF implemented an innovative and elaborate geo-referencing and farm mapping initiative to profile all of the farmers supplying IGTF's two factories, as well as those who held shares in the company but were supplying leaves elsewhere. Data on farm location, size and productivity of members' farms were collected.

Profiling started with the training of IGTF staff on data gathering using GPS-enabled tablets and a tailored data gathering application. Gathered data were later analysed at IGTF and spatially analysed using an open source geographic information system. In 5 months, 10 enumerators moved across farms collecting vital data armed with GPS devices and tablets, and each could cover up to eight farmers a day. At the end of the exercise, in addition to information on farm sizes and locations, the enumerators had gathered comprehensive details including alternative sources of farmer income besides tea cultivation, the age of tea bushes, harvesting methods, and causes of crop failures. "It was one of the most elaborate exercises we have ever conducted and part of the success was due to the fact that the enumerators were able to finish their work a month ahead of schedule. To date, we have managed to profile about 4,500 farmers and mapped approximately 5,200 farms," says Hamlus Owoyesiga, IGTF network and systems administrator.

The work of the initiative was complemented by the use of drones under CTA's Eyes in the Sky project, which were used to pilot remote data acquisition over approximately 40 farms. Data were used to diagnose crop health and quantify unutilised areas or count tea bushes within the single gardens. In addition, aerial views of the farms enriched with crop diagnostic maps were used to develop enhanced dossiers farmers could submit to lending institutions for obtaining credit.

The data collected via the profiling exercise has informed IGTF of the exact number of farmers it works with, as well as their farm sizes and locations, which has enabled the company to ensure that the adequate amount of fertiliser is supplied to each farmer. The information gathered has also assisted the company in identifying problems farmers are having in terms of increasing their productivity, and as such, has enabled them to implement useful interventions, such as farmer training.

Farmer profiling means the company can now reach a bigger number of farmers with inputs, advice on improved farming practices and accessing credit facilities, within a short period of time due to data accuracy. It has also reduced input wastage – which occurred through supplying members with too much – and the occurrence of farmers taking advantage of the system because the details for each farmer are saved on the company's data system. Since distributing fertilisers to farmers in ›

› September 2017 – immediately after the introduction of the profiling system – IGTF was able to recover 90% of the cost in credit to farmers by January 2018. The number of farmers supplying the company also considerably increased at the beginning of the initiative – from 2,900 in August to 3,400 by the end of November 2017, and today, there are 7,000 members.

Farmers have welcomed the project, saying they are now increasing yields as timely distribution of inputs in the right quantities has allowed them to enhance their cultivation. "The profiling has done a great job in reviving confidence in the company among farmers, and it has strengthened their identity as shareholders. Many of the farmers who had been supplying other companies with tea during recent years decided to return to our company," says Owoyesiga. "I have 3.5 ha and I now know exactly how much fertiliser I need to use – something I didn't in the past. I used to waste a lot of vital fertiliser," adds local farmer Shem Babushereka who has doubled his yields from 2,000 to 4,000 kg of leaves each month following more precise application of fertiliser.

Credit based on consistency

As a result of the farmer profiling and availability of data on their farm size and produce quantity, the Igara-Buhweju Tea Farmers' Savings and Credit Cooperative Organization (SACCO) was created in October 2017 to offer registered members credit and financial services. The SACCO monitors farmers' amount of produce and extends credit facilities to them based on quantity and consistency in delivery, and charges lower interest rates compared to commercial banks with reduced credit application time and procedures, which has attracted more farmers. In the first week of its operations in October 2017, more than 200 farmers opened accounts with the SACCO. Farmers are also able to get advance payment in case of an emergency by providing a receipt of their latest delivery to the factory.

Farmer profiling means the company can now reach a bigger number of farmers with inputs, advice on improved farming practices and accessing credit facilities

"We know that we can trust the data gathered during the profiling exercise, for example, about the size and location of tea gardens, and this helps us to assess the creditworthiness of farmers who come to us for loans," says Lillian Nuwagaba, the SACCO general manager. "Now it is easier for farmers to receive fertiliser and credit, not just from us but also from banks because the information that is recorded can act as collateral," Matsiko adds.

Going forward, the project is looking to increase its use of drones by partnering with data analysis institutions like French-based Airinov. Through such partnerships, IGTF aims to introduce applications that would allow for the precise application of nitrogen and fertiliser to crops, and the identification of tea bushes that need to be replaced in order to increase yields. IGTF also hopes to collaborate with other tea factories in Uganda to roll out the profiling and geo-mapping technology as one way of boosting smallholder productivity for tea – a crop that the government has identified as strategic for export promotion. ■

Farmer profiling creates 'digital passport' for coffee

Behind the growing interest in Ugandan coffee among export markets are the spirited efforts of the Ugandan National Union of Coffee Agribusinesses and Farm Enterprises Limited (NUCAFE), which is also working with CTA to strengthen the commodity's value chain. NUCAFE encourages the uptake of technology among farmers and farmer cooperatives to improve yields and boost the country's coffee export earnings. NUCAFE has approximately 1.5 million farmer members organised into 210 cooperatives who own, on average, 0.2 ha of land. However, the organisation has been struggling with coffee marketing to key export destinations, such as the EU and the Middle East, as buyers demands increasingly require data on traceability and growing conditions.

In 2017, in response to this demand, and with assistance provided by CTA, NUCAFE started running a coffee traceability system, which seeks to map its members' coffee bushes and farms. "Through the use of technology, NUCAFE has created a digital 'passport' to prove the authenticity and origin of the coffee we export, creating an auditable record of the journey behind what we are selling," says Joseph Nkandu, NUCAFE executive director. The traceability system is a database where farmer details are uploaded, such as the type of coffee they are growing, the inputs they are using and how much they earn from the sale of their coffee, to provide a profile for each member. Such innovations have facilitated certification for farmers, such as geographical indication, and have seen farmers exporting to new markets, including Japan and South Korea.

The profiling has attracted new members to NUCAFE, who would also like to boost their yields and increase their chances of certification to access new markets. Bufumbo Organic Coffee Farmers association, for example, decided to join NUCAFE and use the profiling database while applying for organic and UTZ certification – a programme and label for sustainable farming. The association received both certificates and has, since the beginning of 2018, entered a deal with Caffe River in Italy to supply 19.8 t of coffee annually.

SPORE

Agribusiness

OCEAN CROPS

Revitalising seaweed farming in Zanzibar

With novel farming techniques and training in seaweed processing, farmers in Zanzibar are producing innovative products for the food and beauty industries.

Munyaradzi Makoni

In Zanzibar, ordinary fishing nets are being recycled into airless cylindrical shapes – known as tubular nets – for use in deep-water seaweed fishing. The nets are stuffed with seaweed seedlings, which grow and multiply along their length when planted 2–6 m under water. The technique, which is more environmentally friendly than traditional farming methods, is helping women seaweed farmers produce high-value varieties for processing.

Seaweed is Zanzibar's third largest industry, bringing in about €2 million annually. Fifteen to 20 years ago, seaweed farmers in Zanzibar planted *Eucheuma cottonii* and *E. spinosum* seaweed varieties in shallow waters off the coast, but due to climate change, surface water temperatures have increased from 31 to 38°C. This has significantly affected seaweed growth, which decreased by 94% between 2001 and 2015.

Farmers have had to switch from using the traditional floating line method – where nylon ropes covered with seaweed are tied between two wooden pegs – due to massive quantities of seaweed dying off before it had developed. "The traditional peg and rope seaweed farming in shallow waters became less and less profitable," says Flower Msuya, senior researcher at the Institute of Marine Science at Dar es Salaam University. "I adapted the tubular nets to help women continue farming high-value seaweed in deeper waters," she says. The new method also reduces disturbance to marine life and reef habitats as farmers no longer walk along the seabed to plant the pegs, but instead use boats to get to deeper water where the nets are placed, Msuya explains.

€2 MILLION

is brought in annually by seaweed farming in Zanzibar

300

seaweed farmers now produce seaweed-based products on the island

The tubular nets were piloted through a Sea PoWer project in April 2017, when 35 women were trained in their use. The women have also learned to place basket traps to attract fish, such as rabbitfish, spadefish, parrotfish and eel for consumption and sale. "I wanted a method that would empower women farmers to keep growing quality seaweed and secure their incomes," says Msuya. "A model farmer can earn between US$300 and US$600 [€255–510] after a good harvest," says Dr Betty Nyonje of Sea PoWer.

In 2006, Msuya also established the Zanzibar Seaweed Cluster Initiative (ZaSCI), a network of academics, government officials and farmers committed to improving seaweed farming and climate adaptation on the island. A group of 21 women from Kidoti in Zanzibar were the first to be trained by ZaSCI in seaweed powder production for use in soap and body cream products. Today, there are eight groups of women trained to plant and sell seaweed on the island, and thanks to further training in value-addition provided by ZaSCI, over 300 seaweed farmers now make more than 50 products, including juices, jam and massage oils, either as groups or individuals. Seaweed farmer Mwajuma Mwinyi says that before learning new skills through the cluster programme, she used to sell 1 kg of seaweed for TSh 400 (€0.15), but now she makes up to TSh 30,000 (€11.30) from soap made from the same quantity of seaweed. ■

© UZIMAGAZINE/FLICKR

Women seaweed farmers in Zanzibar are using tubular fishing nets to farm high-value varieties

E-MARKETS

Zimbabwe's unique online auction floor

By reducing farmers' travel costs and post-harvest losses, a unique online auction system in Zimbabwe is facilitating trade between local farmers and national buyers.

Tonderayi Mukeredzi

© ROSELINE MUROTA/PALLADIUM

In Zimbabwe, an online auction system has provided farmers with an easy and efficient market

A first-of-its-kind online auction system in Mutasa, eastern Zimbabwe, has reformed agricultural marketing in the area by helping to facilitate trade between smallholder farmers and national markets. The Mutasa Auction Floor (MAF), which started operating in May 2016 with support from NGO, Help Germany, and Zimbabwe's Department of Agricultural, Technical and Extension Services, is administered by agricultural commodity company, Farmers Intersection. When the auction commences, only registered buyers can bid for the products on offer in real-time, via the internet. Once a sale is made, the sold product is dispatched to the nearest major town for delivery or is linked with other transport mechanisms for national distribution.

Prior to the introduction of the platform, many farmers in Mutasa struggled to find a ready market for their produce, forcing them to travel hundreds of miles to the nearest major town or the capital, where they often received reduced prices from middlemen. In many cases, farmers' produce would rot by the roadside as they waited for transport or opportunistic buyers. However, Sam Case, director at Farmers Intersection, says that, since its introduction, MAF has reduced farmers' field-to-shop time and enabled them to deal with one buyer, providing an easy and efficient market.

Farmers have welcomed the system because it has localised the market and allows for the almost immediate sale of their produce, whereas before, it could take over a week to transport and sell their goods in the cities. "Payment per week through mobile money has been excellent. It is a good concept and has been very helpful to the community. It has brought hope and the availability of a market to farmers," says Moses Simbi, a supplier of oyster mushrooms to MAF. "MAF has minimised our transport costs because they can even collect from our farms and has also employed local people to load and offload the produce, which gives employment to locals," Simbi continues.

In total, 319 farmers sold through MAF between 2016 and 2017, while 1,010 farmers participated in the pilot phase. Produce worth 96,580 kg valued at around €26,000 has been sold through the system. Case says the 'low tonnage' of sold products is due to a multiplicity of operational setbacks that have included farmer production patterns being out of sync with the market, resulting in gluts and scarcity of commodities. To resolve such challenges, MAF is working with the Mutasa district council to increase dissemination of market information among farmers to avoid such discrepancies, and on a marketing strategy to increase the number of farmers selling their produce in the second year by 50%.

For the future, MAF plans to have one auction floor in every district of Zimbabwe. "Many districts have already expressed an interest. We hope to soon concentrate on other areas and products of interest, such as Honde Valley for bananas, Nyanga for potatoes and Gokwe for carrots and honey," Case explains. ■

NUTRITIOUS PRODUCTS

Fighting food insecurity with indigenous plants

In Niger, a social enterprise is using local plants that are resistant to the arid climate of the Sahel to produce nutritious food. The result is better incomes for farmers and a preserved environment.

Issa Ousseini

© SAHARA SAHEL FOOD

Communities in Niger are helping a local processing company, Sahara Sahel Foods, with the harvesting of indigenous plants to combat malnutrition in the country

The nutritional value of the leaves, flowers, fruit and seeds of some 15 wild plants are being promoted to help strengthen food security and combat malnutrition and desertification in Niger. Sahara Sahel Foods uses plants indigenous to the region to produce highly nutritious food, while providing additional income to rural populations.

The company was officially launched in 2014 with initial funding of €1,200 in personal savings from its founder, Josef Garvi. Its industrial unit is located in the Zinder region, in the south-east of the country, and the products are sold in shops across the country. The company currently produces a range of 35 products – including fruit juices and pulp, oils, almonds, confectionery and teas, all derived from natural plant species grown in the Sahel.

The plants, which include *Balanites aegyptiaca*, *Mearua crassifolia* and *Boscia senegalensis*, grow naturally in cereal and legume fields and produce fruit, leaves and gum. Traditionally, they were picked and eaten immediately, or used in medicine. The plants also prevent soil erosion by water runoff, and their perennial nature makes them all the more valuable for combating desertification.

Initially, communities approached by the company to help harvest the fruit, leaves and gum of the plants did not believe the project could be profitable. Today, however, Sahara Sahel Foods works with 1,500 women across Niger's three regions (Diffa, Maradi and Zinder). They now have an income from harvesting and are replanting family fields with neglected indigenous plants using modern seeding techniques, such as natural regeneration and direct seeding. "The company's employees earn more than FCFA 100,000 (€152.45) a year," Garvi explains.

Local communities were won over by discovering the additional income generated by the harvest, but also the nutritious food produced by Sahara Sahel Foods from the wild plants. The company's success with the local population was such that, by the second year, the company harvested 50 t of fruit, leaves and gum – double the 25 t initially expected. "We knew that some of these natural trees could produce food for local consumption, but we didn't realise they could provide us with a substantial cash income, even during a poor harvest," says Mamou Rabia, a farmer in the Maradi region. "Thanks to Sahara Sahel Foods, we now have a permanent profitable activity. Even better, we have become permanent local forestry agents," adds Barira Safiatou, another woman from the same region.

"The seeds are sown in grids. After 1 year, we start thinning out the plants that have germinated in a grid, keeping the strongest seedlings. A direct seeding grid usually produces a mature tree," explains Garvi. His aim is to set up collection and processing units for harvested products in the other regions of the country, but above all to reproduce the model in other countries where the same varieties of indigenous trees exist. ■

15

wild plants are being promoted to help strengthen food security

1,500

women across Niger work with Sahara Sahel Foods

IMPROVED FOODS

Rwanda: limiting losses with nutritious grains

A processing company in Rwanda is training thousands of smallholders in the production of fortified crops – combatting malnutrition and increasing profits for farmers.

Sophie Mbugua

Over 24,000 Rwandan maize and soya farmers are being contracted to supply one of the country's main manufacturers of enhanced nutritious foods – Africa Improved Foods (AIF). In a joint venture with the country's government, the company aims to improve the nutritional status of Rwanda. AIF also provides farmers with training in best farm management practices and post-harvest handling techniques, enabling them to increase yields and reduce losses. The company dries and mills the maize, which is mixed with soya and minerals in the production of fortified food, containing key vitamins and minerals like potassium, magnesium, iron and calcium.

Contracted cooperatives, through which the farmer training is provided and the grains collected, have increased from nine in five districts to 110 in 21 districts since 2016, explains Elisha Rugambwa, AIF field coordinator. "In 2016, when the programme started, we collected 4,000 t of maize from farmers and 6,000 t in 2017. During the September 2017 to February 2018 season, we have already collected 6,000 t," Rugambwa says.

Contracting has enabled Fina Mukantwari, a 46-year-old mother of six from Nyaruguru district, to rent and grow maize on an extra 9 ha of land at a government-subsidised rate of FRw 1,000 (€1) per ha. Previously, Mukantwari sold her produce to middlemen, whose inaccurate measuring system – using local tins rather than kilograms – meant she usually sold at a loss.

Mukantwari is now a member of the Abishijehamwe Urwonjwa cooperative society and, in 2017, sold 450 kg of maize on the cob at FRw 187 (€0.18) per kg. "We grow and sell as a group, increasing profits, reducing losses and improving quality as we sell immediately after harvest," she explains. "We used to sell our maize to informal collectors who bought the maize at a lower price compared to AIF's. Currently, 1 kg is sold at FRw 130-140 (€0.13-0.14) on the local market while AIF buys 1 kg at FRw 187 (€0.18). It's a big profit for us," says Faustin Nshimiyumukiza, president of Abishijehamwe Urugwiro.

In 2017, World Vision partnered with AIF to facilitate market linkages between maize farmer groups and AIF. "We provided farmers with agricultural training to teach them about the AIF business model in order to respond well to the company's strict quality requirements," says Ryoichiro Mochizuki, World Vision project manager. As a result of the training, the rate of AIF'S rejections due to poor quality of the maize reduced from approximately 90% in 2017 to 25% in early 2018.

The nutritious products, such as multigrain porridge, are mostly intended for young children and breastfeeding women to help address the levels of malnutrition and stunting in the country and the Eastern African region at large. Already distributed across Rwanda and exported to the Democratic Republic of Congo and Uganda, AIF plans to double the number of contracted farmers in the next 3 years and start exporting to Kenya and Tanzania in the coming months. ■

© SOPHIE MBUGUA

In Rwanda, farmers are supplying a local agri-processing company with fortified crops for processing into nutritional products, such as multigrain porridge

LOAN GUARANTEE FUNDS

How to get them right

Loan guarantee funds can be a powerful tool in helping smallholders access finance, but getting the model right is vital.

Helen Castell

A long-established way of helping borrowers with little or no collateral to access finance, loan guarantee funds have been used to support farmers for nearly 100 years. There are now thousands of such schemes globally, targeting various industries. While the model is not always implemented successfully, it remains well regarded and new agri-focused funds continue to launch, determined to learn from predecessors' mistakes.

The idea behind loan guarantee funds is that lenders will be encouraged to extend finance to borrowers that are considered high risk if a guarantor entity – typically created by a government or donor but, in some cases, a private sector company – commits to guaranteeing repayment of a percentage of the loan if a borrower defaults. Effectively, the guarantor is providing collateral on behalf of the borrower. Under so-called retail schemes (see box), the guarantor also helps screen borrowers and assess their creditworthiness to improve the likelihood that loans will be repaid without the fund needing to compensate the lender.

By sharing and mitigating the risk associated with lending to specific industries or other groups, guarantee funds can enable finance providers to lend to those groups in greater volumes and sometimes at lower interest rates than they normally would. Such finance can be critical for enabling small- and medium-sized farmers and agripreneurs – who are often unable to borrow affordably, if at all – to invest and grow.

Cost control

Guarantee funds are rarely a perfect solution. Nevertheless, the development community remains confident that the model has real value and that, as more schemes launch, it can be tailored to support agriculture more successfully. One new fund is Tanzania's Smallholder Farmers Credit Guarantee Scheme (SCGS). Under the scheme, commercial banks will be able to apply for a guarantee covering 50% of any debt that borrowers default on for loans of up to TSh 5 million (€1,867) for individual farmers and TSh 500 million (€186,794) for smallholder farmer organisations.

Although as yet untested, the fund's guarantee size falls in line with recommendations by Calvin Miller, an independent consultant and former head of agribusiness and finance for FAO, that schemes should ideally guarantee around 50% of credit and no more than 70%. Any higher than this and "The cost can start to get really high," he notes. It also defeats the purpose of trying to attract banks to riskier areas if they shoulder almost no risk at all.

A number of eastern European guarantee funds, such as Estonia's Rural Development Foundation (RDF), also provide good models of cost management and governance for guarantee schemes in ACP countries. Although RDF provides guarantees of up to 80%, this reflects the unusual environment it operates in, with Estonian banks often requiring collateral equal to more than 120% of a loan's value. Its small size also makes cost control easier. "I really like these systems," says Miller. "They're very simple, they're sustainable and they run as their own profit centres."

Governance and management

Transparent, professional management and governance is another key criterion for success. From his experience with Germany's guarantee banks, which helped the country's micro, small and medium-sized enterprises sector become a powerful economic force, Michael Hamp, senior advisor on rural finance at the International Fund for Agricultural Development, is a fan of the guarantee fund concept – but only if schemes are "correctly institutionalised." Having a strong development partner to assist with initial assessment and implementation of a scheme is crucial, he says. Otherwise, "There is a tendency for a top-down approach and having the solution up front before knowing exactly the developmental problem to be addressed."

The Danish International Development Agency – which was one of the founders of the African Guarantee Fund (AGF) in

© JOERG BOETHLING/ALAMY STOCK PHOTO

Despite recurring challenges, experts remain convinced that guarantee funds can be transformative for agriculture

How guarantee funds work

Credit guarantee funds are tools for reducing the risk that financial institutions are exposed to when they lend to borrowers that are considered high risk, for example because they do not own land, property or other collateral. Typically, a guarantor – often backed by a government or donor – commits to paying the lender a percentage or 'first loss' of the amount lent if a borrower defaults on a loan. In agriculture-focused funds, the lender could also be a value chain player such as a produce trader, while the borrower could be an individual farmer or a farmer organisation. Under a so-called 'retail' scheme (which involves most agricultural funds) the fund is actively involved in the screening and assessment of borrowers. This makes the fund more expensive to run than a 'wholesale' scheme, where the lender is given more autonomy. Under both models, the guarantee provided is legally enforceable

2011 – has one of the best track records in terms of supporting guarantee funds, Hamp believes. AGF has signed nearly US$783 million (€667 million) of guarantee agreements with 125 financial institutions in 38 African countries since its launch. One recent deal was with Netherlands-based Oikocredit, which in January 2018 was awarded an €8.5 million guarantee over 10 years to support microfinance institutions, agriculture and renewable energy enterprises in sub-Saharan Africa.

A fund's management should also rigorously oversee the loans it guarantees and undertake a double assessment – both upfront and if a default occurs – to manage risk and ensure pay-outs are prompt, adds Miller. Delayed reimbursement to financial institutions is "The best way to kill a guarantee fund," he says, and will "nullify any of the other benefits."

Turbulent times

For all their faults, credit guarantee funds are crucial for giving banks confidence to lend – and to remain in markets during and after turbulent times. Kristian Schach Møller, CEO of the Agricultural Commodity Exchange for Africa (ACE), urges any organisation looking to establish a warehouse receipt finance (WRF) system, for example, to work with a guarantee fund from the outset. While ACE is often lauded as a pioneer model for other African countries, private banks providing finance underpinning its WRF system lost money in 2016 when the market was flooded with imports of maize and pigeon peas, which led local prices to collapse. Banks are now reluctant to lend against stored produce in Malawi, he says. And, while ACE is currently looking to develop a fund to take the first hit on any future bank losses related to price volatility, Schach Møller believes that regaining banks' confidence will take time. "When a bank experiences this kind of extreme, they remember it, and it's hard to get them in again," he notes.

As Hamp concludes, loan guarantee funds are no 'silver bullet', but implemented correctly they can be a "very powerful tool." ■

FARM TO FORK

Innovations reshaping smallholders' market access

Technical solutions to food tracking, traceability and distribution are enabling agribusinesses along the value chain to better manage and expand their operations. Such innovations also help farmers and farmer organisations to establish and strengthen links with buyers.

Stephanie Lynch

Around the world, new technologies are helping to maximise efficiency in the distribution of fresh produce from farms to markets. Farmforce – one such innovation that's having a global impact – is a cloud-based mobile and web platform, which supports the professional relationship between smallholder farmers and buyers, enabling increased transparency along the value chain through the collation of detailed farm data. Food companies across 25 different countries in Africa, Asia, Central and South America use the platform to coordinate the activities of over 250,000 farmers and ensure food meets safety and sustainability standards.

© ERIC CARROLL/ELEVATE SOCIAL BUSINESSES

Farmforce is used to analyse the severity of several types of leaf disease that effect peanut production in Haiti

In Haiti, Acceso Peanut Enterprise Corporation, an agribusiness built by the Clinton Giustra Enterprise Partnership in 2014, uses Farmforce to help oversee their rural operations. Acceso collects groundnuts from more than 3,000 Haitian farmers at depots located near farming communities, tests the nuts to ensure they do not exceed aflatoxin limits and sells them on to large buyers. The company not only provides a ready market for its network of smallholders at a fair price, but also offers the farmers training in good agricultural practices and inputs on credit, to improve their groundnut yields and quality.

Since its launch, Farmforce has enabled Acceso to manage its daily operations and keep comprehensive records of farm data, training attendance, yield forecasts, loan repayments and harvest purchases. Access to this data from the last 4 years has allowed Acceso to assess the impact of its operations and gain a better understanding of which strategies are the most effective for sustainably delivering higher quantity and quality groundnut yields. "Farmforce's ability to log geo-references for farmer registration, field visits, and survey responses gives me the ability to see where my team is and what work they are doing in real-time," explains Patrick Dann Dorzin, deputy operations manager at Acceso. With

© FARM AFRICA/JON SPAULL

Over 72,000 farmers in Tanzania and Uganda have gained higher prices by selling their produce through aggregation centres

Farmforce's help, Acceso has tested and sold 800 t of groundnuts since its launch and has begun to expand its portfolio to include other crops such as lime, mango, moringa, sorghum, sisal and castor.

Enhancing aggregation

The efficient distribution of fresh produce is not entirely reliant on technology; aggregation centres and collection points play a key role in ensuring food supplied by smallholder producers makes it to the market in the safe, fresh and high-quality condition required by buyers. Through its FoodTrade programme, the NGO Farm Africa has focused its support on farmers' organisations, village aggregation centres (VACs) and satellite collection points in Tanzania and Uganda. The NGO builds the business and governance capacities of these farmers' organisations and VACs to help them establish long-term links with buyers and sustainably grow their business.

Using digital market information systems, Farm Africa has also enabled farmers' organisations and VACs to monitor market prices, which ensure the aggregators have leverage to negotiate a fair and competitive price for produce. Improved aggregation and access to market information, has helped supported organisations and VACs sell 104,700 t of aggregated produce and gain higher prices than the value most farmers would previously have received at local markets. At the farmer-level, Farm Africa has worked to advocate the benefits of aggregation to farmers and, in just over 2 years, 72,800 farmers have started aggregating their produce.

> Acceso offers farmers training in good agricultural practices and inputs on credit, to improve their groundnut yields and quality

Run like clockwork

Kenyan start-up, Selina Wamucii, allows buyers to source, aggregate, and redistribute fresh produce from African smallholders to markets (domestic and export) through its mobile platform. To join the platform, farmers simply text Selina Wamucii a code and, with the data, the company is able to map a farmer's location, their produce and the volume harvested. Working with over 3,000 farmers, the company organises them into small groups according to crop variety and coordinated by produce agents. At harvest, the crop volume produced is recorded on the platform and farmers are immediately paid via their mobiles; a traceability code is also generated so that the produce can be tracked from its origins to the market.

Selina Wamucii then grades, packages, distributes and markets the produce under 10 different brands, including Mount Kenya Fresh Avocados, Kenya Herbs & Spices and Essential Oils of Africa. "We're tapping into the power of mobile phones to transform the value chain while passing the benefits of an efficient chain on to the farmers and produce buyers," explains Kariuki Gaita, co-founder of Selina Wamucii. The company's success is evidence that with the right technologies and relevant capacities in place, food produced by smallholder farmers across the world can meet the demands of international markets. ■

HERITIAINA RANDRIAMANANATAHINA

"An entrepreneur must be competitive and creative"

At the age of just 24, Madagascan Heritiaina Randriamananatahina heads up a cheese and syrup processing business that is growing fast. Lacking any formal qualifications, he discusses the barriers facing any aspiring young business man or woman in the agri-food industry.

Mamy Andriatiana

© NOCOMMENT

Despite having no qualifications, Heritiaina Randriamananatahina won the 2016 Anzisha Prize for youth entrepreneurship

Raised by his grandmother, Heritiana Randriamananatahina dropped out of school at 14 years old to earn his living as a street vendor for fruit juice and cacapigeon, a popular Madagascan aperitif. Today, however, he is the head of Fiombonana, which produces cheese, syrups and chocolate. Founded in 2012 when he was just 17, the company currently has an annual turnover of Ar 0.5 billion (€150,000), two factories, 47 employees, a network of 500 small-scale producers, over 40 mobile kiosks and multiple points of sale, mainly in the capital Antananarivo.

What motivated you to create your own agricultural processing business? How did you spot the gap in the market?

Prior to Fiombonana, I had a small network of customers, so my aim was to formalise and expand my activities as a street vendor. Fiombonana means 'unite', 'combine efforts', 'to help each other': it symbolises the approach behind the growth of my work with farmers associations, my workforce and my suppliers. With my mobile kiosk I made home deliveries, but the orders really started coming in once I opened a Facebook account and registered the brand 'Fy'Deliko'. Today, I produce and sell 1,200 kg of cheese and 500 l of syrup every week.

Why did you decide to use only raw local products and how have you managed to establish relationships with the farmers who supply you?

I work with nearly 500 farmers who supply me with fresh, good quality

"Farmers represent 80% of the Malagasy population and this is a way to help them and create jobs"

products (milk, cocoa, peanuts, fruits and vegetables), but most importantly they are also organic and natural, which is what my customers are looking for. Farmers represent 80% of the Malagasy population and this is a way to help them and create jobs. I established my processing facilities in the district towns of Antanifotsy and in Antsirabe – which are 140 km and 170 km away, respectively, from Antananarivo – as well as collection points in rural areas in order to be closer to the producers and create a firm foothold in the area.

What are the main challenges you have encountered and continue to face?

I have no qualifications and I am very young to be running a business. I am also still lacking experience, funding and materials – much of my machinery has been cobbled together. This means I have to earn the trust of my partners (suppliers and employees) and work within my means. The business has grown but the management methods haven't developed in parallel. I need technical advisors and people I can trust as I am unable to cover all of the needs for marketing, management and production methods on my own; I am currently planning to hire a technical advisor. This is an ongoing problem as Fiombonana is still expanding.

What lessons would you like to share with other young entrepreneurs?

To be competitive and creative but, above all, open-minded. You need to be committed and never give up. My strong willpower has allowed me to overcome many problems. My starting capital was pitiful; I had only the little that I had earned as a street vendor – Ar 20,000 (€5). I did not ask anyone else for financial help. When I say that you need to be creative, I mean that you always need to find a niche, to offer something different, your own added value. For example, the *koba* (a Madagascan cake) has completely flooded the market, so I created chocolate and fruit flavoured versions. Packaging is also essential; many cheeses are sold without packaging which is less appealing to the consumer. Finally, you also need to have ambitious goals – I already knew I wanted to be a businessman even when I was in primary school.

© MAMY ANDRIATIANA

Fiombonana produces and sells 1,200 kg of cheese and 500 l of syrup each week

In 2016, you were awarded €21,350 as a winner of the Anzisha Prize for youth entrepreneurship by the African Leadership Academy and Mastercard Foundation. How did the prize help you to develop Fiombana?

The award has helped me to renovate some key equipment; a grinder, a mixer and a refrigeration unit but also to build a new processing facility and purchase a car to transport my products. The only problem is that, without a technical advisor, I hadn't realised that some of this equipment was not essential at this stage. The award also provided me with opportunities to meet foreign technical advisors, but more importantly to raise awareness amongst other local entrepreneurs. The local authorities named me as a 'mentor' for a business incubator in Madagascar; being a mentor has given me the opportunity to support other young entrepreneurs.

"You always need to find a niche, to offer something different – your own added value"

Two years on from winning the award, how do you plan to maintain the competitiveness of your business?

Firstly, to improve the quality of our current products, whilst continuing to research how we can add further value with flavoured products, improved packaging, and by using social media. We also plan to increase production and sales through personalised visits and advertising. I already have an order from supermarkets – Shoprite and Leader Price – but I need to first show we can guarantee the volumes required. My aim is to address the demand on the local market and then to start exporting. ■

INTERVIEW

Farmers need confidence to take on new technology

Co-author of *Sustainable Intensification of Agriculture: Greening the World's Food Economy* and editor of the *International Journal of Agricultural Sustainability*, Professor Jules Pretty explores smallholders' path towards sustainability.

Samuel Price

With smallholder farmers making up the majority of the agricultural workforce in Africa, how can they be engaged in the push for sustainable intensification (SI)?

The vast majority of SI has been taken up in what we might call developing countries, meaning that Africa, Asia and South America are leading, when compared to farms in Europe, North America and so forth. A lot of that is smallholders, and I think this is because we have communicated the notion that there are different futures for farmers; including low-cost futures, particularly in terms of purchasing inputs, the exchange of knowledge and social capital, and the deployment of natural capital.

The various stages of sustainability, as we conceive it, are framed around a model of 'redesign', which focuses first of all on improving efficiency. For example, if you're going to use pesticides, spray them very carefully and don't waste them. So the first step is substitution – substituting biological control methods for pesticides, for example – to bring new technology into an existing system. The real transformation comes when you start rethinking the design of whole agricultural systems, looking for synergies between different components, between crops and trees, water deployment, soils and so forth. We are in quite a different and encouraging space now, with smallholders at the vanguard of social, as well as agricultural change, and the evidence for it is emerging in quite a positive way.

The book argues for the development of 'social capital and infrastructure', which can aid the flow of information at farm level. Is there a role for emerging technology in this area?

Social capital – relations of trust, reciprocity and socially embedded rules – is a critical prerequisite for sustainability. You might have watershed development groups or microfinance groups or irrigation groups; the key is that if you can get people working together, and ensure the message is received collectively and learned practically, but still specific to their own farms, then they are more likely to share the knowledge with others. A good example is farmer field schools, which emerged in Indonesia and the Philippines at the end of the 1980s and aimed to redesign SI. There are now 15–20 million farmers worldwide who have been through the schools, and have subsequently adopted practices that are much more sustainable.

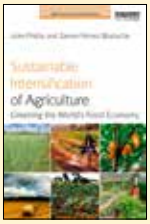
The risks of experimenting for smallholders are extremely high – you've only got to have one bad season and you haven't got any food. So if somebody from another place comes to your farm and says "do this" or "do that," you have every right to be sceptical about it. That was the old model; we need an enabling, participatory environment that builds the confidence of farmers

© THE UNIVERSITY OF ESSEX

Professor Jules Pretty emphasises the importance of social capital in transforming sustainable intensification

Sustainable intensification

Putting farmers' experiences into practice



This study stresses the importance that SI practices – a process where yields increase without adverse environmental impact or the cultivation of more land – are developed by, and continually responsive to, the experience of primary actors in agriculture (e.g. farmers, input suppliers, etc.). This approach to SI ensures that successful practices are reinforced from the start, drawing on the knowledge and innovations of the same farmers who will go on to implement them. Chapter 5 underpins the integrity of farmer-level influence in the development of SI, presenting data from a series of case studies across Africa, Asia and Latin America, in which grassroots SI innovations have succeeded – even in the absence of state support.

The book then makes the case that an 'environment' conducive to farmer-level development and innovation in SI should be created by those with the capital and authority to do so, such as the state, NGOs, large-scale private enterprise and financial institutions. In particular, the book advocates for partnerships between private enterprise – with the capital and structural agility to adapt to emerging knowledge, problems and innovations in agriculture – and governments that are able to uphold the private sector's accountability. However, the authors emphasise that an enabling SI environment can only be successful if these secondary actors are receptive to the knowledge and lessons accumulated by primary actors on the ground, and eschew a prescriptive, top-down approach to SI practices.

Sustainable Intensification of Agriculture: Greening the World's Food Economy
By J Pretty & Z Pervez Bharucha
Routledge, 2018; 190 pp.
ISBN 978-11-3819-602-5
€33.50
www.routledge.com

to experiment, so that they are engaged in continuous change. That is what we pick up on in the book: the need for a new agricultural 'knowledge economy'.

What policy lessons can be learned from the current state of SI in developing countries?

I think the best example of effective policy support for SI comes from one state in India, Andhra Pradesh, which promoted 'zero budget natural farming'. They are building strong networks of social capital, with the ambition to have all 25 million of the state's farmers using this by 2025. However, there are very few examples of a singular integrated effort to spread new agricultural practice across the whole of the landscape. There are individual policy areas, like irrigation management in Thailand, or microfinance support through NGOs in Bangladesh, all of which tend to be sectoral. The next challenge is to find ways of creating national- or state-level policy, like in Andhra Pradesh, to integrate all of this.

One reason why policy integration is difficult is due to strong countervailing forces. There are companies and sectors that will lose a lot of business transitioning to sustainability. You can expect a fight whenever there is a transition of this sort, which is why policymakers often find it difficult to grasp what they should do. ■

Sustainable agriculture

Building resilience

Accounting for more than half of Africa's labour force, the agricultural sector still only generates 15% of the continent's GDP. Presenting a series of case-studies drawn from across the continent, Building a Resilient and Sustainable Agriculture in Sub-Saharan Africa proposes policy-oriented solutions aimed at three key areas of agricultural development: improving productivity, mitigating exposure to climate shocks, and boosting agro-industrialisation.

Building a Resilient and Sustainable Agriculture in Sub-Saharan Africa
Edited by A Shimeles, A Verdier-Chouchane & A Boly
Palgrave Macmillan, 2018; 302 pp.
ISBN 978-33-1976-221-0
Downloadable as a PDF file from:
https://tinyurl.com/y84wgtnr

Food security

Crop diversification

Smallholder farmers make up the majority of Malawi's agricultural sector, and rely predominantly on rain-fed farming systems that face growing challenges from land degradation and declining soil fertility. This short study examines crop diversification as a method for mitigating the threat to food security in Malawi, and its capacity to improve both nutrition and farmer incomes. The authors conclude that agricultural policy should continue to explore and promote crop diversification.

The Role of Crop Diversification in Improving Household Food Security in Central Malawi
By N Mango, C Makate, L Mapemba *et al.*
Agriculture & Food Security, 2018; 10 pp.
Volume 7
Downloadable as a PDF file from:
https://tinyurl.com/y7qlumxy

SOIL POLLUTION

Searching for a sustainable solution

Worldwide, poor farming techniques are polluting soils. If allowed to continue, the currently 'hidden' effects of soil degradation upon human health and nutrition are expected to become more difficult to ignore.

Sam Price

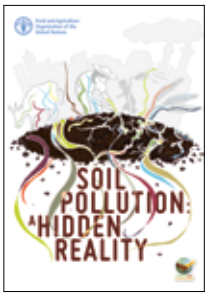
Soil pollution results from a range of human activities: industrialisation, war and mining, to name a few. Overuse or spills of agrochemicals, such as pesticides and fertilisers, also degrade soil, which threatens crop productivity, food security and nutrition. According to Maria Helena Semedo, FAO deputy director-general, "The potential of soils to cope with pollution is limited; the prevention of soil pollution should be a top priority worldwide."

This comment by Semedo was made in May 2018, at the launch of the FAO report, *Soil Pollution: A Hidden Reality*. The publication sets out the nature of soil pollution currently afflicting Asia, Africa and Europe, its impacts on agriculture, and the remedies that need to be deployed to rectify the situation. The use of untreated wastewater in irrigation and poor animal waste management, for instance, contribute to soil pollution in farming communities. One of the risks with these pollutants is that they can affect humans if they are exposed (ingesting, inhaling, etc.) to harmful contaminants from the surrounding soil. A solution to this, as outlined by the report, is to treat water used in irrigation and to remove dangerous animal waste from crop growing areas.

The negative effects of soil degradation across the continent are highlighted in *Soil Atlas of Africa*; a publication from the European Commission, which also sets out the primary functions of soil in Africa. This enduring publication also outlines the fact that many farmers in Africa have to maintain their soil's fertility through the use of crop rotation or mineral fertilisers. However, challenging economic and social conditions, such as poverty or natural disasters, can often mean that these techniques are neglected or not adopted, resulting in reduced soil fertility and low yields.

The effects of saline build-up on agricultural land is detailed in another publication from FAO; *Handbook for Saline Soil Management*. Whilst this book primarily focuses on soil in Eurasia, the guidelines are relevant to saline-affected soils in Africa. This type of soil degradation is also linked to inappropriate agricultural practices, including the over-irrigation of land, which deteriorates the soil's ability to act as a filter against pollutants. The saline disturbs the soil's participation in the water and nitrogen cycles, which has adverse effects on the surrounding ecosystem. One method of ameliorating this issue is to apply chemicals, such as sulphuric acid solution, to the effected land to eradicate the accumulation of saline in the soil.

The issue of soil pollution demands different solutions for differing problems. As the literature states, soil management is vital for protecting agricultural productivity and preventing hunger, worldwide. If problems such as agrochemical spills and poor waste disposal are not curbed, the visibility of soil pollution and its impacts for soil fertility, agriculture and human health will come to the fore. ■



Soil Pollution: A Hidden Reality
By N Rodríguez Eugenio, M McLaughlin & D Pennock
FAO, 2018; 142 pp.
ISBN 978-92-5130-505-8
Downloadable as a PDF file from:
https://tinyurl.com/y83dtb6d

Soil Atlas of Africa
By A Jones, H Breuning-Madsen, M Brossard *et al.*
European Commission, 2013; 176 pp.
ISBN 978-92-7926-715-4
Downloadable as a PDF file from:
https://tinyurl.com/yalkx57k

Handbook for Saline Soil Management
By R Vargas, E I Pankova, S A Balyuk *et al.*
FAO, 2018; 132 pp.
ISBN 978-92-5130-141-8
Downloadable as a PDF file from:
https://tinyurl.com/ycqoh6s2

Transforming agriculture

The value of weather data

Meteorological data that is available for use, reuse and to be shared and built upon by anyone, for any purpose, enables weather information to become a vital part of the agricultural value chain. Tailored weather data acts as a specialised tool to help farmers adapt to the impacts of climate change, with farmers employing the use of localised information in order to follow weather patterns and act accordingly to changes in the climate. *ICT Update: Weather Data for Agriculture* examines the rising importance of weather data in agricultural production and how its exclusivity needs to be challenged. Some smallholders are excluded from using weather data due to their inability to access data, or because weather services ignore their need for data in the form of understandable and informative weather advice.

This *ICT Update* issue therefore emphasises how raw data has to be transformed into comprehensible weather information if it is to be used to help farmers make well-informed, land-management decisions. Author of one the issues' featured articles, Tufa Dinku, explains that, "Even the best data has no value if not accessed and used."

While weather data on its own is useful, combining such data with agronomic data gives farmers an even greater breadth of information at their disposal. The strategic alliance of Kenyan companies eProd and aWhere is working to do just that. The eProd handheld device collects GPS locations and agronomic information, such as soil type, seed variety and the planting date of the crops. aWhere then combines this information with weather data and the farmers are sent SMS weather forecasts, fertiliser advice and yield projections based on incoming weather. Meteorological data that has been linked to the agricultural data of a particular farm, improves the effectiveness of weather data by enabling the farmer to take steps to increase productivity and output in the face of climate variability.

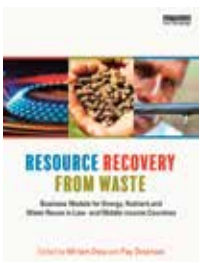
Food production, harvest predictions and disaster mitigation would benefit from improved weather data, however there are currently only 300 weather observation stations across Africa. This publication therefore surmises that the benefits of weather data are dependent upon improving weather observations across Africa. The continued promotion of quality data, as well as the creation of partnerships between public and private sector organisations seeking to improve sustainability and profitability for smallholders through the use of metrological data, is also featured in this *ICT Update* issue. ■

ICT Update n° 87: Weather Data for Agriculture
Edited by M Speer *et al*.
CTA, 2018; 24 pp.

Downloadable as a PDF file from:
https://tinyurl.com/ydfc6jqo

Resource recovery

Harnessing energy, nutrients and water from agricultural waste



Worldwide, millions of tonnes of waste is produced each day, including agricultural waste such as maize cobs, millet husks, groundnut shells and animal manure. Used water from industrial and household sources also classifies as waste. However, the safe management and use of such waste can allow farmers to derive value from it.

Resource Recovery from Waste, Business Models for Energy, Nutrient and Water Reuse in Low- and Middle-income Countries stresses how the recycling of waste products can support livelihoods and green economies in low- and middle-income countries. In the publication, emphasis is placed on agro-industrial waste (such as slaughterhouse refuse), food waste and household waste (including sewage) and the ways in which they can be transformed in order to maximise resource recovery.

Striking infographics and diagrams provide examples of how waste can be repurposed, for example, using rice husks to produce electrical power or transforming sewage into nutrient rich compost. Properly treated waste water can also be used in irrigation and in replenishing reduced ground water levels in drought-affected areas.

There are 24 examples of effective waste recovery within this publication and 15 case studies from Africa, which emphasise the value of repurposed waste. The World Economic Forum estimates that the potential global revenue for biomass from agricultural inputs could reach as high as €250 billion by 2020. The empirical evidence of these studies shows how energy, nutrients and water from waste can be reused to ensure that refuse does not amount to lost value for farmers in less economically developed nations. ■

Resource Recovery from Waste, Business Models for Energy, Nutrient and Water Reuse in Low- and Middle-income Countries
Edited by M Otoo & P Drechsel
Routledge, 2018; 816 pp
ISBN 978-13-1578-086-3
€35
www.routledge.com

Will Africa's new trade agreement boost agribusiness?

RICHARD KAMAJUGO

Non-tariff barriers are key to enabling trade

Richard Kamajugo,
Senior Director, TradeMark East Africa

The Continental Free Trade Area (CFTA) is widely seen as a potential stimulant for economic growth, industrialisation and sustainable development in Africa, despite some challenges which need to be addressed. Fears of significant tariff revenue losses and an uneven distribution of benefits are among the main obstacles to the continent's market integration.

Trade liberalisation in the CFTA will lower trade costs and allow consumers to access a greater variety of products at lower prices. Lower costs for imported raw materials and intermediate inputs will increase the competitiveness of downstream producers and promote the growth of regional value chains. Trade liberalisation in Africa will also allow agribusinesses to access a large continental market of 1,284 billion people, thereby creating economies of scale. In the long run, increased competition is expected to improve agribusiness efficiency. However, small and medium-sized enterprises may struggle to compete when they are exposed to competition from more established firms as a result of the CFTA.

Thriving agribusiness will drive economic growth

Approximately 75% of Africans rely on agriculture for their livelihoods and agribusiness and agro-industries account for more than 30% of national incomes, as well as the bulk of export revenues and employment. Scaling up agribusiness could offer immediate opportunities for value addition through commodity-based industrialisation, which could lift many rural dwellers out of poverty while creating jobs across national economies.

Agribusiness also holds the key to meeting urban consumers' demand for food, particularly value added and processed food products. Emerging economies and markets that result from the CFTA will increase demand for Africa's farm commodities. There is vast potential for establishing production and trade links, as well as synergies between different actors along the entire agribusiness value chain, through the improvement of the business regulatory environment. A more enabling regulatory environment would incentivise private sector investments and encourage competitiveness. A shift to modern integrated agribusiness would also provide lucrative opportunities to many smallholder farmers, the majority of whom are women, and generate jobs for Africa's youths.

Flattening trade barriers

With enhanced skills and technology, the CFTA is projected to increase intra-African trade and expand the product range of traded goods, thereby setting the stage for increasing exports from Africa to the rest of the world. While standards, testing, conformity and assessment are applied in a manner that they become non-tariff barriers (NTBs), partner states in the East African Community (EAC) – Burundi, Kenya, Rwanda, Tanzania, Uganda and South Sudan – are frantically trying to improve the application of these NTBs in a bid to increase trade across the EAC bloc.

The World Bank's World Development Indicators show reductions in the time taken to import and export goods from each EAC partner state since the NTBs were applied. The time taken to import has, on average, dropped from 36 to 31 days from 2012 to 2015 and from 33 to 26 days for exports. In addition, inland transportation times from Mombasa to Kigali and Dar es Salaam to Kigali have also dropped considerably, to 5 and 3.5 days respectively.

The Standards Harmonisation and Conformity programme in Eastern Africa indicates that a 59% reduction (from US$500 to US$205 [€425 to €174]) in testing costs and a 74% reduction in the average testing time (from 38 days to 10 days) has been achieved across the EAC region. The number of products complying with quality and standards requirements has increased through certification, thus contributing to increased intra- and extra-EAC trade values and volume, by 23% and 50% respectively (from €728,373 in 2010 to €1,780,719 in 2014). With the CFTA, this success could be replicated across the continent.

The CFTA's potential

Despite the challenges that still remain, Africa's agribusiness export potential can be unleashed as the constraints on the supply side are overcome by the CFTA, and preconditions are met for entry into global markets and value chains. This will enable Africa to develop its capacity to seize emerging market opportunities for higher value-added agribusiness and agro-industry products, both in developed countries and emerging economies. ■

WANDILE SIHLOBO

Overcoming Africa's infrastructural challenges

Wandile Sihlobo,
Agricultural Business Chamber of South Africa

The CFTA is arguably one of the world's largest free trade blocs (by number of member states) and there are several reasons to be excited about its development. However, it is important to note that the CFTA will only be legally binding once it is ratified by at least 22 country signatories. It is very impressive to think that the official engagements for this agreement started in 2002 and the signing is now a reality in 2018. One sticking point, however, is the fact that neither Nigeria nor South Africa, which are among Africa's largest and most influential economies, have signed the agreement.

The CFTA is very strategic considering that, from a demand perspective, the continent's market will grow to over 2 billion people by 2030. Meanwhile, from a supply perspective, the agricultural and agribusiness sector is expected to grow to €0.86 trillion by the same period. Moreover, the fundamental reason why private sector participants ought to be excited about the CFTA is the harmonisation of trade and investment rules and regulations. That alone provides a sufficient basis for the continent's food sector to be growth-ready, as and when market conditions permit the industry to capitalise on it.

It may sound counter-intuitive for one to be excited by the state of readiness of an outcome, rather than the outcome itself. But such a level of ambition becomes plausible if you have a situation where the infrastructure, institutions and systems are not sufficient to provide the initial conditions for growth to take place. At this stage, it is the pre-conditions that matter the most, rather than prematurely-induced trade growth – which, in all likelihood, will lead to inequitable growth. Perhaps, for now, Africa needs to make every effort to negotiate and strengthen its own 'rules'. Africa's institutions need to be developed and, where in existence, they need to be strengthened in order to get the best out of the CFTA.

At least this part of the debate speaks to a broader global trend of pluri-lateral trade agreements, which are based on 'rules'. Many experts have argued that part of the reason why Africa's ambition has not matched that of other advanced nations of the world is due to its reluctance to negotiate issues, such as trade in services. South Africa's Minister of Trade and Industry, Dr Rob Davies, has stated that the continent is simply not ready to start opening up markets because the extent of their impacts on the smaller economies is yet to be fully understood. While that fear is well placed, the CFTA should lay the groundwork for a work programme that will begin to explore those new generation issues with respect to rules and regulations.

The irony of the CFTA is that it comes into fruition at a time when the continent is still facing some fundamental challenges among its own Regional Economic Communities, which include the East African Community, the Southern African Development Community and the Common Market for Eastern Southern Africa. Some of the issues – such as rules of origin – will be resolved as countries negotiate the CFTA. The agreement could offer significant opportunities if some of these pertinent issues are addressed in the CFTA text. ■

Poll

Will Africa's new trade agreement (CFTA) boost agribusiness?

44%
The harmonisation of trade regulations will help to lower export and import costs

28%
Small and medium-sized agribusinesses will struggle to compete with larger enterprises

28%
Increased market competition will drive improvements in agribusiness efficiency

0%
Africa's infrastructure is not yet adequate for rural businesses to benefit from the continental market

Other debates

Find *Spore*'s *Opinion* pages and a third blog on this topic online. New debate topics are published each month on the *Spore* website:

http://spore.cta.int/en/debates.html

In the next issue

191 December 2018 - January 2019

© PETTERIK WIGGERS/PANOS PICTURES

DOSSIER

Scaling development

Strategies to extend the impact of successful interventions

TRENDS

Funding resilience

Emerging mechanisms for climate-smart financing

TRADE & MARKETING

Food safety

Improving food quality for increased trade opportunities

READER SERVICES

Write to *Spore*

CTA - *Spore*
PO Box 380
6700 AJ Wageningen
The Netherlands
Fax: +31 317 460067
Email: spore@cta.int

READ SPORE ON-LINE
www.spore.cta.int

Subscribe to *Spore*

Please note that for new readers only subscriptions to the e-version of *Spore* are available.

Subscribe to the free newsletter at:
https://publications.cta.int/en/subscribers/register/Spore/

You can also subscribe to *Spore*'s social media channels to receive live updates from relevant events, as well as notifications about new articles as they are published.

Follow *Spore* on:
- **Twitter @spore_mag**
- **Facebook @CTASpore**
- **LinkedIn @Spore Magazine**

Reproduce *Spore*

- *Spore* articles, but not pictures can be freely reproduced for non-commercial use, if credited as coming from *Spore*. Please send a copy to the editors.
- Reproduction for commercial use requires prior permission.

TO OBTAIN PUBLICATIONS

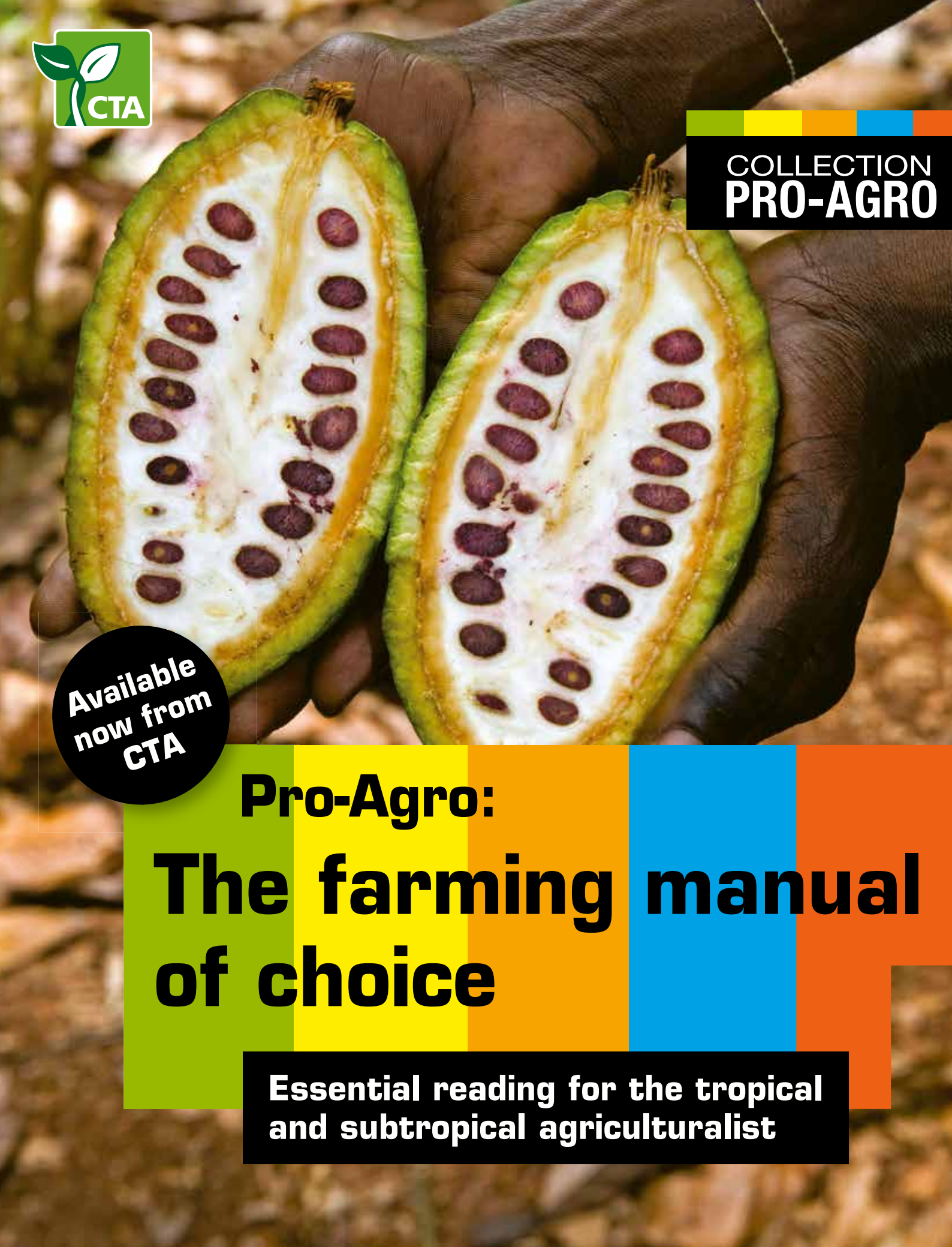
Publications marked may be downloaded from the following website:
http://publications.cta.int

Titles marked with the logo can be obtained as follows:

If you are a subscriber to CTA Publications use one of these options:
- If you have an account with http://publications.cta.int, go on-line and select your books depending on the credit points you have, then click on 'Add to shopping cart' and 'Proceed to checkout'.
- If you do not have Internet access, you can continue using the order form supplied by CTA.

If you are not a subscriber to CTA Publications, you can buy the publications from the publisher or in a book shop. Alternatively, you can download certain titles on the website http://publications.cta.int. More than half of our publications are downloadable free of charge.

SPORE is the quarterly magazine of the Technical Centre for Agricultural and Rural Cooperation (CTA). CTA operates under the Cotonou Agreement between the countries of the Africa, Caribbean and Pacific (ACP) group and the European Union and is financed by the EU. • CTA • Postbus 380 • 6700 AJ Wageningen, The Netherlands • Tel: +31 317 467 100 • Fax: +31 317 460 067 • Email: cta@cta.int • Website: www.cta.int • **PUBLISHER AND CHAIRMAN OF THE EDITORIAL BOARD:** Michael Hailu • **EXECUTIVE EDITOR:** Anne Legroscollard • **EDITORIAL BOARD:** Stéphane Gambier, Isolina Boto, Benjamin Addom, Piet Visser, Toby Johnson, Thierry Doudet • **EDITORIAL STAFF:** Managing editor: Susanna Cartmell-Thorp, WREN*media*, Fressingfield, Eye, Suffolk, IP21 5SA, UK • **CONTRIBUTORS:** C Addison (CTA), M Andriatiana (Madagascar), B Bafana (Zimbabwe) and A Twahirwa (Rwanda), Y Boloh (France), I Boto (CTA), H Castell (UK), V Defait (India), S Diarra (Mali), N Dookie (Trinidad and Tobago), O Frost (UK), B Koigi (Kenya), S Lynch (UK), M Makoni (South Africa), S Mbugua (Kenya), A Miller (UK), T Mukeredzi (Kenya), I Ousseini (Niger), S Price (UK), S Reeve (UK), B Rioba (Kenya) • **DESIGN:** Vita, Italy • **LAYOUT:** T Paillot, P Pothier, Intactile DESIGN, France • **PRINTER:** Latimer Trend & Company, UK • © CTA 2018 - ISSN 1011-0054


CTA
COLLECTION
PRO-AGRO
Available now from CTA
Pro-Agro:
The farming manual of choice
Essential reading for the tropical and subtropical agriculturalist

DISCOVER
THE NEW SPORE

More expert analysis

More on your region

More debate and opinion

More interactivity

Get the latest on agricultural development with just one click

SMARTPHONE TABLET COMPUTER

www.spore.cta.int