

**SUSTAINABLE
DEVELOPMENT GOALS**

*Agriculture's transformation is
key to achieving the 2030 Agenda*

INTERVIEW

*Dr Wanjiru Kamau-Rutenberg
reflects on the integral role of
women in agricultural research*

DIGITAL BORDERS

*Technologies are maximising
the efficiency of East Africa's
cross-border trade*

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Digitalising agriculture

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Capitalising on digitalisation's potential

Michael Hailu, director – CTA



2019 looks set to be the year of digitalisation in agriculture and it will certainly be a major focus for CTA, along with many other key organisations involved in transforming smallholder agriculture. The Global Forum for Food and Agriculture (GFFA), which took place in Berlin in January focused on the theme, 'Agriculture Goes Digital – Smart Solutions for Future Farming'. The GFFA ministerial communiqué states that agriculture ministers of the 74 nations, "aim to use the potential of digitalisation to increase agricultural production and productivity, while improving sustainability, efficient use of resources, employment and entrepreneurial opportunities."

Technology is not a silver bullet, but it can play a key role in making value chains more productive, efficient, profitable and – crucially – more inclusive. In this issue of *Spore*, we explore how digitalisation is providing women with better access to finance, information and markets, as well as opening up new opportunities for young entrepreneurs to develop apps and other digital services in agribusiness.

Digitalisation is key to improving cross-border trade, as we also highlight in this issue. Blockchain technology is rapidly evolving as a solution for improved efficiency, sustainability and traceability in agricultural supply chains and the wealth of information now available to us through satellites, drones and artificial intelligence can help smallholders farm with greater efficiency and accuracy, making them more resilient to extreme weather conditions like droughts or flooding.

These are all key developments that CTA has been working on for a considerable time and will continue to focus on as a core part of our strategy for 2019. In particular, this year will see two important developments promoting the agricultural digitalisation agenda. The first will be CTA's publication of a landmark report, in collaboration with Dalberg Global Development Advisors, which maps the landscape of digitalisation in agriculture and makes future projections for Africa. In addition, the African Green Revolution Forum, to be held later this year in Accra, Ghana, will focus on the theme 'Grow Digital'. CTA will be taking a lead role in developing a series of digitalisation-focused sessions and other content throughout the event.

We trust that the dialogue initiated at the beginning of the year at the GFFA will continue with these forthcoming events, and will help to propel the mobilisation of young African innovators, entrepreneurs, investors and governments to capitalise on digitalisation's potential.

AGRICULTURE

A keystone for sustainable development

In order to achieve the Sustainable Development Goals by 2030, small-scale farmers in developing countries must be involved in the transformation of agri-food systems.

Vincent Defait

The adoption of the Sustainable Development Goals (SDGs) by the UN in 2015 led to wide recognition of the paramount importance of the agricultural sector in ensuring socio-economic progress – it is currently the world's leading employer and plays a vital role in the livelihoods of 40% of the population.

Agriculture is obviously the main focus of Goal 2, which aims to achieve 'zero hunger'. But the agricultural sector is also involved, to different extents, in Goals 12 (responsible consumption and production), 13 (climate action), and 14 and 15 (related to conserving aquatic and terrestrial life). Agriculture is also a focus of Goal 5, which is geared towards promoting women's rights to land ownership; this sector is therefore a key component in the 2030 Agenda for Sustainable Development to achieve the SDGs. According to the multi-stakeholder Farming First coalition, established to promote sustainable development worldwide, "Agriculture is the common thread which holds the 17 SDGs together."

Yet, the latest news indicates that agriculture is faltering. All African countries, for instance, have been rated very

poorly by the Sustainable Development Goals Center for Africa in its latest report on SDGs in Africa. In 2018, around 70% of the countries regressed in the areas of food security and sustainable agriculture (SDG 2), access to affordable and clean energy (SDG 7) and the protection of marine ecosystems (SDG 14). Worse, "This is the third consecutive year that progress in ending hunger has stalled and now has actually increased (in 2015, 2016 and 2017). Child stunting is a major problem and nearly 2 billion still suffer from hidden hunger or a deficiency of important nutrients. This also includes people who are overweight or obese," warned FAO director general José Graziano da Silva at the Accelerating the End of Hunger and Malnutrition Conference, held in Bangkok in November 2018.

Millions more to feed

FAO has drawn up a list of factors impacting the future of agriculture and agri-food systems, including: population growth, urbanisation, climate change, technological progress, food trends, wealth sharing, the state of natural resources, conflicts and peace,

etc. In this changing environment, how can global agri-food systems be transformed, and how can ACP farmers be guaranteed benefits from the changes? It is unclear how these factors will unfold, yet certain trends are emerging: farmers will have to produce more with fewer available resources, while preserving the environment, in order to meet the needs of a world population that is expected to grow to 10 billion people by 2050.

The World Resources Institute (WRI) considers that, relative to 2010, three gaps will have to be bridged in order to feed the world population in a sustainable way by 2050: it will be necessary to produce 56% more crop calories, expand the agricultural land area by an additional 593 million ha (nearly twice the size of India), while mitigating greenhouse gas emissions by 11 Gt to keep global warming below 2°C. WRI warns that this will be impossible without acting collectively with the world's 700 million smallholder farmers to sustainably transform agri-food systems and value chains.

According to the latest UN report, *The State of Food Security and Nutrition in the World*, 821 million people are currently



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As the world's leading employer, agriculture is key to achieving the Sustainable Development Goals

undernourished, and this situation has not improved in the last 10 years. FAO estimates that, if nothing changes, 653 million people will still be malnourished by 2030, despite the fact that governments have committed themselves to ending hunger in the world by that date. The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) sums up the situation by stating that global agri-food systems will have to be transformed within the next decade if we are to be on track in achieving the SDGs.

A more holistic approach

Tremendous progress is required, but the task is not impossible. The international community has made a remarkable first step by placing agriculture at the nexus of the SDGs, thus shifting the sector's approach. "There is a trend towards a holistic agri-food systems approach, encompassing agriculture as the centre of multiple development outcomes, interlinked with major issues such as poverty, climate change, and health," explains Shenggen Fan, director general of the International Food Policy Research Institute (IFPRI). "While

The data challenge

How can appropriate policies be formulated to achieve the SDGs without reliable updated data? At a time when digital technologies are being widely adopted, including in the agricultural sector, "There are huge and growing inequalities in access to data and information and in the ability to use it," notes the Secretary-General's Independent Expert Advisory Group on Data Revolution for Sustainable Development.

The group's 2014 report, *A World That Counts*, highlighted two major challenges: invisibility (things that we don't know because of a lack of data) and inequality (gaps between those with and those without information). Many initiatives are being undertaken to meet these challenges, such as the Global Open Data for Agriculture and Nutrition (GODAN) initiative. GODAN proposes to set up a portal accessible by governments, the UN, civil society and the private sector to promote accountability and transparency on achievements and progress towards realising the SDGs (see Spore interview, *Data on all levels is very valuable to the value chain*: <https://tinyurl.com/y2uge4t2>).

Experts at the organisation note that, "Currently, the considerable lack of open data on agriculture, food security and nutrition inputs and outcomes will not allow the global community to assess whether SDG2 will be met in 2030." To address this, GODAN's recent report, *A Collaborative Process towards a SDG2 Accountability Framework*, points out that, "Increasing mutual accountability will be a prerequisite for achieving the SDGs."

policies and programmes previously have focused mainly on addressing rapid urbanisation and urban areas, they are now shifting to revitalise rural areas at the same time."

The new inclusive approach aims mainly to offset the burden that

urbanisation and the growth of the middle-class are placing on agri-food systems. It will also stimulate domestic demand and reduce dependence on exports to other countries, claims the IFPRI representative. In Kenya, for example, Bio Food Products Ltd.,

supported by USAID, has helped farmers access funding, equipment and training to enable them to produce quality milk. The result is that farmers now have much better incomes, while city residents have access to quality dairy products and the company is turning a profit (see *Agri-investment: Increased demand for Kenyan dairy products* on page 33).

Proposals for action to achieve the necessary agricultural transition are not lacking. FAO has, for instance, put forward a list of 20 integrated and inter-dependent actions aimed at linking the many facets of agriculture and rural development to a country's overall development agenda, thus laying the foundations for resilient and sustainable societies. The actions include facilitating farmer access to finance and markets, combating climate change and reforming the institutional framework.

In a recent *Info Note*, CCAFS proposes a six-part action plan to transform food systems under climate change to accelerate progress towards achieving the SDGs. These steps include: strengthening farmer and consumer organisations, which must play a central role in agricultural transformation; propelling food systems into the digital age; changing the scale of climate-resilient practices and technologies; promoting innovative financing to leverage public and private investment; reshaping value chains, food distribution and procurement; and supporting gender equality, capacities and policies.

Meanwhile, IFPRI ranks 'accelerators' of change to end hunger and malnutrition into three categories: national strategies; policies, programmes and institutions; and technologies. Practically, this translates into market-oriented reforms and public investment; engineering social protection programmes to help markets deliver better nutrition for farmers and consumers; and the increased uptake of ICTs within value chains.

Innovation the silver bullet?

All of these proposals focus on the need to define new business and agricultural models – innovation is the watchword. Tanzanian farmers, for example, have decided to find new uses for *Allanblackia* trees, which grow in the African tropics, by using the seed oil to produce skin creams and lotions.

Financing options for agricultural transformation'

Transforming global agri-food systems is an expensive task – so who will pay for it? At COP24 in Poland in December 2018, World Bank's Martien van Nieuwkoop said that "Governments across the world currently give half a trillion dollars in direct and indirect agricultural subsidies each year, but those do not necessarily generate the best environmental outcomes". He claimed that redirecting public funds towards climate-smart agriculture, would be more efficient. Other experts at the forum called for a combination of public and private funding sources to address the issue of declining development aid.

Private sector involvement in transforming agriculture is not yet widespread. The *SDG Reporting Challenge 2018* report estimates that only 27% of the 700 companies surveyed have taken account of the SDGs within their business strategies. To address this lack of investment, the World Bank has launched the Sustainable Development Goals Partnership Fund, which aims to raise several billion dollars through partnerships with the private sector.

The high demand for such products in developed countries has prompted farmers to seize this market opportunity, thus enabling them to increase their incomes, while learning to preserve the environment by ensuring their main resource (trees) are growing and producing well.

Fan points out that, "Adopting climate-smart, multiple-win strategies can help smallholder farmers strengthen climate resilience and enhance productivity in an environmentally-sustainable manner. In particular, innovative agricultural technologies that are yield-enhancing can have multiple wins." Working along these lines, CTA focuses its actions on providing farmers with access to climate-smart services and technologies – such as indexed weather insurance and drought-resistant seeds – and on promoting policies to combat climate change.

“Global agri-food systems will have to be transformed within the next decade if we are to be on track to achieve the SDGs”

Like most experts, Fan stresses the importance of innovative agricultural technologies. Among these innovations, digital technologies are booming and have shown their usefulness in providing financing services (especially for

women), access to weather information, agricultural advice and inputs, and in promoting precision agriculture. "We have direct experience of mobile technologies assisting farmers in Uganda and Kenya to access markets in a fair and transparent manner, which would have been impossible without the use of technology," says Ray Jordan, Group CEO of Self Help Africa and Farming First spokesperson. He mentions a social enterprise that links farmers to markets: "TruTrade is a trading platform which gives farmers visibility of all the costs associated with getting their product to market," while going on to say, "It also gives farmers the confidence that they will be treated fairly [by retailers] in the transaction so that they will plant again next year."

The need for adequate policies

For technologies to be able to fully play their disruptive or transformative role in agricultural development, two further elements are needed: an appropriate policy framework and sufficient public and private investment. In the above-mentioned CCAFS report, the organisation offers the following analysis regarding policy: "For a true transformation in food systems – one that enables food and nutrition security for all, today and tomorrow – policy has to create incentives, foster a level playing field, ensure support for those left behind, and catalyse investment and action in food systems that meet the SDGs and the goals of the Paris Agreement."

Ethiopia has been pursuing a proactive policy in this area for two decades. The SDGs are an integral part of the country's National Growth and Transformation Plan, which outlines the objectives sector by sector. As such, the governmental Agricultural Transformation Agency oversees 25 national 'production and productivity' and 'agribusiness and markets' projects. They include the development and distribution of improved seeds, soil quality mapping, the formation of farmers' cooperatives, market access assistance and the development of rural agricultural services. According to the UNDP, Ethiopian agricultural production has been growing rapidly for more than a decade, farmers have received training and more inputs, while food security is improving despite the recurring droughts.

Private sector response

Funding is another important factor for agricultural transformation. FAO's

Global agri-food systems need to be transformed to feed around 10 billion people by 2050

Graziano da Silva noted at the Bangkok conference that some €232 billion per year will be needed to eradicate hunger and poverty in the world by 2030. The private sector is called upon to help as the public sector withdraws: agricultural aid in developing countries reached €11 billion in 2016, representing 6% of donor funding, compared to 20% in the 1980s.

Beyond the financial issue, partnerships with the private sector – entrepreneurs, farmers' organisations, cooperatives, SMEs and multinationals – can enhance development through inputs of expertise, technologies and knowledge transfer, while also spurring innovation, job creation and diversified sources of income. "Companies must play a role," claims Paolo Barilla, vice chairman at the Barilla Center for Food and Nutrition. "Barilla has begun to implement sustainable farming by teaming up with farmers on our most relevant raw material: durum wheat needed to make pasta. Together, we combine the wisdom of our ancestors' crop rotation with modern tools, such as advanced

meteorological forecasting technology. Farmers decrease their use of fertilisers and their land remains fertile. It is a win-win-win situation," he explains.

New food diets

Dietary changes are also necessary for agricultural transformation. FAO estimates that, "roughly one-third of the food produced in the world for human consumption every year – approximately 1.3 billion t – gets lost or wasted." Meanwhile, in January 2019, The Lancet published a study by a committee of experts which proposes a 'great food transformation'. While estimating that the daily *per capita* dietary intake is 2,500 calories – less than the current average of 3,700 calories in rich countries, but more than that of developing countries at 2,200 calories – the experts recommend doubling global fruit, vegetable, nut and legume consumption, and reducing red meat and sugar consumption by over 50%. Adjusting diets as suggested in the study would generate a range of development opportunities for small-scale farmers around the world. ■



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DRIED FRUITS

Tapping into the snack market in Lagos

To address unhealthy snacking in Nigeria, award-winning entrepreneur, Affiong Williams, is providing a healthy alternative with a range of nutritious dried fruit products.

Sophie Reeve and Oluwinka Alawode

Affiong Williams started her fruit processing company, ReelFruit, in February 2012 in a small apartment in Surulere, Lagos. She established the business using around €7,000 of her own personal savings, as well as investments from friends and family. Williams came up with the idea of producing dried fruit snacks – a first-of-its-kind in Nigeria – in 2012, and ReelFruit launched its range of dried mango and pineapple in March, 2013. Today, the company's products are distributed across Nigeria and exported to Central African countries, as well as to France, Switzerland and the UK.

Initially stocked by just one supermarket chain in Lekki, Lagos, ReelFruit's range of six unique snack products are now retailed in over 250 stores in Nigeria, as well as being supplied to local and international airlines, schools, hotels and

restaurants. The products include 40 g, 50 g and 1 kg packets of dried banana, cashew, coconut, mango, and pineapple, as well as fruit and nut mixes, targeting health-conscious consumers. In 2018, ReelFruit also launched 'Frootie Tooties', a 100% mango roll snack for children. The company sales have increased from over 500,000 packs of snacks in 2016 to over 700,000 in 2017.

Williams was inspired to set up her company believing job creation is the most effective tool to develop Nigeria, and aims to provide over 1,000 jobs within the next decade. "Job creation was my number one criterion when deciding which industry I wanted to enter, so I really wanted to build a business in an industry that had great potential for this. I picked agriculture and agribusiness," she says. Through ReelFruit, Williams also hopes to promote more export-based business in Nigeria, "I want to be an example. We don't have many companies exporting finished products out of Nigeria, so I want

to show that it can be done. We now list our products on Amazon.com, which demonstrates that a new business model can be forged for Nigeria."



€223

increase in annual income for ReelFruit's women farmers

Williams manages a team of 42 employees at the ReelFruit headquarters in Lagos, and for her mango products, she works with a team of 45 women who grow high quality, export-grade mangoes in Kaduna, northeast Nigeria. By working with the company, the women farmers have increased their annual incomes by €223. The women have also been provided with seed capital to grow shorter-term crops that could increase their incomes. ReelFruit sources its other raw materials from a complex regional and international supply chain network that includes Burkina Faso, The Gambia and Ghana.

Apart from being named in the Forbes Africa 2016 list of 30 under 30 African Entrepreneurs, Williams was placed first out of 700 applicants for the Women in Business Challenge organised by BiD Network in the Netherlands in 2013, and won €5,000 to expand her business. Three months later, she won the Creative Focus Africa's SME competition for businesses in Lagos. ReelFruit was also selected as one of the 10 finalists out of over 700 applicants for the first Islamic Development Bank business plan competition in December 2014. ■

ReelFruit in Nigeria processes and distributes on-the-go packets of healthy, dried fruit and nut snacks



© REELFRUIT

SPECIALISING IN SPICE

The sweet smell of success in Madagascar

Mihanta Malala Randriantsoa is the owner of a spice and essential oil export business, and a firm believer in upskilling her staff. The strategy has paid off.

Mamy Andriatiana

In 2004, Mihanta Malala Randriantsoa co-founded Jacarandas, a Madagascan company that exports spices and essential oils. Its biggest-selling products are cinnamon, Madagascan wild pepper, pink peppercorns, cloves, geranium leaves, ginger and turmeric. Randriantsoa, now managing director of the company, set out with a clear strategy in mind: to focus on quality and to empower women. “Competition is fierce and winning customers’ trust isn’t easy. You have to stand out from the crowd,” she says. Today, the company exports 700 t of products – 600 t of spices and 100 t of essential oils – and has an annual turnover of €2.5 million.

Randriantsoa’s recipe for success is to employ a highly skilled workforce. Her 250 staff – 230 of whom are women – complete around 30 training courses every year. The company also delivers training to the 3,500 producers from whom it sources its ingredients. The idea behind this strategy is to compensate for low levels of educational attainment among the company’s workforce – 80% barely finished primary school. A quality expert at Jacarandas teaches staff how to count, add, work out averages and yields, and use calculators. They also receive training on hygiene standards, as well as best practices for collecting, sorting, drying and packaging produce. “Employees need to be able, for instance, to calculate how long and how many workers it takes to produce a given quantity of product,” explains Randriantsoa.

The company also employs four agronomists who train farmers on how to increase their output, covering topics



Jacarandas aims for excellence in the quality of its products by providing ongoing capacity building for staff and suppliers

© JACARANDAS

such as how much seed and fertiliser to use, and what yield they can achieve from their land area. Every product undergoes microbial analysis as per international standards and this emphasis on quality has earned Jacarandas the trust of more than 40 clients in Europe and South America, including French cosmetics giant L’Oréal and fragrance companies in Grasse, a French town widely considered the home of perfume-making.

Achieving excellence also requires investment in infrastructure. In 2015, the company built a new essential oil distillery that meets international standards. The facility has three stills and an

extractor, and operates for 1 month each quarter – enough to cater to demand. “It’s a promising development because it means we have more control over product quality,” says Randriantsoa.

In 2017, the business owner won the under-40 entrepreneur National Industrial Development Bank award. The panel said Jacarandas’s growth over the past 13 years “mirrored its young director’s dynamism, ambition and pioneering spirit”. Randriantsoa is now working on other projects that tie in with her business. She has opened a new botanical garden for tourists and plans to set up her own spice plantation. ■

PRECISION AGRICULTURE

Nigerian smallholders farm smart with soil data

Advanced sensory technology is connection Nigerian smallholders with information about their soil health, taking the guesswork out of farming.

Oluyinka Alawode and Sophie Reeve

Farmers in Nigeria are accessing soil data in real-time to better manage their crop growth and access financing that was previously out of reach. Zenvus, a precision farming company, has created electronic sensors with in-built GPS, which are placed in the soil to measure pH, nutrient content, moisture level and temperature. The data collected from different farms is aggregated and analysed according to location, and the appropriate advice is then provided to farmers via a 'SmartFarm' web and mobile app. Using this data, farmers are able, for instance, to apply the correct fertiliser and optimally irrigate their farms, leading to enhanced farm operations, reduced input waste, and improved productivity.

Farmers can also collect on-farm images of their crops using the Zenvus 'Yield' – a hyper-spectral imaging camera that monitors farm vegetation to detect potential problems, including crop disease, pests, and drought. Smallholders take photos of their crops and send them through the SmartFarm app to receive advice. "Our business is designed to remove guesswork as a farming strategy by enabling data-driven farming systems and processes across a nexus of modern agriculture, including credit, irrigation, planting and harvesting," says Professor Ndubuisi Ekekwé, founder of Zenvus.

Financial service providers can also access the farm data collected – if previously agreed with the farmers – to help with decisions regarding the provision of insurance, loans and/or investment. Using the GPS software within the sensors, the technology also gathers data regarding farm boundaries and land area. Investors can review this data – along with information on the type of crop grown – to work out potential yields and profits when considering investment. Zenvus independently analyses and verifies the data collected, and lenders pay a subscription fee to view the information through a separate platform called 'ZCapital'.

500,000
farming entities
across Nigeria
have adopted
SmartFarm's
technology



© ZENVUS

The use of digital soil sensors in Nigeria is facilitating precision agriculture and increased productivity among smallholders

Another Zenvus service, 'ZInsure', enables farmers to apply for insurance by uploading data about their farm, which is also independently verified by the company. Not only do insurers benefit from access to standardised, verifiable information, but farmers are also able to access customised insurance, which helps reduce premiums. "Zenvus has used technology to remove information asymmetry, making it possible for farmers to share data with lenders and insurers, creating a specialist system, which has improved their capacities to access credit. Enabling lenders to know what they are funding gives them higher confidence to provide credit," explains Ekekwé.

The SmartFarm technology, which costs €175 to €525 depending on the size and scope of the sensors, as well as the data transmission source (cellular, WiFi or satellite), also provides services for different subscribers. Fertiliser manufacturers, for instance, can use the data collected to determine what fertilisers to produce to meet the soil nutrient requirements of farmers in specific regions. The data can also be used by government or development organisations looking to keep track of farms they have supported in a particular location.

Following its launch in 2014, SmartFarm was first deployed in the eastern part of Nigeria. The technology has since been scaled out to 500,000 farming entities and is used nationwide in Nigeria, as well as in Botswana, Ghana and Rwanda. "I was initially sceptical [of the Zenvus sensor], but later decided to try it. I got a huge crop yield and harvested so much. The good thing is that the device is so easy to use," says Cyracus Obiah, a farmer from Imo state in Nigeria. ■

CREDIT PROFILING

Mobile app automates agricultural contracting

A credit rating app is enabling Zimbabwean small-scale farmers to build up credit profiles, helping them to compete in the market for finance.

Tonderayi Mukeredzi

In Zimbabwe, over 3,000 small-scale farmers are benefitting from a 'grower management' system, which is improving their access to agricultural inputs and finance. Developed in 2015, Agro Axess is a mobile app that stores the farm information of smallholders looking to work with potential contractors. The data, such as farm size, the type of produce grown and yield levels, is added to the app by field workers associated with agricultural contracting companies. Integrated into the app is a credit rating system, which records information regarding a farmer's access to inputs and/or credit from the contractors, and their subsequent harvest repayments. This information is compiled over time to create credit profiles, which can then be used by financial service providers and other contractors to track a farmer's activities and their creditworthiness.

The app is the invention of Zimbabwe's largest agricultural risk management company, Expert Decision Systems (XDS). "We have contractors in the country who lent to small-scale farmers in the form of cash and inputs. However, there was no proper system that was used to track farmers, looking at how productive they are and how well they repay their loans. We decided to get into that space because we were interested in credit data," says Oleen Maponga, an XDS director.

The technology can warn contractors of any 'double-dipping' activities – when a farmer gets inputs from two separate contractors for the same piece of land – or side-marketing activities. The application does this by flagging or blacklisting a farmer. Once registered, the app runs a credit check on the farmers to see if they have existing debt with other contractors, retailers or financing institutions. According to Farayi Dyrakumunda, another director at XDS, there has been high demand for and use of the technology among tobacco and cotton contractors, as well as microfinance institutions.

Farmers registered with the app have improved their debt profiles, with default repayment rates declining from 17% in 2016 to 9% during the 2017–2018 farming season. This is most likely due to the application's repayment monitoring, which warns credit providers if the farmers do not fulfil their obligations. "What has changed from when we started is that farmers have more access to credit because, at XDS, we now have more information on the farmer," reiterates Maponga. ■

Pest control

Data-science anticipates risk

TO MITIGATE the devastating impacts of pests, estimated to cause around 40% of crop losses worldwide, researchers in the UK have developed a service that uses satellite and earth observation data to forecast the risk of pest outbreaks. The Pest Risk Information Service (PRISE) feeds information related to temperature, weather forecasts and plant-pest lifecycles into a computer model that predicts when an outbreak is likely. Farmers using the service receive an alert to their mobile phones when there is high risk of an outbreak, enabling them to implement appropriate precautions. PRISE is currently being used in Kenya, Ghana and Zambia, where it is hoped to improve yields and increase farm incomes by up to 20%.

Managing maize

New apps to maximise yields

VITAL INFORMATION to improve the efficiency and productivity of maize farming has been made available via two mobile apps, the Maize Variety Selector (MVS) and Maize Seed Area (MSA), which were launched by the International Maize and Wheat Improvement Centre in 2018. African maize farmers often lack information about the maize varieties that can be grown in their localities, which limits their ability to maximise farm productivity and incomes. MVS therefore recommends available maize varieties to farmers in Ethiopia, Kenya, Nigeria and Tanzania, based on their preferred planting and harvest dates; whilst MSA – which is currently being piloted in Western Kenya – gives farmers field-specific planting advice, such as optimal plant spacing for their chosen variety.

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Smallholders in Zimbabwe are using a mobile app to store their farm data and credit history to better access credit and farming contracts

CLIMATE RESILIENCE

Irrigating Mozambique's vulnerable south

A climate-smart agriculture initiative is boosting the productivity and food security of Mozambique's smallholders by providing climate resilient farming infrastructure.

Samuel Price

Smallholders in Mozambique are bolstering their climate resilience with the establishment of irrigation and storage infrastructure in the country's arid south. Launched in 2013, the Baixo Limpopo Climate Resilience Pilot Project (BLCRPP) seeks to improve the productivity of the country's farmers by providing access to water year-round, while also helping them to mitigate and adapt to adverse climate change impacts.

In Gaza province, around 8,000 farmers have so far gained access to irrigation and improved drainage through BLCRPP's infrastructural development in the region. Just over 1,000 ha of land in the Magula East region of Gaza province has been equipped with irrigation pipelines, drawing water from the Limpopo River through a pumping station situated in Magula. As a result, farmers in the area have seen production levels increase by up to 75%. To ensure that the irrigation infrastructure can withstand flooding, and to prevent water seepage, the irrigation canals have been lined with flexible plastic sheets covered

by concrete. A backup generator has also been installed at nearby Umbape, allowing drainage pumps to continue operating during electricity blackouts.

Farmers are also benefitting from significant infrastructural developments beyond the farm. Following the devastating floods in 2000, when insufficient road and drainage systems saw many rural communities cut off entirely, and around 450,000 people displaced, the BLCRPP has improved the surface and drainage capacity of 45 km of road in Gaza province. The upgraded road surface gives farmers better access to larger urban markets, while also improving accessibility in the event of floods or other emergencies. Better drainage along the roads, meanwhile, helps to reduce soil erosion previously caused by surface runoff.

The project is also working to improve climate resilience at the farm-level, training farmers directly in climate-smart agricultural practices. Filomena Zandlala, a rice farmer from Chongoene district, has received training

in production best practices, such as how to maintain optimal water levels for crops year-round, and the effective use of fertilisers – as well as post-harvest practices – including cleaning, sorting and drying of produce. “This project has taught us a lot about agriculture and we are looking forward to better harvests,” she says.

By 2016, 3 years into the project's implementation, Mozambique produced around 800,000 t of vegetables – up from 550,000 t in 2012, and half of this in the country's southern regions. To help ensure that this level of production can be sustained, 5,000 local farmers have also received training in the maintenance of the irrigation infrastructure. The recent construction of a cold-storage and agri-processing facility in the capital city of Gaza province, Xa-Xai, will also help to significantly reduce post-harvest losses.

“The African Development Bank's climate-smart resilience financing is helping to lift Mozambicans out of poverty, and dramatically improve livelihoods,” explains Wael Soliman, the project's principal hydrologist. Co-funded by the Bank and the Strategic Climate Fund (SCF), the project forms part of SCF's broader aim to bring climate resilience initiatives into the policy mainstream in developing countries. By drawing on past experience – particularly the floods of 2000, which destroyed previous irrigation infrastructure – the BLCRPP aims to bolster climate resilience at every point along the agricultural value chain, and to ensure that this resilience can be sustained. ■



Improved irrigation and drainage infrastructure is helping Mozambican smallholders to become more climate-resilient

Soil carbon

Steps to mitigate climate change

EIGHT STEPS to recuperate soil carbon stocks have been published by climate change and agricultural scientists in the *Nature* journal. The amount of carbon in soil is over twice the amount stored in trees and other biomass; however, one-third of the world's soils are already degraded, which constrains agricultural production and adds high levels of CO₂ to the atmosphere. The steps are therefore intended to help mitigate against climate change and boost soil fertility, and include promoting best practices for storing carbon, such as the incorporation of cover crops and crop residues. The steps will also inform the next Koronivia Joint Work on Agriculture climate meeting, which will focus on soil carbon.

Climate

'smartness'

Rating agricultural technologies

THE CLIMATE-SMART agricultural practices and technologies of 33 countries across Africa, Asia and Latin America have been assessed in a report launched at COP24. Developed by the International Center for Tropical Agriculture and the World Bank, *Bringing the Concept of Climate-Smart Agriculture to Life* evaluates, categorises and rates some 1,700 climate-smart combinations. This informative report aims to build the resilience of the world's 500 million smallholder farmers by outlining which site-specific interventions work under different circumstances. The report finds that the 'smartest' farming techniques by region are silvopasture (the cultivation of trees and pasture), intercropping and use of biogas in Latin America, Africa and Asia, respectively.

★ For more information, see <https://tinyurl.com/y758b89h>

LAND RESTORATION

Enhancing water management in Kenya's drylands

Across sub-Saharan Africa, an integrated development programme is implementing land and water management interventions to enhance productivity and food security.

James Karuga

In the arid counties of Kitui, Machakos and Makeni in Kenya, over 30,900 smallholder farmers have adopted climate-smart farming methods to conserve water, restore degraded lands and fight food insecurity. Since 2014, a Dryland Development Programme (DryDev) has been working in the country, as well as in Burkina Faso, Ethiopia, Mali and Niger, to help farmers shift from traditional subsistence farming and reliance on emergency food aid, to sustainable rural development. The climate-smart land and water management practices introduced by the project include agroforestry, tree regeneration and the use of water harvesting ponds. Since the start of the project in Kenya, over 8,900 ha of land has been rehabilitated.

DryDev has trained farmers in how to increase tree cover through farmer-managed natural regeneration practices. Methods include pruning and thinning live indigenous tree stumps that still have some sprouts, to stimulate growth. As the indigenous trees regenerate, the land around the trees develops vegetation, and soil fertility is enhanced. Farmers are also intercropping *nitrogen-fixing* legume trees and plants like *Gliricidia sepium* and *Faidherbia albida*. The extensive root system of legume trees improves soil structure and ensures it doesn't harden in the heat, meaning rainwater is able to infiltrate the soil.

On his 0.3 ha piece of land, Urbanus Mutune from Machakos county has dug terraces to capture rain water and a large



© JAMES KARUGA

In Kenya, farmers are being trained in land restoration techniques to increase tree cover on farms

water harvesting pond with the capacity to hold around 500,000 l. Mutune uses the water harvested from his pond to irrigate his high-value tomato plants. "These days, without relying on rains, I can grow my crops according to market demand," says Mutune, who estimates that his yields have increased by over 80% since adopting the DryDev methods in 2014.

Rainwater harvesting and agroforestry practices have also changed the fortunes of Magdalene Kimeu from Machakos. Prior to the project, Kimeu was only able to grow traditional staples like maize and beans during the rainy season; now, she cultivates pawpaw fruits, collard greens, china cabbage, pepper, passion fruits and onions. The cultivation of pawpaw trees provides shade for her horticultural crops and reduces water evaporation following irrigation. "Neighbours now consult me on climate-smart farming and how they can be food secure like me," says Kimeu, who earns at least €13 per day from the sale of her horticultural produce and fruit trees. ■

WANJIRU KAMAU-RUTENBERG

Investing in women's leadership

Dr Wanjiru Kamau-Rutenberg, director of African Women in Agricultural Research and Development (AWARD), discusses the importance of building women's confidence and skills in the agricultural sector.

Susanna Cartmell-Thorp

At AWARD, you support women's inclusion in African agribusiness. Are there any standout examples that have been through the programme which you feel are helping to bridge the gender gap?

We are really proud of all of the businesses that have stepped up to incorporate a gender lens into their business growth plans through our initiative on Gender in Agribusiness Investments for Africa. Cowtribe from Ghana, for example, is working on expanding access to veterinary services to rural areas. After participating in the AWARD AgTech Innovation Challenge, they started thinking about the importance of working with smaller mammals and chickens, understanding that more women work with and invest in smaller animals. Cowtribe then identified the provision of veterinary services for those animals as a gender-responsive way to grow their business.

Fresh Direct, a Nigerian business that grows vegetables in urban spaces, has won a tremendous amount of global recognition recently. Recognising that gaining access to land is often a major challenge for women, it has been fascinating to see how the company has addressed the issue by encouraging women to grow food in shipping containers.

CTA's Pitch AgriHack competition is another initiative that provides young entrepreneurs, such as Cowtribe, with business mentoring and financial support. What role can this kind of support play in bringing more women into Africa's agriculture sector?

Pitch AgriHack is a critically important part of Africa's agripreneurship ecosystem. In addition, we need to work hard to ensure that women not only enter into agribusinesses, but that they have what it takes to remain in the ecosystem and continue developing there. We may have women entering the sector and launching their own businesses, but there is still more work to be done to build a healthier ecosystem where women can receive the support they need to grow their businesses.

My sense is that women have the ambition, the energy and the will to get their businesses up and running – but further down the road, our support systems are not conducive to sustainability. By support, I mean guidance from those with experience in a particular field, and this is crucial to the development of a sustainable business model. But support also comes in the form of access to capital, which is an equally important aspect that needs to be tackled.

You have just celebrated 10 years since AWARD was first established; what progress do you feel has been made over the last decade?

We are most proud of the fact that the AWARD Fellowships are bending the careers of African women scientists in an upward trajectory. By the end of 2019 over 1,300 scientists from 40 countries will have directly benefited from the AWARD Fellowships (as fellows, mentors and fellow mentees). Among the proven benefits of the AWARD Fellowship, especially for the women scientists in whom we invest, are increased inner strength, confidence, motivation, self-knowledge and career vision. Fellows have also confirmed significant improvements in their leadership and science research skills, as well as increased professional recognition and visibility.

Beyond the Fellowships, an additional 1,500 scientists and research leaders have benefited from AWARD's partnerships with 46 research institutions from around the world, who have invested their own resources to pay for their staff to participate in AWARD training events.

AWARD has helped to bring gender and agricultural research to the forefront of discussions with influential actors – from the African Union, to the Forum for Agricultural Research in Africa (FARA), and the Regional Universities Forum



After 10 years of AWARD, Dr Wanjiru Kamau-Rutenberg explains what more needs to be done to support women in the agricultural research and agribusiness sectors

for Capacity Building in Agriculture (RUFORUM). We have worked with these African institutions to strengthen their commitment to gender responsiveness in agricultural research. As a result of AWARD's work, organisations that work to fund agricultural research – from private philanthropic organisations, to bilateral donor agencies – have also heightened their awareness of the importance of funding gender-sensitive agricultural research on the continent.

A number of organisations are now focusing on empowering women in African agricultural research. What more needs to be done in this area?

I think we need to move beyond a recognition of the challenges facing women's underrepresentation in research, and into real action on the ground and in our institutions. AWARD cannot singlehandedly push this agenda and it is important that all the different stakeholders in the sector take their own actions and their own commitments, in terms of better integrating gender responsiveness into their own work.

It is also important for all actors in this space to work together. For example, one of the projects that my team and I are working on is the Global Forum for Women in Scientific Research (GoFoWiSeR), which seeks to leverage the last 10 years of AWARD's experience and expertise to catalyse and convene a broader conversation about improving the numbers and experiences of women in the research sector. Through this project, we aim to take the lessons we have learned about women working in agricultural research, and scale this out to different areas of scientific research. GoFoWiSeR is a good example of how we are trying to move the conversation around women's participation, from localised spaces, to a more global platform.

Do you feel that men have a role to play in promoting women's leadership, or does this need to come from women having a stronger voice?

It is really not an either/or question. When you look across the sector right now, men are over-represented in

leadership and decision-making positions, so there is no way to advance women's representation in agricultural research without engaging men to become active participants in driving that shift towards balance. Men absolutely have a huge role to play; but of course, the other side of the coin involves women having the confidence and skills to step into positions of leadership. This building of women's skills and confidence remains at the heart of the AWARD Fellowships.

At AWARD, we have been working very closely with Dr Mandefro Nigussie, who is the director general of the Ethiopian Institute of Agricultural Research (EIAR) – and who, for me, has emerged as a clear male champion in promoting women's leadership at EIAR. Dr Mandefro has supported AWARD's Gender Responsive Agricultural Research and Development initiative, which helps agricultural research institutions to better incorporate gender into how they work. I also want to commend the leadership of organisations like RUFORUM and FARA, who have partnered effectively with AWARD to develop our work in gender inclusivity.

What are the key lessons you've learned over the last 10 years that you would like to build on going forward?

I think probably the first and most important lesson is that investing in the development of leadership skills for women scientists is absolutely necessary – but this is not sufficient to drive the kind of systemic transformation that is needed to achieve a balance in gender representation in agricultural research. Going forward, we need to support institutions to become the kinds of places where men and women not only survive, but are able to innovate and thrive. ■

✦ ***For more information about AWARD, and their work to address the gender gap in African agriculture, visit <https://tinyurl.com/y2puqjrx>***

Faith Milkah Muniale

Making agriculture “gender responsive”

Faith Milkah Muniale discusses her involvement in the African Women in Agricultural Research and Development (AWARD) Fellowship, and her work with indigenous Kenyan communities.

Pius Sawa

As a 2013 AWARD Fellow you were mentored by Dr Mary Gikungu, a senior researcher at the National Museums of Kenya. What did you gain from this mentorship?

The mentorship helped me to draw up feasible goals, and follow through to achieve them. The AWARD training introduced me to the ‘purpose road map’, which, working with my mentor during the workshop, helped me to break down those goals into doable steps – and 3 years later, I’m still on track! I am so glad to have had the privilege to participate in this fellowship, and Dr Gikungu has continued to play the role of an advisor whenever I need to consult with her. I will be graduating with a PhD at the end of this year, which was one of the original goals that I wrote down in the first AWARD mentorship training workshop – the research I am undertaking in the programme was inspired by my experience during the AWARD Fellowship.

You are currently working with the Ogiek indigenous community. Why is indigenous knowledge important for building climate resilience?

I have been working with the Ogiek people, Kenya’s last forest-dwelling indigenous community, who possess a wealth of indigenous knowledge. This knowledge is extremely important in building climate resilience because it is holistic in its approach. Indigenous knowledge does not operate in silos, and therefore takes a kind of ecosystem approach: it touches on people, plants, animals and their interactions.

The approach to problem solving is localised and based on what has worked in the past.

How has your involvement in the AWARD Fellowship shaped the work that you do to help rural communities?

Rural communities are often marginalised communities. For the Ogiek people, this is most likely due to their lifestyle choice of not pursuing formal education. To empower such communities and improve their livelihoods, I have to be conscious of the marginalising factors affecting them.

Through the AWARD Fellowship, I have developed a deeper understanding of the concept of ‘gender responsiveness’, which has been very useful in my work with rural communities. Now, I ensure that every intervention I undertake is gender responsive. If I am promoting a project to empower the community, for instance, I ensure women are involved in training as well as the men – who naturally attend such meetings.

Have you had the opportunity to pass on the skills you acquired to other young women in the sector?

Yes, gladly so. A role-model event at my former high school, which I organised as part of the AWARD Fellowship, was the beginning of a mentoring programme that I and a few former schoolmates now run. We hold annual events in the school to talk to the girls on various topics that can help to improve their academic and social lives, and their career paths. It has been very fulfilling. I mentored two colleagues using the

Faith Milkah Muniale, discusses her work with indigenous communities, and women’s role in agricultural research



© FAITH MILKAH MUNIALE

AWARD mentorship guidelines, and now I proudly see them walking the ‘purpose road maps’ they drew up for themselves.

Why is it important that more women are supported in agricultural research? What more needs to be done to ensure this happens?

In the communities that I have been working with, women are the major drivers of agriculture. They are the ones interacting with the farms, feeding the family and nation at large, and bearing the burden for food production. Unfortunately, women mostly operate at the farm level and are not in a position to make decisions. Women should be given the tools to access more information, empowering them to make informed decisions as they drive agriculture in sub-Saharan Africa.

We need to encourage girls to choose agriculture-based careers while at school, and to draw young women into the agricultural sciences through long-term mentorship initiatives. Agricultural research centres could also offer training positions to young women graduates, such as internship programmes to help them build experience and boost their career aspirations. ■

SPORE

Dossier

**DIGITALISING
AGRICULTURE:
BRIDGING THE
GENDER GAP**

Access to digital innovations – from SMS advice services to digital networks that connect women in agribusiness – is enabling women to participate in formal agricultural value chains and improve their livelihoods.

GENDER EQUALITY

Ag-tech's potential to boost women's empowerment

Digital technologies are revolutionising agricultural value chains, providing improved access to inputs, finance, markets and weather information. With the right policies and programmes in place, agricultural digitalisation has the potential to facilitate women's economic empowerment.

Tiana Cline

In Africa, women comprise close to 50% of the agricultural labour force and this figure is set to rise as men seek more industrial employment in urban areas, leaving female farmers with a myriad of hurdles to overcome. "In most instances these women lack operational capital, have limited access to credit and insurance, and land ownership remains low," explains Isabel Papadakis, head of IVE (Industries Value Engineering) at SAP Africa. "Most of these women have no benefit of formal schooling or agribusiness training. With no knowledge of how to improve yields or increase the quality of the end-product, they mainly depend on manual labour and intermediaries."

Women are often the primary care-givers and sole income earners in their families, and struggle to build a thriving agriculture business. While a new generation of tech-savvy female

farmers are finding innovative ways to break into the industry, many more are being left behind. "Providing women equal access to services and assets and enhancing their agency and opportunities in the agricultural sector, could increase agricultural production in developing countries by about 2.5-4%, and potentially reduce the number of hungry people by 12-17%," elaborates Patricia Van De Velde, gender focal point for the Food and Agriculture Global Practice at the World Bank.

The ag-tech revolution

There's no question that technology is revolutionising farming. Agriculture is now an infinitely smarter ecosystem where sensors, robotics, 3D printing, cloud-based computing and artificial intelligence are becoming normalised. Drones and connected machines are becoming more affordable, giving rise to

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Digital technologies offer long-term value for women in agricultural value chains

smart devices for farming suppliers and service providers, allowing the exchange of huge amounts of data. Farming is also becoming more precise. And, while there are some aspects that digitalisation cannot change – bad weather conditions, crop and animal diseases, and commodity market fluctuations – big data and predictive analytics enable real-time simulations, which can inform risk mitigation strategies to manage these conditions.

But technological development does not exist in isolation. And, within rural communities, digitalisation is not necessarily advancing agribusiness at the pace it should. If anything, it is still in its infancy. Emerging nations often have the minimum scientific capacity to implement digital solutions that could solve everyday agribusiness problems.

“It would be a half-baked truth to say that technology has been rolled out fully across Africa, specifically in the agriculture sector. A lot of the technology is still not understood and has hit some cultural barriers with women,” explains Fatima Alimohamed, CEO of African Brand Warrior, a Kenyan-based marketing company well known for their rebranding work across Africa. “That said, wherever technology has been introduced or involved there has been significant improvements, with women not only having access to information at their fingertips, but also enabling them to be a part of the [agricultural] value chain, right down to payments linked to farm produce,” she says.

Back to butter

Technology has the transformative power to change lives. Through digitalisation, women have shown that when they have access to technology they become not only users, but advocates and promoters of other women (see *Spore’s* field report: *Lawyers go digital to reach women farmers*). There are many success stories where technology has been introduced in agribusiness, which show that women’s lives are improved and their roles in agribusiness become more sustainable through the use of technology. No one can tell you this more

than the shea nut farmers in Northern Ghana.

Shea butter is a highly sought-after product in Ghana. Many women are dependent on the picking and processing of shea nuts to make a living. It is a manual, labour-intensive process. The nuts are gathered on a weekly basis before they begin to ferment, then par-boiled, dried and cracked. Shells are meticulously removed by hand, the kernels sorted, cooked and then finally ground up, either by hand or at a mill. Only when the ground kernels are mixed with water and boiled again, does the final product – the butter – come to life.

But the shea nut value chain is broken: the Ghanaian women who are engaged in informal shea processing often receive the lowest return in the value chain thanks to multiple intermediaries who significantly increase final costs. But, by using technology, their lives have been transformed. This was evidenced in a proof-of-concept initiative between SAP and a Ghanaian-based NGO, with the aim to review the shea nut value chain. “Digital technology has helped to break down barriers in agriculture by providing access to market prices, which reduced dependency on middle-men. The women’s profits increased by 82% due to access to a new international buyers’ market, and they are now able to secure buyers in advance,” explains Papadakis.

Women shea nut farmers are now connected to the formal economy through the Shea Network Ghana (SNG), which provides access to instant market prices and allows women to sell their products using their mobile devices. The network also provides consumers with information about where the products have come from. “[SNG] are streamlining the food supply chain and sharing information that end-consumers are concerned with, such as the origin of the food and the production process involved,” says Papadakis.

Megan Angus, owner of Woodview Wagyu, sells certified Angus and Wagyu beef throughout South Africa, as well as to international markets. She too is seeing how transparency and provenance are becoming imperative and, as

› a result, has placed QR codes on all retail packaging. “Specifically in the cattle and beef industry, digitalisation has enabled full traceability. Customers now have the power to gain more information about the beef by the click of a button,” says Angus. Women livestock farmers in Ghana are also benefitting from digitalisation with CowTribe’s vaccine delivery app (see *Spore’s* field report: *Livestock vaccines: Digital delivery service*)

Mind the gap

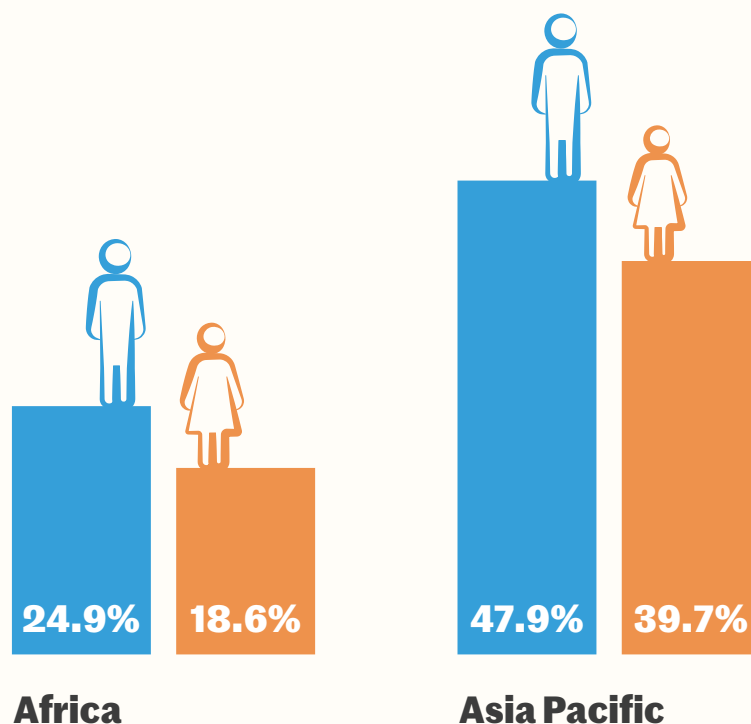
Agriculture’s digitalisation has allowed many female ‘agripreneurs’ throughout Africa to leverage technology-based solutions, yet infrastructure and the accessibility of technology remain the biggest challenges and continue to widen the gender gap. The first step in removing barriers to gender equality in agriculture is education. According to a global study to highlight the importance of women in agriculture and to gain insight into where female farmers sit within the agricultural value chain, those surveyed said that they need more training. Corteva Agriscience found that training is essential to taking advantage of agricultural technology. Internet of Things devices, access to market information, and digital payment and billing services, are all key aspects of ag-tech that will differentiate and digitise the smallholder farmer’s experience.

“Providing women equal access to services and assets in the agricultural sector could reduce the number of hungry people by 12-17%”

“More than 500 million smallholder farmers provide over 70% of the world’s food, yet they are often unconnected to the internet and have limited ways to find new sources of timely information,” explains Claire Benard, a Wefarm data scientist. Wefarm’s technology enables farmers to text each other farming questions for free. The technology behind Wefarm’s platform works on the most

Closing the gender gap in internet usage

The percentage of men and women using the internet in 2017



SOURCE: STATISTA AND UN WOMEN

basic mobile phone and in English, as well as local African languages (Luganda, Runyakitara and Swahili), providing access to agricultural advice for smallholder farmers who need their services the most. “Wefarm’s service is fundamentally inclusive. Anyone can join and learn from the other 1.3 million users on the network. We also use human-centred design principles to improve our product and ensure women are well represented in our user personas,” adds Benard.

Wefarm operates in Kenya and Uganda where, as elsewhere in Africa, women are a crucial part of the agricultural workforce. Many women here are shouldering responsibilities both at home and in the field that enable the operation of small farms. “Our hope is that Wefarm becomes a trusted tool for women, to make their lives easier, and to open possibilities that

would not have existed otherwise,” adds Benard. “The solution for empowering women entrepreneurs is a culture shift, most likely driven by education.”

Lowering the barriers to entry

The barriers that women in agribusiness face can be significantly reduced by technology, especially if deployed in a sustainable manner and in collaboration with like-minded stakeholders. As with Wefarm, digitalisation helps to connect women with advisory services, potentially removing middle-men or reducing labour burdens, providing market or legal information, and enabling financial transactions. However, without the right policy frameworks, technological investments in agriculture can not only bypass women, they may also further marginalise them.



The Americas

“We need to make sure we build ecosystems that take into account the specific constraints that women farmers face,” says Van De Velde. “Interventions should always look for the reasons or causes behind women’s impediments in the agriculture sector.” Like Van De Velde, Papadakis believes that tech companies need to enable women farmers to access training on new technologies and best practices. At the same time, policymakers could introduce measures to support women with all the additional domestic responsibilities that make it difficult for them to focus on sustainable, efficient, and profitable farming businesses. Equal Measures 2030, for example, is an international network which works closely with UN Women and other UN agencies, using data to change gender policies. They provide the data and evidence

needed to advocate for gender equality across every sector. With partners in both Senegal (FAWE) and Kenya (Groots), they believe that even though the gender policy landscape is complex, available and accessible information will ‘move the needle’ for women.

The barriers that women in agribusiness face can be significantly reduced by technology

According to Papadakis, tech companies are also better-positioned to collaborate with funding agencies to introduce programmes that are

dedicated to women, leveraging technology to increase farming productivity. “The end goal is about aligning policy and leveraging technology to create business networks that meet society needs, instead of creating divides between genders and/or cultures. This will assist in introducing efficiencies and improvements that could transform subsistence farms into sustainable businesses,” explains Papadakis.

VALUE4HER

There is clearly a need to create an extensive digital database for women-owned agribusiness in Africa. And this is where CTA’s VALUE4HER programme steps in – bringing together like-minded women agripreneurs throughout Africa. VALUE4HER has built a digital platform to create region-centric

Digitalising Senegal’s fishery sector

In Senegal, where the majority of fish processors are women, an innovative mobile app is enhancing the competitive advantage of the entire fisheries sector. The ‘Wireless Solutions for Fisheries in Senegal’ (WISE) project has designed an app with multiple functions to be used by different market players in the fishery value chain. The app provides women processors with access to videos on good hygiene practices and other best practices for fish processing, to improve product quality and generate better prices. Among the women beneficiaries is Anta Diouf, a fish processor in Mballing, in Senegal’s Thiès region, and one of the 5,000 people who use the app. “WISE helps us communicate with fishermen while they are still at sea,” she says. “Their fish prices are sent to a server that transmits them to us in real time. This enables us to negotiate in advance and, thus, be more efficient and productive.” The app also helps users to secure microcredit loans at low interest rates (3-5%), which is often a challenge for women agribusiness owners.

WISE is coordinated by the non-profit organisation FHI 360, the telecom operator Tigo, and the NGO Inter-Mondes, with the support of the Senegalese government. According to FHI 360, since the programme launch in 2014, most processors have more than doubled their income by boosting their monthly output from 100 kg to 1,000 kg of processed fish.

WISE also seeks to improve the safety of Senegalese fishermen, 90% of whom are small-scale. In recent years, many fishermen have been lost at sea without being able to report their location. Others have been killed by the coastguards of neighbouring countries because they crossed the border without authorisation. WISE has therefore developed a navigation tool that uses the GPS receiver in a smartphone to find authorised fishing grounds. “An alarm sounds on the phone if fishers get too close to the borders,” explains Berhane Gebru, WISE director at FHI 360. An SOS feature enables fishermen lost at sea to quickly send their contact details to sea rescue services. In addition, the application provides meteorological data, such as wave height, visibility, wind speed and direction at different times of the day. As a result of using the app, fishers have indicated that they have increased their catches by 50%.

Matteo Maillard

hubs. This will provide a more enabling environment for women farmers to fully, and more capably, participate in agricultural markets. From business-to-business matchmaking to a competitive innovation fund, VALUE4HER's two-year programme will also provide training around market dynamics to elevate key business skills.

"I want to be one of the first women entrepreneurs to turn around agriculture to value for money within my community, country and beyond," explains Fannie Gondwe, the executive director of Perisha Agro and Packaging Enterprise in Malawi, and part of the VALUE4HER network. In partnership with Africa Women Innovation and Entrepreneurship Forum (AWIEF) and African Women Agribusiness Network, VALUE4HER

brings women entrepreneurs in agriculture together to tap into the opportunities of sharing experiences in leadership, networking, production, processing, marketing, and business development. "We are helping these women access higher value markets, acquire the knowledge, skills and confidence to operate effectively in such markets, and access the capital that they need to grow their business," explains Sabdiyo Dido Bashuna, CTA's senior technical advisor for value chains and agribusiness.

When women are empowered through programmes like VALUE4HER, it gives them long-term value in terms of skills and networking. "It will not take long for women entrepreneurs in Africa to embrace agriculture transformation in the age of technology, so long as

there's political will in our governments, deliberate policies targeting women to advance in technology, inclusiveness, commitment from women themselves and intensifying programmes like VALUE4HER," says Gondwe.

Women like Gondwe are the future and digitalisation, through programmes like VALUE4HER, will help them to break down agriculture's gender barriers. It is something the World Bank calls breaking the 'grass ceiling'. After all, it is not only in Africa where women are the backbone of agricultural development. What VALUE4HER has established is a sustainable and beneficial network that will help to transform small farms and agribusinesses into commercially-viable entities (see *Spore's* interview with Irene Ochem, CEO of AWIEF). ■

Closing the gender gap in mobile usage

Apart from cost, poor digital literacy is one of the key barriers to women's use of mobile phones



Women are

10%

less likely than men to own a mobile phone in low- and middle-income countries



184 million

fewer women own a mobile than men in low- and middle-income countries



Women are

26%

less likely than men to use mobile internet in low- and middle-income countries



€13 billion

could be earned from closing the gender gap in mobile ownership and mobile internet use

SOURCE: GSMA

INTERVIEW

Irene Ochem: Using technology to bridge the gender gaps in agribusiness

Stephanie Lynch

Irene Ochem emphasises that with better access to digital technologies women are able to generate greater profits from agribusiness.

AWIEF focuses on building the business capacities of women entrepreneurs in Africa; what are the key skills that help women business leaders to succeed?

Part of what we do at AWIEF is provide skills, training and capacity building to women entrepreneurs. In doing so, we have found that to be a successful business leader, you need to have the right mind-set. It is important to be open to change and learning, persistent with your goals, as well as resilient. Business is very challenging, especially as a young start-up. A lot of women business owners lack self-confidence, so we also try to help women recognise their successes and achievements.

Another important skill, which is good to have from the outset, is financial literacy. Unfortunately, many young businesswomen tend to lack this. We have found that a good deal of women business owners need to know how to better manage their finances and their cash flows. These are just some of the key skills that will allow you to succeed as a business leader.

Why did you decide to partner with CTA to establish the VALUE4HER programme?

The VALUE4HER programme is about supporting women to increase their incomes from agriculture. In Africa, women produce the majority of the food that we eat through their roles as farmers, labourers and entrepreneurs. However, women's participation in agriculture and agribusiness is usually informal, unrecognised and under-resourced. They lack access to information, technology, productive resources, assets (including land), finance and networks. These are all the ingredients that you need to succeed as an agribusiness owner or leader. Our partnership with CTA to establish the VALUE4HER programme is a great opportunity for us to start to address these gaps. VALUE4HER is meant to strengthen women's participation in the sector, to promote

their efforts as agribusiness owners and leaders, and help them to create more value from the sector. So we are proud to be a partner in this great initiative.

How will the programme use digital technology to break down the barriers that women in agribusiness face?

The VALUE4HER programme is using technology to bridge knowledge and information gaps, to build networks between women in agribusiness, and to facilitate access to markets and finance. We are working now on building a digital platform – an 'eHub' – where women can access information and data, network and share experiences, and exchange information to boost their agribusinesses. The digital platform provides information about supply, finance, markets and opportunities in the agribusiness sector. So, for example, if you are looking to supply a certain product and another woman in agribusiness in Kenya knows that someone has a demand for that product, the VALUE4HER platform can help to connect you.

How can policymakers help to ensure women benefit from the opportunities offered by agricultural digitalisation?

When we talk about agricultural digitalisation and the opportunities that are there, I think the first thing that governments have to do is ensure that these opportunities are accessible to women. Women need to be educated and made aware of the opportunities that they can tap into, in terms of digitalisation, in order to build a business. Governments should invest in ICT infrastructure and training programmes for women to benefit from digital technologies. Financial support, to ensure that women can take advantage of the technology that is available, is also important. Ensuring that gender-sensitive policies to improve the accessibility of digital technologies are implemented, and that funding is utilised in the right ways, are some of the areas where policymakers can help to ensure that women benefit adequately and equitably from agricultural digitalisation.



Founder and CEO of Africa Women Innovation and Entrepreneurship Forum (AWIEF), Irene Ochem, explains how CTA's VALUE4HER programme will harness digital technology to support women in agriculture.

GHANA

Livestock vaccines: Digital delivery service

Women livestock farmers in rural Ghana are receiving veterinary services delivered to their door at the tap of a finger when they register with Cowtribe's app.

Kofi Adu Domfeh

In the pastoral northern regions of Ghana, as in many African countries, women bear the responsibility for providing and caring for the household. As livestock farming is the primary source of income, this includes rearing farm goats, sheep, and poultry. However, the high prevalence of disease often leads to the death of their animals. To help farmers fight livestock disease, Cowtribe has developed a digital on-demand and subscription-based service, which delivers livestock vaccines to rural farmers.

Leveraging technology

Cowtribe's 'Lamisi' project aims to ensure that men and women have equal access to veterinary services using a unique cloud-based logistics management system, which enables delivery of vaccine services to farmers when and where they are needed. The system also allows farmers to track the health of each animal, and reminds them when their animals need veterinary services.

"By leveraging technology to digitise data, we are able to see areas where services are lagging and we make sure services reach the farmers in a very affordable and convenient manner," says Alima Bawah, co-founder of Cowtribe, which she helped to establish in 2016. With farmers subscribing to the service by mobile phone, Cowtribe can collect relevant information about the farmer and his/her animals in order to better understand their needs.

Alima Bawah is excited to be implementing innovative livestock solutions to benefit women's livelihoods. As a girl, growing up with her grandmother in Ghana's Northern Region, Alima never encountered a veterinarian. The household's poultry often died from Newcastle disease because the family could not access vaccines. "Finding this



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kind of solution for other rural folks that are living like myself and my grandmother is something that gives me inner satisfaction,” she enthuses.

A tailor-made solution

Cowtribe selects target communities based on population size, livestock population, main income source and other relevant information. A concept selling meeting is organised by field agents to mobilise interest within the community and inform farmers about the value of vaccines, as well as how Cowtribe helps farmers to access veterinary services. Those with livestock, who are convinced by the value of the platform, are registered and signed up to Cowtribe for an annual subscription fee of €4.50.

Although mobile phones are prevalent in Ghana’s rural areas, internet connectivity is limited. However, Cowtribe’s system is tailor-made to ensure that internet access is not a limitation. “We have built our platform to be offline, so the agents that are using our app in the field to register the farmers do not need to have internet before they use the platform,” Alima explained.

Orders for vaccines within a community are aggregated to enable delivery in bulk – some vaccines are given out for free and others at subsidised prices. Registered women also receive voice messages in their local languages via their mobile phones, which tell them the availability of a vaccine, as well as offering advice on best farm practices and livestock management.

Economic and social value

The access to vaccines provided by Cowtribe has helped to reduce high livestock mortality rates and increase farmers’ incomes. Since subscribing to Cowtribe, Latif Yapaga, a 34-year-old mother of four from the Gbugli community in Kumbungu district, has increased her poultry birds from seven to 21 without being affected by the outbreak of disease. The income she has generated has enabled Yapaga to buy school uniforms for her children. “Previously, our animals

would die unexpectedly, but now we have vaccines to keep them healthy. We are on the path of multiplying our livestock and hopefully my family will have a better future,” she says.

“Our focus is not just in the commercial value but the social impacts that we are making,” states Alima. To promote women’s economic empowerment, Cowtribe works with groups of women to ease the process of sharing information and also help them to support each other. Each woman in the group is given two birds for free by Cowtribe. The women breed their two birds to produce 20 and then pass on two to the next woman in a revolving scheme.

Future opportunities

Since its inception, Cowtribe has expanded its services to 30,000 farmers in 230 communities in the Brong Ahafo, Northern, Upper East and Upper West regions of Ghana, and around 200 vets have been trained to provide support services. By the end of 2019, the target is to reach 100,000 farmers – from 10 communities in each of Ghana’s 10 regions. Women constitute at least 60% of Cowtribe’s target.

In March 2019, a new app called Benefy will be launched to enable third-party applicants to buy vaccines through remittance for delivery to a beneficiary at location. A son living in the Greater Accra Region, for instance, could use the app to purchase a vaccine for his mother in the Northern Region. “We are looking at a future where every farmer has access to animal vaccines... Where there are no more diseases that are killing livestock that would have otherwise helped to pay schools fees,” explains Alima.

In the future, Cowtribe also hopes to link livestock farmers to markets to help sell their products. “Now they have access to vaccines at their convenience and there is no more mortality amongst their flock, as a result of disease... Farmers are able to sell their surplus livestock to meet their needs,” says Alima. Cowtribe is building partnerships and receiving attention at the national and international levels to achieve these ambitions.

The social enterprise was selected as one of the 25 finalists in CTA’s Pitch AgriHack 2016 start-up competition, which provided business training and mentorship, as well as the opportunity to pitch their digital solution to potential investors. Cowtribe has also gained visibility through winning the British Council Social Innovation Challenge in December 2016 and coming second in the Gender in Agribusiness Investments for Africa Agtech West Africa Challenge in April 2017. ■

Vaccines provided by Cowtribe have helped to reduce high livestock mortality rates and increase women farmers’ incomes



UGANDA

Lawyers go digital to reach women farmers

For less than €1, women farmers in Uganda are accessing legal advice via their mobile phones. The SMS service, driven by an all-female team under the leadership of Hellen Mukasa, helps women to understand and defend their rights, particularly with regard to land ownership.

Busani Bafana



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An SMS service offering farmers legal advice is helping to improve women's control over productive resources



Legal advice has reached 3,000 farmers in their local language in central and northern Uganda via an SMS service, launched in 2017. Lawyers 4 Farmers (L4F) provides farmers with better access to legal information, by offering guidance in response to any legal problem they encounter, via SMS. The digital platform eliminates the need for farmers to travel to access legal services and improves farmers' knowledge of their rights for less than €1 (the cost of sending an SMS). If necessary, the automated response system enables lawyers to arrange follow-up phone calls or meetings with farmers to ensure their issues are resolved.

Protecting women's land rights

Land is a hotly contested resource in Uganda. Despite the constitutional rights of women to own and inherit land, customary practices of keeping land under the ownership of men often take precedence, particularly since many people are unaware of the constitutional law. It is unsurprising then, that the majority of L4F enquiries relate to land ownership and inheritance, and over 70% of the platform's beneficiaries are women like Nakazibwe Resty, who farms 0.4 ha of land in Kasana town, in Uganda's Luwero district. Resty settled on this *kibanja* (piece of land) with the landowner's consent in 2007. For 10 years she paid annual ground rent, called *busuulu*, for the land on which she farms and lives with her three children.

However, in 2017, Resty's landlord decided that he no longer wanted the rental payments and forced her to vacate the land immediately, leaving her crop in the field. With nowhere to go, Resty contacted L4F, who explained her rights as a *kibanja* holder, which meant she could offer to buy the land from her landlord. Alternatively, the landlord would either need to find another *kibanja* for her to occupy, or compensate Resty for her interest in the land. "I used the information in a meeting with my landlord, and when he noticed that I knew my rights, he allowed me to pay him for my interest in the *kibanja*," Resty explains. "I now own it and have the sale agreement to prove my ownership."

Tackling gender inequalities

Resty heard about L4F through her farmer group, and is now one of the lucky few women farmers to own land in Uganda. Hellen Mukasa, co-founder and executive director of L4F's all-female team,

explains that gender was a major driver for the start-up. "In the legal context, agriculture is more of a minefield for female farmers than male farmers. The agriculture value chain is long and starts at production, and this means access to land. This is where the challenge begins for women in Africa," states Mukasa.

A 2018 study, the *Regional Outlook on Gender and Agri-food Systems*, by FAO and the African Union Commission identifies a huge gender gap in terms of women's access to and control over productive resources, such as land. To address this gender disparity in agriculture, the content that L4F develops and the outreach activities that it carries out are focused on protecting and supporting women farmers, particularly in regards to land rights. L4F works with formal farmer groups in Uganda – which are predominantly made up of women – to offer legal services, such as needs-based legal advice and training on how to formalise a farm business,

for example. "Besides legal advice and outreach, we offer subsidised legal services to the farmer groups (e.g. micro legal insurance), where each member pays a small fee, which they pool together and pay for legal cover," Mukasa explains.

In Uganda, it is illegal for lawyers to advertise their services; to overcome this

challenge L4F use physical meetings to reach communities and draw attention to their work. L4F's outreach activities include highlighting issues related to land ownership, gender equality and women's rights. The company works with farmer groups to disseminate legal information to raise awareness about land rights and the types of agreements in farm transactions. In addition, posters and infographics are used to improve understanding about L4F's work. The start-up has found that women are more receptive to getting information about their rights through face-to-face outreach programmes than men. In most of the communities in which L4F work, families send the women to the training on the pretext that the men are too busy to attend.

Enhancing women's access to legal advice

Namata Teo, another farmer from Kasana, grows and supplies maize grains to different buyers in her town. As a result of repeat business, she developed good relations with her buyers and began to give them produce on credit, without keeping records of the goods supplied. Over time, the buyers owed her so much money that some refused to pay. Teo

The majority of L4F enquiries relate to land ownership, and over 70% of the platform's beneficiaries are women

› discovered that L4F could offer her legal guidance to address this problem, following an outreach programme in her community. “I sought help from L4F who helped me to collect some of the money but, due to the lack of records, I was not able to get it all back. L4F gave me templates of simple sale agreements, which I now use with my buyers to guard against such loss,” says Teo.

“60% of our farmers are based in rural areas, yet 90% of legal service providers live in urban areas”

In addition to using SMS to respond to farmer queries, simplified information is also shared by the organisation’s diverse team of lawyers via social media platforms, such as Whatsapp and Facebook. “In terms of legal services in our context, 60% of our farmers are based in rural areas, and yet, 90% of legal service providers live in urban areas. This poses a challenge for farmers in rural areas because they need extra money to go into town and get legal advice or information,” explains Mukasa. “With digitalisation this is changing. L4F’s mobile platform enables farmers to access legal services without leaving the comfort of their homes.”

Expanding the reach of legal services

Originally a commercial lawyer, Mukasa founded L4F following a family land dispute. “A compulsory government land acquisition took 2 square miles [517 ha] of our 5 square

mile [1,294 ha] ranch, but my family never received compensation for the land that was taken. My father did not know how to navigate the complexities of the law in chasing this compensation so I got involved in the case.” Mukasa won her family’s land dispute case, after the Attorney General of Uganda agreed to an out-of-court settlement with several other landholders. “Learning about the challenges on the family ranch and working for my family to solve them gave me the ‘light bulb’ moment as to how many other farmers faced such situations,” says Mukasa.

Mukasa has received support from CTA and the Hague Institution for Innovations of Law to hone her social entrepreneurship skills, including training in building a sustainable business model. As a finalist in CTA’s 2018 Pitch AgriHack competition, which last year focused on supporting innovative women entrepreneurs, Mukasa participated in a 2-day training session to help her manage L4F’s finances and improve the company’s readiness to raise capital from investors. During the competition finals, at the African Green Revolution Forum in Kigali, Rwanda, Mukasa had the opportunity to pitch L4F to potential investors and industry experts. “Pitch AgriHack gave us a lot of visibility, especially in the agricultural sector... This helped us a lot with some partnerships, like the coffee fraternity in Uganda,” Mukasa said.

Since the start-up was launched, over 9,000 SMS messages have been exchanged with 1,965 active users. In 2018 alone, L4F successfully resolved 264 legal cases. With support from partners such as the Africa Agribusiness Academy, which has a presence in Burundi, Kenya and Rwanda, L4F plans to scale out its services within East Africa and reach 15,000 farmers by 2020. ■

Sarah Nangendo's legal journey

After farming 0.4 ha of family land with her husband for 30 years, Sarah Nangendo found herself forced to leave the land behind when her husband died in October 2017. The land was not registered in Nangendo’s name and, because women do not often own or inherit family land in Ugandan culture, her husband’s family took the land from her. “There is a fear and stigma that comes with being a woman farmer,” says Mukasa. This is particularly the case when the woman farmer does not have a husband or father to take ownership of the land.

Determined not to lose the land she had worked on for most of her life, Nangendo fought her in-laws for the right to legally keep the land. The process to register the land in her name was long and required frequent court appearances, which meant she had to leave her farm in Agwata village, in Uganda’s Dokolo district, early to make it to the court on time. Nevertheless, Nangendo persevered until she received

the letters of administration that allowed her to manage her husband’s estate and registered her name to the land title at the Ministry of Land.

One night after she had received the land title, Nangendo’s home burnt to the ground and the paperwork was destroyed. Reluctant to undergo the whole process again, Nangendo sent an SMS to L4F in April 2018 after seeing a poster about their work at her farmer group-meeting place. L4F promptly responded to her message and helped her to get a replacement certificate without having to go through the same long process as before.

Uganda has good policies that protect land rights for all – the challenge lies in the failure to effectively implement these policies and the ignorance of the communities about the existence of these laws. “We need to involve men in protecting women’s rights to land ownership and inheritance,” Mukasa emphasises.

SPORE

Agribusiness

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FRUIT STORAGE

Mali ramps up mango export capacity

To help reduce significant mango post-harvest losses in Mali, fresh fruit packing and cold storage facilities have been established in the country.

Vincent Defait

The development of new fresh fruit packing and storage facilities across Mali is allowing local mango wholesalers to tap into global export markets. Mangoes have a short shelf life, keeping fresh for just 7 days after harvesting unless they are stored at a low temperature. Professionals throughout the value chain can now use the PLAZA – a packing facility and logistics centre that opened near Bamako airport in 2007. Funded by the Dutch Development Agency, the World Bank and the government of Mali, the centre has six packing rooms and a temperature-controlled area that includes a pre-chilling chamber, two cold stores, and a refrigerated loading zone. The PLAZA has a monthly output capacity of around 50 containers, or 3,000–3,500 t of mangoes, per 3-month growing season.

22,000 t

of mango was exported from Mali in 2018

3,000–3,500 t

is the monthly output capacity of the PLAZA facility

“Before [the PLAZA], we could only ship mangoes by air. Each plane could hold 504 boxes – so we only exported 200–300 t a season,” says Mahamadou Yaffa, business development director at Yaffa et Frères, one of the country’s biggest exporters. Now that the company can store greater quantities of mangoes at the PLAZA, they have alternative export options. “The cold store means we can ship our mangoes by sea (from Côte d’Ivoire, where they are carried in temperature-controlled trucks). Each

shipment contains 54,440 boxes. That amounts to 900–1,000 t per season.” The PLAZA charges the firm a handling fee of CFA 550,000 (€840) per container.

Mali is West Africa’s biggest mango producer and exports of the fruit have tripled in the past decade. In 2018, Mali exported 7,200 t of mangoes to Europe, with most of the produce ending up in France and the Netherlands. But its biggest export markets are Burkina Faso, Gabon, Ghana, Mauritania, Morocco, Niger and Senegal. Total mango exports amounted to 22,214 t in 2018, at a combined value of CFA8.9 billion (€13.65 million). Yet losses are still a real problem – around 60% of mangoes perish in the field. “A 2006 study showed that Mali’s potential mango output was 575,000 t, but the country was only exporting 6% of that amount,” says Kone Konaté, coordinator of the Agricultural Competitiveness and Diversification Project – an initiative launched by the Malian government to diversify and intensify agricultural production, and responsible for setting up the PLAZA.

Mango exports through the PLAZA hit a record high of 1,914 t in 2016, however, the centre is only operating at 54% capacity. Konaté puts this down to inadequate supply, while Yaffa cites logistical challenges. “The cold stores aren’t big enough to cope with our daily output volumes, it takes too long for the temperature-controlled trucks to return from Côte d’Ivoire to Bamako, and banks won’t finance us because our produce is perishable and we import all our packaging materials,” says Yaffa. Konaté says several national programmes should address these issues, once funding is secured. If Mali can overcome its problems, it will be in a strong position to tap into growing demand for mangoes in Europe. ■

The Bamako packing facility has helped to triple Mali’s mango exports



© MAHAMADOU YAFFA

GUARANTEED MARKETS

Kenyan mobile platform matches supply with demand

To reduce fragmentation in the produce market, a mobile platform is supplying vendors in Kenya with fresh fruit and vegetables and providing a steady market for smallholders.

Bob Koigi

In Kenya, over 17,000 farmers are being provided with access to guaranteed markets and increased farm gate prices, whilst costs for fruit and vegetable wholesalers are being reduced. Established by an agri-tech start up, a business-to-business system is matching more than 6,000 urban retailers with smallholder produce to improve the supply chain from farms to markets, and reduce agricultural losses.

Twiga Foods developed the food supply platform in 2014, at a time when middlemen, oversupply and significant post-harvest losses were taking a toll on farmers' earnings, while increasing food prices for consumers. To overcome these issues, Twiga initially worked on connecting banana farmers directly with local vendors, "We realised that there was a very disjointed chain regarding how produce moved from farms to markets," says Grant Brooke, Twiga Foods CEO. "Our initial proposition was that, if we could get a critical mass of retailers ordering on a daily basis, this would stabilise demand and allow us to offer producers guaranteed markets," Brooke adds.

Through its platform, Twiga cuts out the middlemen and can therefore offer higher prices to farmers, whilst providing lower prices and a reliable, high quality supply to vendors. Farmers deliver their produce to the nearest Twiga Foods collection centre, which are spread across 20 counties, and receive an SMS receipt of the goods and payment within 24 hours through the mobile money service, M-PESA. "They pay well, I'm assured of my payment and they don't have many conditions,"



A business-to-business mobile platform is linking urban Kenyan retailers with rural smallholders

says Alvan Muriithi, a farmer from Embu County, who, since working with Twiga, has nearly doubled the profits he makes from the sale of his pawpaw fruits.

Produce is processed and packaged at a central warehouse in Nakuru, Kenya, before being distributed to 6,000 street vendors around the city. To uphold food safety standards, the company works with international experts in setting up post-harvest regulations that mirror international practices, including cleaning produce at the time of harvest to reduce the development of fungi, and the use of cold rooms to manage temperature and humidity. Twiga also works with Kenya Plant Health Inspectorate Service officials to ensure that produce coming from collection centres conforms to the required standards.

Buoyed by an increase in platform members and by the evident benefits for both farmers and vendors, Twiga Foods is now looking at rolling out operations across East Africa. The company has also expanded its product portfolio to include 17 different products, including other fruits, vegetables, maize flour, cooking oil and sugar. In 2018, the company raised over €8 million from investors, led by the International Finance Corporation (IFC), to add processed food and fast-moving consumer goods to its product line-up. "The IFC investment will enable us to reach more farmers, improve efficiency in service delivery and increase access to high quality produce and foodstuffs for vendors," says Brooke. ■

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FOOD INNOVATION

Wild turmeric turns a trade in Belize

In Toledo district, farmers are earning three times the going rate for their turmeric by supplying a local processing company to produce ‘wildcrafted’ whole root turmeric paste.

Natalie Dookie

Over 350 turmeric growers in Belize have registered with an agricultural social enterprise, Naledo Belize Ltd, to supply whole root turmeric for processing into ‘Truly Turmeric’ paste. The crop is grown wild and under cultivation in forests or amongst other crops, and this biodiverse production model makes it sustainable and supports regenerative agriculture. To optimise production, the farmers receive training from the company on how to re-plant small rhizomes (underground plant stems), reduce contamination by herbicides/pesticides, clean roots efficiently and harvest the main part of the root. Turmeric yields over 4,500 kg per 0.5 ha and has a short growth cycle of 9 months, but was previously only produced in Belize in small amounts for hand-processing into powder for local consumption. Farmers registered with Naledo are now producing over 9,000 kg per month.

In 2014, while volunteering in Belize, Umeeda Switlo, CEO of Naledo, discovered that the size of Belize turmeric, *Curcuma longa*, was larger than other species. After testing it for pathogens and heavy metals, and finding none, she began processing turmeric paste from her kitchen in Canada. Switlo also discovered various nutritional benefits of the Belizean turmeric, for instance, while most turmeric has 2% curcuminoids, which is a powerful anti-inflammatory compound valued for its health benefits, Switlo discovered that Belize turmeric has 7.6%.

The Truly Turmeric paste contains fresh squeezed lime juice, cold pressed coconut oil and sea salt, which makes it a nice addition in smoothies or curries, for instance. “There is nothing on the



© VIRGINIE GOUDEAULT

Farmers in Belize are using a biodiverse production model to cultivate whole root turmeric for processing into paste

market like this. Wildcrafted is a step above organic, as the turmeric is naturally grown with no added agricultural inputs,” says Switlo. Reducing environmental impact is important to Switlo, “We produce very little waste as we process the roots whole with the skin on, and the smaller rhizomes are re-planted as seeds. We also work with farmers to ensure that when washing the root, the silt does not go in to the rivers.”

Young people in Toledo are also accessing new employment opportunities through Naledo’s agro-processing factory in Punta Gorda, the capital of the district. Here, all value-added activities take place, from bottling to labelling, and the factory employs 10 people between the ages of 18 and 31 years, including several managers, paying at least double the Belize minimum wage. Naledo employees also receive training in business, bookkeeping, food safety and entrepreneurship.

350

turmeric growers across Belize have registered with Naledo Belize Ltd

9,000 kg

of turmeric produced per month by Naledo

The Truly Turmeric product reached the finals of the 2018 SIAL Innovation Awards and is currently available in 24 outlets across Belize. The paste is also exported to 650 stores in Canada, including Whole Foods and Choices Markets. Having found a distributor in the Bahamas, Naledo is keen to expand to the rest of the Caribbean and in 2019, the company will begin exporting to the US and will introduce five new beverage products that use Belizean turmeric. ■

Increased demand for Kenyan dairy products

By providing financial and technical support to dairy farmers in Kenya, a local agribusiness is diversifying its product line whilst enabling farmers to expand their operations.

Kizito Makoye

Growing private investment in Kenya's dairy sector is increasing the availability of high quality and nutritious dairy products across the country. Bio Food Products Ltd, which is supported by the USAID East Africa Trade and Investment Hub, works with dozens of local farmers to produce and sell a range of milk-based products, including yoghurts, creams and flavoured milk drinks, to its retail and hospitality customers across East Africa. The company has supported dairy farmers by paying above-market prices for their products and offering loans so that farmers can invest in technology, such as milking machines, storage tanks, cooling systems and other equipment to scale up their operations.

At Amagoro farm on the outskirts of Kitale in Kenya's Rift Valley region,

Christopher Joroge, a 39-year-old farmer, decided to switch from crop to dairy production a decade ago, after repeatedly experiencing dismal yields. "When I started dairy production, I realised it was the right decision" says Joroge, who now has a herd of 50 cows. Joroge started with just two cows and initially, did not have the capacity to store any of the milk he collected. He was thus forced to sell his product locally and at a low price of around Ksh30-35/l. However, after securing a loan from Bio Foods in 2015, he was able to purchase a cooler with the capacity to store 1,000 l, which has helped him to expand his business and sell his milk on to Bio Food for a better price of Ksh45/l. Using this technology, Joroge also collects and stores milk from neighbouring smallholder farmers, acting as a collection point for Bio Food.

"I sell my fresh milk to Bio Food Products under a special agreement," he explains. "The financial loan has helped stabilise my business... I no longer incur losses," says Joroge, who collects and sells about 350 l of milk per day.

Bio Food currently purchases 1.2 million l of milk per year or 100,000 l per month from local farmers, and the company's products are now available in over 800 retail outlets. The products are also being exported to neighbouring markets in Rwanda, Tanzania and Uganda. Bio Food also provides technical support to farmers to help them produce better quality products. Farmer training focuses on simple, low cost, low technology and effective measures to reinforce quality cattle feeding and improved milk hygiene by cleaning equipment, including the cooling systems. "Our dairy products are of a higher quality [due to effective on-farm chilling to increase shelf life], which is why consumers don't hesitate to pay more for them," says Gerald Mwangi, the production manager at Bio Food.

According to Joachim Westerveld, the company's managing director, staff employment has also increased from 143 in 2016 to 249 in 2018. Jobs at the Bio Food factory include food scientists, packaging staff, cooks, tasters, shop floor workers, accountants and customer safety managers. The company has also expanded its product line to include complementary products like honey and jam. ■



Bio Food Products Ltd in Kenya works with local farmers to produce high-quality dairy products

SMART CONTRACTS

Blockchain builds trust in trade

Distributed ledger technology promises to help plug a trust gap in agricultural commodity trade and finance, with new platforms offering farmers a bigger pool of buyers for their harvests.

Helen Castell

Blockchain-based contracts have the potential to transform the way agricultural commodity trade is conducted, building trust between buyers and sellers, encouraging banks to fund transactions and empowering farmers to command a fair price for their produce. Tech companies, banks and commodity exchanges have been quick to see the opportunity, investing in a flurry of agriculture-focused platforms and pilots across ACP countries. But while some of these initiatives are already gaining momentum, blockchain technology is not a silver bullet and real-world solutions must still be found for real-world problems.

Distributed ledger technology (see box) has many theoretical applications for agricultural commodity trade and finance, states Max Mattern, author of a recent CGAP brief (<https://tinyurl.com/y9t3ssjd>). By allowing several parties to view agricultural assets on a ledger, the technology injects transparency into commodity trade, while the ability to create digital records of assets on a distributed ledger means they can be used as collateral for lenders. Smart contracts also mean asset ownership can be transferred automatically in the case of default. Ledgers can be used to track the origin and shipment of

commodities, improving supply chain management, while they can also be used to build and store credit data on buyers and sellers, improving their access to finance, Mattern notes.

Sterling Bank gets on board with Binkabi

In 2018, Nigeria-based tech start-up Binkabi teamed up with local commodities exchange Afex and Sterling Bank to create a blockchain-powered, automated trading system. Under the system, farmers deposit crops at Afex warehouses and receive a receipt that verifies their ownership. The receipt is converted into a digital token for trading on Binkabi's platform, allowing farmers to sell to a bigger pool of buyers – such as processors – which deposit payment with Sterling Bank. The bank also accepts the token as collateral for loans of 50–70% of the value of farmers' produce.

This is the first time that Sterling Bank – which has committed to providing at least €24.1 million (¥10 billion) of finance for crops including maize, rice and soybeans via the Binkabi platform – has agreed to lend on the back of warehouse receipts alone. This is partly because of the certainty provided by blockchain-based smart contracts, which are automatically voided if any

party defaults, with the token returned to whoever is selling it.

Binkabi founder Quan Le notes that, after harvest, farmers under pressure to repay input financing are seeking an immediate sale. At this time, sellers in the market outnumber buyers, depressing the crop price. However, being able to access upfront funding allows farmers to wait until the stored produce commands a better price, rather than being forced to sell to the first buyer.

Brokers also typically take more than 5% of the sale value as a fee, compared with Binkabi's introductory rate of 1.25%, divided equally between the buyer and seller. The digital warehouse receipt also offers certainty to buyers and lenders that they are not paying for, or lending against, goods that have already been sold, which can be a risk with paper invoices or receipts, states Le.

Since its launch in December 2018, more than 100 farmers have signed up to Binkabi for its pilot with Afex. Binkabi has also partnered with local fertiliser company TAK Agro to help it acquire a license for another exchange that will run on the same platform. Le predicts the total value of transactions over the platform will reach €4.4 million to €8.8 million this year but predicts a long ramp-up period.



Digital contracts are plugging a trust gap in agricultural trade, providing farmers with a bigger pool of buyers

Agrikore expands fast

Smart contracts are also used by digital payments provider, Cellulant, to facilitate commodity trade in Nigeria via its Agrikore platform. This allows buyers to draft contracts using an Agrikore template, under which they offer to pay a certain amount for a specified quantity and type of agricultural commodity, explains Cellulant co-founder and CEO Bojaji Akinboro. These are then published to farmers, who can agree via SMS to fulfil contracts of their choice. Buyers fund contracts in advance – either in cash or through a debt obligation – so that sellers are automatically paid as soon as delivery is made, making the contracts effectively self-enforcing. Logistics companies, warehouses, insurers and banks can also be written into the same smart contract.

Blockchain technology's greatest benefit for agriculture in Africa is its ability to help overcome trust issues that plague the sector, says Akinboro. The platform provides an identity management service to guarantee to participants that they are dealing with real, traceable entities.

In the first two months of its pilot launch in November 2017, the Agrikore

Distributed ledger technology

The use of ledgers to record contracts, payments or ownership of assets has historically underpinned economic transactions globally. Traditionally, however, they were paper-based, making them vulnerable to duplication, theft or loss. Blockchain technology allows for a digital, decentralised ledger or database to be distributed among multiple participants, which are able to access information recorded on the network and to own an identical copy. Any changes made to the ledger are copied to all participants in near real-time, speeding up transactions and the signing or settlement of contracts. Information is stored securely and accurately using cryptography, reducing the risk of cyber-attacks or a single entity attempting to change records unnoticed. The shared nature of a distributed ledger, which can only be altered with the agreement of all participants, means assets can be recorded, certified and transferred without relying on a central governing authority such as a bank or other middleman.

platform – which currently supports trade in maize, rice and soybeans and will soon add sorghum – facilitated €1.7 million worth of trade. This rose to nearly €17.5 million in 2018 as farmers and big buyers like Olam Nigeria quickly became more comfortable with the technology, states Akinboro. By 2020, Agrikore aims to expand this to €262 million as more banks sign up to the platform – with two banks currently in final talks.

Beyond the hype

Nevertheless, while banks and tech firms have rushed to embrace distributed

technology, it is important to look beyond the hype, recognising what blockchain can and cannot do for commodity trade, cautions Mattern. With regards to trust, for example, automated payments can effectively enforce the smart contracts that underpin blockchain-based trade, but disputes regarding the quality of commodities post-delivery still require external resolution. The technology will gradually evolve to address more 'real world' problems as governments create legal and regulatory frameworks to support it. Only then will blockchain's potential in agricultural commodity trade be fully realised, he concludes. ■

IMPROVED EFFICIENCY

Digitalising East Africa's border control

Cross-border trade in East Africa has never been more efficient with the introduction of centralised digital systems that can be accessed by authorities across the region, to monitor the journey of goods and ensure all the necessary documentation is available.

Stephanie Lynch

With the integration of digital technologies into East Africa's border post operations, transit and clearance times for goods crossing borders have been significantly reduced, saving traders as much as €50 million annually. TradeMark East Africa (TMEA) has been leading efforts to increase the efficiency of cross-border trade in the region with the introduction of One Stop Border Posts (OSBPs) in 13 locations along the borders of Burundi, Kenya, Rwanda, Tanzania and Uganda between 2014 and 2017. OSBPs are designed to

combine the activities of immigration, customs and other agencies on both sides of the border so that traders only have to go through border formalities once in each direction.

Previously, at the Tanzania/Burundi border, for example, traders would have to spend up to 12 hours queuing to go through the clearing agent and declare their goods to the customs officers, who would make a physical inspection of their cargo on the Tanzanian side of the border. After the customs officers approved their goods, traders would

have to go through immigration procedures, before undergoing the whole process again to enter Burundi. The tedious process cost traders significant time and potential revenue. "Before, it would take 2 days to cross the border," says Celestin Nzeyimana, the Head Officer at Kobero border post in Burundi. "Today it is 1-2 hours."

Centralised ICT networks

Each OSBP has new office buildings for customs staff and clearing agents, parking yards, cargo verification bays, scanner and passenger sheds, and integrated ICT networks. The OSBP ICT networks are centralised to enable access and use of the relevant operational and management systems by the various government agencies, organisations and other regulators on both sides of the border. The systems are designed to remove paper-based transactions and instead offer digitalised services to facilitate more efficient movement of goods and people across borders. For instance, since 2015, all 24 government agencies involved in cargo clearance at Kenya's port and border posts have been using the Electronic Single Window System (SWS) to digitally process trade transactions.

The SWS has not only reduced transit times at OSBPs, but also facilitated international trade at Mombasa port (along with other digital systems that have been set up) – which, in addition to domestic imports/exports, serves Burundi, the Democratic Republic of Congo, Rwanda, South Sudan and Uganda. The time it takes for customs to process goods entering or leaving Mombasa port has more than halved,



The integration of digital technologies into East Africa's border post operations has reduced transit times by 75%



Small-scale traders are benefitting from the improved efficiency and transparency of digital customs systems

from 7 to 3 days, with the introduction of the SWS. With similar systems in use in Burundi, Rwanda and Uganda, traders are able to digitally submit regulatory documents at a single location. The information can then be shared and exchanged between different customs and border agencies, as well as with private sector stakeholders. “The SWS has tremendously improved clearance of transit goods by reducing lead times for customs clearance, as well as eliminating delays at the borders,” said Job Kemboi, Group Commercial Manager at Siginon Group, a transport and logistics company based in East Africa.

Safer and faster trade

To further enhance trade efficiency across East Africa, Kenya, Rwanda and Uganda have introduced the Regional Electronic Cargo Tracking System (RECTS). Using an electronic seal attached to the vehicle, RECTS enables the centralised tracking of goods across the region by transporters and revenue authorities in all three countries. Government authorities manage

and administer the electronic seals at no cost to transporters and traders, to reduce the risk of theft, lower insurance premiums and improve profit margins for traders.

The digitalisation of East Africa’s trade procedures has removed paper-based transactions to facilitate more efficient movement of goods across borders

Without government subsidies the seal costs approximately €1,060, which is what businesses in Tanzania and Burundi currently have to pay if they want the assurance provided by RECTS. However, the East Africa Business Council is engaged in ongoing discussions with both countries to persuade the revenue authorities to adopt RECTS

for a harmonised system across the region.

According to TMEA, €175–220 is lost each day a truck spends in transit; lengthy waiting times at border crossing are particularly costly for traders carrying fresh agricultural produce as it increases the risk of spoilage. However, since pilots for the OSBPs, SWS and RECTS began in 2014, the total amount of time traders spend crossing the border has reduced by an average of 75% according to recent time and traffic surveys. With higher levels of traffic passing through border posts, the increased efficiency of the digital systems has boosted trade revenues in the region. Moreover, the technologies have introduced greater transparency between traders and agency staff at the borders, in addition to increased accountability between the border staff and agency management at the head offices. This not only acts as a deterrent to corruption, but also helps to prevent border officials harassing small-scale traders – many of whom are women selling products such as maize and beans. ■

JANE MAIGUA AND CHARITY NDEGWA

“We want to be role models for running a business”

Exotic EPZ is working to develop sustainable, inclusive value chains for coffee and nuts in Africa. Jane Maigua and Charity Ndegwa – two of the organisation’s founders – spoke to *Spore* about their work to support smallholders and rural women.

Bob Koigi

Drawing on more than 30 years’ experience in both the public and private sectors, three Kenyan women created Exotic EPZ to help foster profitable, sustainable value chains for rural African farmers – with a focus on gender equality. Working directly with growers, the organisation links farmers to processing operations as well as high-value export markets.

What motivated you to launch Exotic EPZ?

Jane Maigua: The three of us had all worked on different projects that focused on women’s economic empowerment, rural smallholder development and entrepreneurship. Charity Ndegwa and I then found ourselves working on the same project in 2014-2015 – funded by the International Labour Organization (ILO) – which focused on linking HIV positive women horticultural farmers with high-end hotels to sell their produce.

It was inspiring to see the farmers grow their incomes, educate their children and buy assets as a result of the ILO initiative. But, as the horticulture



© EXOTIC EPZ

Exotic EPZ brings together more than 30 years of experience to link rural African farmers with high-value export markets

project neared completion, Charity and I – and Loise Maina, whom I had met on a project with UN Women – wanted to establish something that would be sustainable, and felt this could only be achieved through the private sector. The

majority of NGO projects often have a very limited timespan to build local capacity and deliver tangible impacts. I always felt that this approach was not sustainable and Charity and Loise felt the same. We also wanted to be role

models to both young and older women on how to successfully run a business.

“The greatest strength of our business is that, across the value chain, nothing goes to waste”

You previously worked as a programme coordinator at ILO and your co-founders have also held influential positions at large organisations. How have your respective backgrounds helped to drive the development and success of Exotic EPZ?

Jane Maigua: The networks we secured in our work lives and our ability to gain from these networks worked a great deal in our favour. I have worked in the private sector and with government, financiers, donors, communities and smallholder farmers. These actors have been a great resource in shaping our business. We were able to make contact with the government, for example, to secure licensing for the company, with financiers in establishing the financing mechanisms, and reach out to farmers to supply us with produce because of previous interactions.

Waste products, such as nut shells, are burnt at Exotic EPZ to fire the boilers that process the nuts. Why are sustainable practices important to your business model?

Charity Ndegwa: The greatest strength of our business across the value chain is that nothing goes to waste. Adoption of renewable energy means that, besides cutting down on energy costs, we operate within the company’s mantra of conserving the environment and curbing carbon emissions.

We are also able to sell any rejected kernels to companies that are pressing oil, which generates income for our business.

Eighty percent of your workforce are women and you have plans to help build the capacities of your women farmers. Why is it important to prioritise inclusivity and support women in agriculture?



The company aims to foster sustainable value chains for coffee, nuts and oils, with a focus on inclusivity for rural women farmers

Jane Maigua: Actually, it currently now stands at about 90%. There are numerous studies that show that up to 80% of those working in the agricultural sector are women. The question, then, is how much do they benefit from their ventures? As part of our research to identify which crop to concentrate on, we realised that traditionally macadamia trees were considered of little value as compared to coffee and tea, but that local women and children would sell the nuts at the markets. Now, macadamia has increasingly become a high value crop, but men have taken ownership of the trees. We have therefore started exploring ways in which to move women beyond the traditional duties of, for instance, working on farms, harvesting and de-husking macadamia nuts, to higher money-making activities, like marketing agents and nut processing.

What are the key qualities that led to your business winning an AWIEF award and how do you plan to build on these qualities as Exotic EPZ develops?

Jane Maigua: Our job creation model, which is to provide men and women with an avenue through which they can sustain themselves and their families, has been key to our success. The significant volume of nuts we have been

supplied with since starting the business – about 700,000 kg – means that everyone in the value chain, from the farmers themselves to those at the collection centres and the workers in our EPZ, has a source of income. This is another aspect of our business success.

“80% of those working in agriculture are women – but how much do they benefit from their ventures?”

Charity Ndegwa: We also invest in high standard systems and processes, such as the Food Safety System Certification FSSC 22000 standard, to ensure that our business responds to market needs and international best practices. We have also extended our partnership portfolio as we look to new projects like oil pressing, which we are due to start next year. These have been key developments in helping us respond to a fast changing and dynamic market. ■

KARIM EL AYNAOUI

“Large-scale irrigation presents several benefits”

Karim El Aynaoui, managing director of the Policy Center for New South (PCNS) and member of the Malabo Montpellier (MaMo) Panel, explains what Africa can gain from effective irrigation policies and programmes.

Stephanie Lynch

The MaMo Panel report, Water-Wise: Smart Irrigation Strategies for Africa, recommends that African policymakers make irrigation a top priority. Why is it so important that African countries implement effective irrigation policies?

Low agricultural productivity still hinders Africa’s agricultural development sector, leading to high levels of food insecurity. To promote agriculture on the continent, the private sector and governments must act on various key elements. Among those, irrigation should be addressed first in order to intensify agricultural growth, while ensuring it is both inclusive and sustainable. Currently, only 6% of cultivated land is irrigated in Africa. Compared to other continents such as Asia, where 37% of cultivated land is equipped for irrigation, this rate is very low and can be significantly improved. Irregular and insufficient rainfall, long periods of drought and the negative impacts of climate change are bottlenecks that must be overcome to improve agricultural production in Africa, particularly to meet a rapidly growing food demand. Effective and efficient irrigation policies, which take into account the context of increasing water scarcity and growing

water demand, should therefore be implemented to achieve a successful structural transformation of African economies.

Are there any stand-out lessons from the report’s case studies that other African countries could learn from?

The report showcases several countries across Africa that have experienced significant progress in implementing effective irrigation strategies, building large-scale infrastructure and establishing innovative institutional frameworks. Sharing these experiences with other countries on the continent will help shape new irrigation strategies to tackle local issues. For example, Morocco and Mali have invested in developing irrigation infrastructure to mobilise water for agriculture. Thanks to those efforts, the two countries recorded a higher pace of irrigation expansion compared to other African nations.

We can see a different, yet equally impactful initiative in Ethiopia, where the government promoted small- and medium-scale irrigation systems and established an irrigation development programme that consists of improving water efficiency toward food self-sufficiency. To this end, the



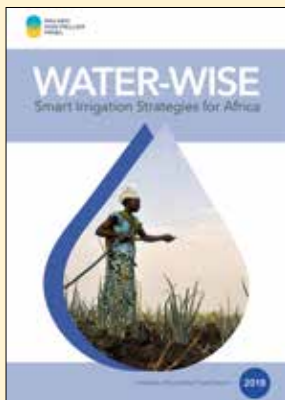
© PCNS

Karim El Aynaoui tells Spore how African countries can learn from each other to develop successful irrigation systems

government plans to build micro dams to catch flows from rivers and promote the use of shallow wells using manual pumps. There are many experiences that could help African countries in shaping their irrigation policies – however, a

Running water

Influencing irrigation policy



As climate change causes extended droughts and increasingly erratic rainfall in Africa, efficient management of the continent's water resources has never been so important. The pressure placed on Africa's agricultural systems by the growing population furthers the need for smart irrigation strategies to ensure food security. However, 62% of Africa's crops are currently rain-fed.

To promote the implementation of evidence-based irrigation policies, the Malabo Montpellier Panel (MaMo) has published a new research report, *Water-Wise: Smart Irrigation Strategies for Africa*. The report includes nine policy recommendations covering key considerations, including the introduction of smart water regulations (e.g. to

govern efficient maintenance of irrigation systems) and investment in the necessary infrastructure and technologies.

The report is accompanied by six country case studies, which outline the lessons that can be learned from successful irrigation policies across Africa. For instance, through its National Irrigation Strategy, South Africa has committed to increase the area of irrigated land by 50% over the next 10–20 years – the policy has already supported 32,000 smallholders to irrigate their fields. MaMo hopes that sharing such success stories will encourage the replication of effective programmes across the continent.

Water-Wise: Smart Irrigation Strategies for Africa

By Malabo Montpellier Panel

International Food Policy Research Institute, 2018; 64 pp.

Downloadable as a PDF file from: <https://tinyurl.com/yjszeo4t>

deep understanding of the local context is essential.

What are the benefits and limitations of large-scale government-funded irrigation schemes?

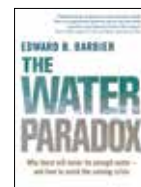
No matter the source of funding, either public or private, each irrigation management scheme has its advantages and limitations. The choice of large irrigation projects or small-scale irrigation depends on technical and financial characteristics, namely the existing quantities of water endowments, the surface area of land dominated by dams, the possibility of bringing water to farmers and the cost of projects. Where it is technically possible, large-scale irrigation presents several benefits. From the agricultural production point of view, it is a means of supplying water to large areas. By closing the gap in the

variability of rainfall over space and time, such irrigation systems improve yields and stabilise agricultural production for many farmers in the same area. As a result, national agricultural production is stabilised, and food prices too.

The other side of the coin is that large-scale irrigation can have poor environmental ramifications – by increasing the alkalinity or salinity of soils and groundwater, for example – and can also encourage monoculture, consequently decreasing farmers' incentive to innovate. Farmers must therefore be involved as major players in irrigation strategies established by governments. They have the local know-how that is necessary to ensure the effective implementation of irrigation systems with minimal negative impacts on the environment. ■

Resource management

Water scarcity



With global water demands surpassing supply, *The Water Paradox* examines the failures in water management that have made water scarcity a persistent reality

for both rich and poor countries around the world. The author, Edward Barbier, argues that the combination of outdated governance structures and under-pricing have led to the overuse and undervaluation of water. As a result, the private sector has little incentive to invest in long overdue technological innovations to improve water management.

The Water Paradox: Why there will never be enough water – and how to avoid the coming crisis

By Edward B. Barbier

Yale University Press, 2019; 296 pp.

ISBN 978-03-0022-443-6

€22.81

<https://tinyurl.com/y8cg5xwo>

Irrigation development

Farmers invest



In many parts of Africa, small- and medium-scale farmers have assumed a driving role in improving their water use by developing or expanding efficient irrigation

systems; this is known as farmer-led irrigation development (FLID). In Kenya, there is potential to irrigate over 1.3 million ha of land for enhanced agricultural productivity and economic growth. This report looks at a pioneering project underway in Kenya to accelerate FLID and smart water solutions across the country, and provides practical guidelines for those facilitating and supporting FLID 'on the ground'.

Accelerating Farmer-led Irrigation

Development: Theory and practice of the

Smart Water for Agriculture in Kenya project

By J Muturi, S Oggema, L van Veldhuizen, et al.

SNV Netherlands Development Organisation,

2019; 41 pp.

Downloadable as a PDF file from:

<https://tinyurl.com/y2w7qwak>

CLIMATE-SMART FARMING

Protecting pastoralists and ending food insecurity

Faced with increasingly unpredictable weather patterns, food security and livelihoods in Africa can be improved by using climate-smart methods to promote crop and livestock production.

Alex Miller

Global food production needs to increase by 60% by 2050 (FAO estimates) in order to meet the demands of the world's growing population. CTA director Michael Hailu argues that most of this food must come from existing farmland, "at a time when many farmers are already beginning to experience the impact of climate change." This point is made in a CTA publication on climate-smart farming – an approach that is being promoted as a way of reducing continental food insecurity and improving resilience amongst crop farmers and pastoralists.

CTA's *Promoting climate-smart farming in sub-Saharan Africa: Stories from the field* emphasises the transformative potential of climate-smart farming techniques to mitigate against the effects of climate change. The techniques include planting drought-resilient seeds and climate-proofing pastoralism in eastern Africa, where unpredictable weather patterns currently threaten 20 million livestock keepers. These difficult conditions can be addressed by providing livestock farmers with insurance for their animals and creating business linkages between pastoralists and end-buyers. This increases farmer resilience to droughts but also improves their livelihoods, which makes them more economically secure when climate shocks occur.

The vulnerability of pastoralists is further explored in the FAO publication, *Pastoralism in Africa's drylands: Reducing risks, addressing vulnerability and enhancing resilience*. Displacement, livestock

disease and climate change are all covered in this book, which also looks at ways in which resilience amongst livestock keepers can be increased. Suggestions for the latter include livelihood resilience programmes, which aim to improve animal feed supplies by utilising agricultural by-products such as bagasse or hay.

A country-specific example of enhancing climate change resilience amongst dairy producing pastoralists is provided in another new CTA publication, *Rebounding from the brink of extinction: Commercial production of milk amongst pastoralists for climate change resilience in Uganda*. This book focuses on a case study from Uganda's south-west and central regions and highlights other climate-smart farming techniques, such as improved rangeland management. This strategy involves avoiding over-grazing as well as building dams to ensure adequate food and water are available to livestock, year-round. The climate-smart techniques featured in this publication are the result of government resilience-building programmes that were first initiated in the 1980s. This governmental support has endured and now helps Ugandan pastoralist communities that are close to "the brink" to thrive, even under changing climatic conditions. To enhance the implementation of climate-smart farming strategies across the continent, other African governments should look to provide similar levels of support. ■



Promoting climate-smart farming in Sub-Saharan Africa: Stories from the field

By C Pye-Smith

CTA, 2018; 24 pp.

ISBN 978-92-9081-646-1

Downloadable as a PDF file from:

<https://tinyurl.com/yd3qotcm>



Pastoralism in Africa's drylands: Reducing risks, addressing vulnerability and enhancing resilience

By FAO

FAO, 2018; 52 pp.

ISBN 978-92-5130-898-1

Downloadable as a PDF file from:

<https://tinyurl.com/y9gh4c7x>



Rebounding from the brink of extinction: Commercial production of milk amongst pastoralists for climate change resilience in Uganda

By E Niemi & J Manyindo

CTA, 2018; 40 pp.

ISBN 978-92-9081-637-9

Downloadable as a PDF file from:

<https://tinyurl.com/y7rg9h6f>

Data4Ag

Putting digital technology in farmers' hands



For decades, farm data across ACP countries has been collected by governments, financial service providers and even mobile network operators, to provide insights into agriculture that can be used to shape and influence the sector from the top down. But with more than 40% of African households now belonging to farmer cooperatives – many of which digitally record and store their members' farm data – decision-makers increasingly

acknowledge that a more localised and inclusive approach to data may be the best way to transform agriculture.

Issue 89 of CTA's *ICT Update* focuses on 'Data4Ag', presenting a selection of eight case studies from across Africa that demonstrate the benefits of placing digital technology – with the capacity to record more and more accurate data – in farmers' hands. This is no less clear than in Kenya where, in 2018, AgroCares piloted a mobile app that converts soil data gathered using a portable scanner into customised fertiliser recommendations. As a result, farmers using the app reported more economic fertiliser usage and higher yields.

As well as enhancing productivity, digital technology is increasingly being used to bolster farmers' climate-resilience in the face of weather uncertainty. A CTA-supported Climate Livestock and Markets project in East Africa, for instance, provides pastoralists with weather information – including potential rainfall, temperature and evapotranspiration. A cloud-based weather information system draws this data from a

host of local weather stations, where it is then delivered directly to the pastoralists' mobile phones via SMS – allowing farmers to better plan for, and adapt to, changing weather and climate conditions.

Weather and climate data is also being employed across Africa to provide farmers with index-based insurance. The Dutch Environmental Analysis and Remote Sensing organisation uses data gathered from meteorological satellites to develop 'index thresholds' for specific climate factors. In Uganda, for example, when evapotranspiration – a reliable indicator of plant growth – falls below the calculated threshold, farmers in the insured area are automatically compensated without having to file a claim.

The latest *ICT Update* highlights the importance of a better connected and smallholder sector – which, it suggests, can be achieved by giving farmers and farmer organisations the tools to capitalise on existing digital technology. ■

★ For more information on 'Data4Ag', see Spore's dossier in issue 190, available online here: <https://tinyurl.com/yaao3lzb>

ICT Update n°89: Data4Ag:

New opportunities for organised smallholder farmers

Edited by Yanick Bakker

CTA, 2018; 20 pp.



Downloadable as a PDF file from: <https://tinyurl.com/ya8jgyhq>

Development prospects

Harmonising trade and agricultural policy in Africa



Improved trade for farmers and agribusinesses in Africa's least developed countries could stimulate economic development and improve food security in these regions. Aligning trade and farming policies can, however, be challenging, and policy incoherence between the two sectors negatively impacts value chain development and farmer prosperity.

A recent FAO publication, *Policy coherence for agricultural transformation in African least developed countries (LDCs): Aligning*

agriculture and trade policymaking processes, defines policy coherence as the "systematic promotion of mutually reinforcing policy actions across government departments and agencies." The report argues that, in the context of African food security, policy cohesion is ensuring that government trade policies do not undermine government agricultural policies and vice versa.

As outlined in the report, one clear example of policy incoherence is in

facilitating stronger market linkages between producers and local buyers. With agricultural ministries focusing on improving productivity at the farm level, and trade ministries regarding exports as a priority area, local trade can get ignored. In order to facilitate smallholders' access to regional markets, the publication suggests that mutual recognition of trading standards at the local level are needed. This can be achieved through better coordination between the two sectors and their coordination with the national statistics authorities – to ensure that data regarding, for instance, agricultural production rates, market prices and stocks, is consistent across the ministries for policymaking. ■

Policy coherence for agricultural transformation in African least developed countries (LDCs): Aligning agriculture and trade policymaking processes

FAO & ECDPM, 2018; 25 pp.

ISBN 978-92-5130-679-6

Downloadable as a PDF file from:

<https://tinyurl.com/ya7mk28s>

Is digitalisation alone enough to attract youth to agriculture?

JOHN AGBOOLA

Digitalisation is a timely magnet for youth involvement in agriculture



*John Agboola,
Farmer and Agriculturist*

The global population is projected to reach 9 billion people by 2050, with nearly 2 billion of those people living in Africa. Global population growth, particularly in Africa, looks set to boom before there is a food system in place that can support all people at all times.

The idea of Africa feeding itself is not farfetched though: Africa has about 65% of the world's uncultivated, farmable land; Africa is endowed with a wide diversity of agro-ecological zones, such as heavy rain-forest vegetation and dry-arid vegetation; agriculture provides around 60% of all jobs on the continent; and Africa uses only 2% of its renewable water resources, compared to 5% globally. The issue, however, is that smallholder farmers aged 60 years and above account for over 80% of agricultural food production in Africa. This is despite the fact that half of Africa's population is aged under 25 years.

Changing mindsets

By 2025, an estimated 330 million young Africans will enter the labour market. Hence, there is a need to match youth unemployment with the enormous potential of African agriculture. Young people picture the drudgery of farming and perceive agriculture as a low income employment sector. In recent years though, digitalisation and agricultural technologies have enhanced the way that food is produced. ICT-enabled agriculture is gradually changing the mindsets of young people

and creating young entrepreneurs who are willing to take risks and invest in agriculture.

Digital solutions and platforms, such as smart-mobile applications, remote sensing technology, big data, digital soil maps, social media, blockchain, drones, precision technology and cloud-based computing, have the tendency to not only increase food production and market efficiency, but also accelerate youth involvement in agriculture. Over the past few years, private sector companies and donor agencies have become increasingly aware of the role that digital agriculture can play in driving agricultural growth for smallholder farmers and youth in agriculture. Mobile applications and low-tech solutions have been developed by different stakeholders, including young entrepreneurs, to tackle issues related to production, input supply, finance, processing, logistics, and marketing. The key question is whether digital agriculture is enough to drive growth and ensure sustained youth involvement in agriculture.

The potential of digitalisation

There is a popular assertion that on average, young people are smart, energetic, innovative and capable of integrating technology into their activities. These attributes are complementary to what digital agriculture can offer, enabling young people to transform agriculture in Africa from the palm of their hand. Across agricultural

value chains, digital agriculture has proven to be a timely way to attract youth into agriculture, but the rubber still needs to meet the road. There is a need to link youths involved in digital agriculture with substantial financial inclusion, investment support from both the private and public sectors, and tailored agricultural training.

Dr Akinwumi Adesina, President of the African Development Bank, emphasises the potential of digital agriculture by saying that “modern agricultural technology, such as digitally enabled agriculture, precision farming, hydroponics, robotics, and artificial intelligence, is expanding globally. The future farmer will most likely not be in overalls, but will be a farming-enabler. A farmer that is not physically engaged in agriculture. These farmers will take agriculture to the next level, a level shaped by innovations.”

At the CGIAR Big Data Convention in October, I interviewed Dr Debisi Araba, the Centre for Tropical Agriculture's Regional Director for Africa, about his perspective on youth in agriculture. He said that a “prosperity approach needs to overtake a poverty reduction approach, to encourage young people into making a career in agribusiness. The future of Africa is not seeing more youth on the farm, but more youth at the top of the value chain pyramid, where digital agriculture creates multiple entry points for young people looking to get involved in agribusiness.” ■

NAWSHEEN HOSENALLY

Digitalisation is only part of the solution



Nawsheen Hosenally,
Co-founder of
Agribusiness TV

For many years now, we have been talking about the importance of making agriculture attractive to youth, so that they are involved along the value chain and contribute to food security. In the process, one hypothesis that has come up is that with agriculture's digitalisation, youth will become interested in starting a career in the sector. But how far is this true?

No 'silver bullet' solution

In my opinion, ICTs are very powerful tools that can indeed change the way we do business and modernise agriculture in Africa. However, digitalisation is no silver bullet when it comes to attracting youth to agriculture. For a young person, flying a drone over their farm to apply pesticide, monitoring crop growth using an iPad, and using a mobile application to check market information, is much more appealing than the traditional image of a smallholder farmer. On the other hand, digitalisation is costly and technologies are not always affordable for young farmers; it also requires certain infrastructure and expertise that we cannot take for granted.

Sharing the success of young agripreneurs

In 2016, I co-founded Agribusiness TV to change the narrative around agriculture and showcase success stories of young agricultural entrepreneurs from Africa. The primary objective of the web TV is to inspire youth to get involved in agriculture through videos. In two years, Agribusiness TV has produced over 100 videos, which have been viewed more than 8 million times. Feedback from entrepreneurs demonstrates that with the visibility that they get from the videos, they have been able to increase sales and revenue. As for the young audience, many have shared their interest in

venturing into agribusiness, and some of them have actually got into agriculture after watching our videos. In this sense, digitalisation can certainly be used to attract youth to the sector.

Developing a sustainable business model

In the last 5 years, many web and mobile applications have been developed by youth to solve identified agricultural challenges. But, as I mentioned before, digitalisation is costly and ICT-enabled agribusiness start-ups are often difficult to sustain. For example, a young person can develop a digital solution that provides market prices and weather information for farmers in a certain region. Technically, the solution might work, but the problem that often arises, is who will pay for the service? For me, this is one of the biggest problems with digitalisation in agriculture. It takes time to educate farmers and convince them that the digital solution is a valuable investment by showing them how the information provided will actually increase sales. Developing a viable business model to sustain such digital solutions is still a work in progress. There is very little evidence that shows that the use of digitalisation by youth in agriculture is actually working as a sustainable business.

Digitalisation is only part of the solution when it comes to attracting youth to agriculture. The starting point should, in fact, be about identifying what attracts youth to agriculture. The digital component is definitely important, but from my experience working with youth in agriculture, the first thing they say that has kept them in the sector is the passion they have for what they do. Hence, it is important to find a balance and see where digitalisation can fit into the picture. ■

Poll

Is digitalisation alone enough to attract youth to agriculture?

38%

With the right skills and training, young people will use digital agricultural innovations to flourish in the sector

28%

Digitalisation will not eradicate the stigma associated with agriculture without significant investments in education about the opportunities in the sector

20%

The revolutionary impact of digital technologies in reducing drudgery and increasing incomes will attract more youth to agriculture

14%

To benefit from the opportunities of digitalisation young people must first have better access to finance

Other debates

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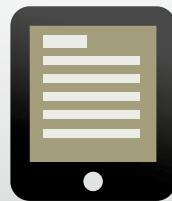
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