Reflections on digitalisation

Contents

ICT Update

http://ictupdate.cta.int

20 years of ICT Update: Looking back to see forward

Yanick Bakker and Chris Addison

In 2004, in *ICT Update* issue 18, Rutger Engelhard, former coordinating editor of *ICT Update*, painted a picture of a day in the life of an agricultural extension worker in Kenya in 2020. The picture was hopeful: extension workers would have state-of-the-art technology, allowing them to link up mobile devices with satellites to receive the latest information, collect field data and conduct real-time analyses. Although the technology Engelhard dreamt of may not be available to the wider public at that scale, thanks to ICT solutions, a lot has changed in the past decades for extension workers, smallholder farmers and the agri-food sector across the ACP region.

For this issue, we reflect back on almost 20 years of *ICT Update* (nearly 100 issues). *ICT Update's* objective has always been to capture contemporary developments in ICTs for agriculture; the trends, latest technologies and stories from the field. By looking back, we can see significant changes in the ICT4Ag landscape, and draw lessons on how to move forward and address ongoing challenges for inclusion, adoption and innovation. This issue highlights three of *ICT Update's* recurring themes: learning; barriers for inclusion and adoption of ICTs; and innovation and entrepreneurship.

Learning

In 2003, when ICT Update had its first dedicated issue on extension (issue 14, *Agricultural Extension*), the question of how ICTs were transforming agricultural extension was raised. ICTs were shown to be broadening the range and increasing the quality of extension services, despite limited web access and ICT tools at the time. It was predicted that traditional 'training & visit' extension, based on linear information flows, would not survive the digital revolution. Instead, multi-channel learning through ICTs would significantly change the extension landscape.

In 2009, the possibilities for interactive multi-channel learning were becoming visible through rural radio (issue 49, *Livelihoods*). Taking advantage of the increased adoption of mobile phones in rural regions, Farm Radio International (FRI) had been experimenting with strategies to make radio more interactive, through SMS, MP3 recorders and voice messages on air. Ten years later, FRI looks back at its African Farm Radio Research Initiative and the continuing relevance of radio in an increasingly digitised environment (P. 6).

It seems that ICTs have changed the extension landscape; radio, being an entrenched technology, continues to be reinvented, making use of opportunities new ICTs offer. Likewise, interaction between extension agents and farmers is more interactive and digital information is more timely, accurate and tailored. Professor Agwu Ekwe Agwu of the Department of Agricultural Extension at the University of

Nigeria discusses the extension landscape in Nigeria today, and the opportunities and challenges of ICT adoption for and through extension services (P. 4).

ICTs continue to create new opportunities for interaction, knowledge exchange and learning. In 2016, issue 81 explored the power of online learning communities – or Communities of Practice (CoP), such as DGroups or CTA's Web2forDev. Drawing lessons from different CoPs CTA has hosted over the years, Giacomo Rambaldi of CTA shows how WhatsApp has served as a platform for the Africa Goes Digital CoP of over 30 African start-ups in Unmanned Aerial Systems (or drone) services (P. 12).

Barriers for inclusion and adoption

Despite the many opportunities ICTs offer, barriers for large-scale adoption and scaling of ICT4Ag initiatives to reach rural populations still remain an issue; poor ICT infrastructure and power supply, (digital) illiteracy and high costs of services. Tim Unwin, UNESCO Chair in ICT4D, argues that access to internet and digital technologies is fundamental for the inclusion of the rural poor in development (P. 10). In 2013, *ICT Update* dedicated its *Small Islands and e-resilience* issue to the specific challenges small island states, such as in the Pacific, face in accessing the web. Pacific islands rely heavily on public investment for network development, and advancement of the digital ecosystem differs widely between different islands. ICTs are, however, key in overcoming the geographical barriers that have hampered development in the past. Sheikh Izzal Azid and Varunesh Rao of the University of the South Pacific shed light on connectivity challenges in the Pacific. (P 14).

In addition to the fundamental need for inclusive access to ICTs, Unwin argues that to truly benefit and emancipate rural poor populations, ICT solutions need to be designed by them, not for them. With 40-50 % of Africa's smallholder producers being women, their inclusion in this process is non-negotiable. Throughout the years, *ICT Update* has focused on women's empowerment through ICTs, gender in ICT initiatives and women-led initiatives on ICT4Ag. In 2004, for example, *ICT Update* highlighted the winners of the 2003 GenARDIS small grants fund, which was set up to support grassroots level work on gender-related issues in ICT4Ag. Between 2002 and 2010, GenARDIS selected 34 grantees from 21 countries from over 900 applicants, divided over three rounds. GenARDIS jury members Helen Hambly Odame and Dorothy Okello, look back on the GenARDIS project and the continued need for gender-inclusive policies and practices (P. 16).

Innovation and entrepreneurship

Digital innovation in support of agricultural transformation can enhance social inclusion, not only of women, but also of youth, through the creation of jobs and entrepreneurship opportunities in the agricultural sector. Discussing the findings of the 2019 CTA/Dalberg report on *Digitalisation of African Agriculture* (see Resources), Ben Addom of CTA highlights the need to address structural barriers for scaling of digitalisation and ICT4Ag by garnering investments from beyond the donor community (P. 18). The public sector is key in creating an enabling environment, but the private sector is needed to generate innovation and build on sustainable business cases. As such, all three major players (public, private and donor community) provide push and pull factors for entrepreneurship and employment through digitalisation in agriculture. These push-pull factors are captured in the framework for youth employment and entrepreneurship in agri-food systems developed by CTA

and Wageningen University & Research (P. 20). Hello Tractor is an example of how an innovative technology solution can, with the right support and business cases, support smallholder farmers, create employment and generate revenue for scaling and further development (P. 22).

A new phase

ICT Update developed from a series of observatory meetings looking at the use of new information and communication technologies in agriculture and rural development in ACP countries. To keep stakeholders updated, an e-mail newsletter was established in the 1990s, which developed into a printed magazine, a website, a CD-ROM, live events, a Twitter account and Facebook page. Over the years, *ICT Update* has reached tens of thousands of readers. The articles have been used for various purposes, such as for teaching in Kenya, for developing strategy documents by the Malabo Montpellier Panel, and at field level by book clubs, such as the one run by the Women of Uganda Network in Uganda.

Over time, the topics *ICT Update* has covered have changed; using machine learning to analyse the articles, the latest review of *ICT Update* online shows that different regions have had differing issues and priorities. Telecentres developed rapidly in East Africa in the early 2000s but small island states have only benefitted from full internet connection in the last two years. Articles from West Africa have tended to focus more on inclusion issues, compared to East Africa where data and policy issues were a higher priority. The writers of this editorial will examine these trends and methods of supporting ICT development through new forms of communication in a forthcoming workshop.

As *ICT Update* closes with one final issue to come we ask you to send your feedback on how you have used it, how it has been useful and what you think is needed to identify and communicate the use of ICT in agriculture. ●

Feedback can be sent to Didier Muyiramye at CTA: muyiramye@cta.int

About the authors

Yanick Bakker is editorial consultant for *ICT Update* and an expert in rural sociology, food security and research and development. yanick.bakker@gmail.com

Chris Addison is senior programme coordinator at CTA and leads the Data4Ag project. addison@cta.int

Challenges and opportunities for ICT adoption in agricultural extension

Professor Agwu Ekwe Agwu and Nwokorie Uchechi

With the majority of extension personnel in Nigeria having access to computers, telephones and radio equipment, more farmers are being reached with agricultural information than ever before. However, challenges of inclusion and affordability remain.

ICTs generally refer to an expanding assembly of technologies (including mobile phones, smartphones, computers, the internet, CDs/DVDs, email, radio, television, and cameras) used to handle information and aid communication. ICTs enable individuals to create, collect, process and manage information in different ways (voice, text or image). There is scarcely a field of human activity today that has not been touched by the dramatic changes in ICTs. The use of ICTs in agriculture in ACP regions, for instance, is progressing, with growing appreciation of the importance of increasing access to information.

However, challenges exist to using ICTs in this field, such as: erratic power supplies; fluctuating networks; high costs of ICT infrastructure; low incomes of rural farmers; lack of policies to enhance ICT development in rural areas; and a lack of necessary skills to use the technologies. Despite such problems, opportunities abound in terms of adoption of novel agricultural practices promoted through ICTs, and more farmers in the ACP region have developed their ICT literacy via extension training, increasing the use of such technologies. Further, ICTs are considered to be transforming agricultural extension through enabling greater access to text, graphics, audio and video files in an integrated manner.

Revitalising extension

Over time, the permeation of ICTs into agricultural extension practices has provided a platform for extension workers and farmers to communicate from afar, and to enhance the provision of information and new technologies. With greater access to such information, farmers are able to improve their production, incomes and standards of living.

In Nigeria, the federal government is currently focused on revitalising agricultural extension services by empowering and equipping extension workers with IT skills to support farmers in the areas of: digital farm mapping; soil type identification; meteorology; and agricultural records. The establishment of farmer helplines by the National Agricultural Extension and Research Liaison Services to provide support for planning, production, storage and distribution of crops, livestock, and fisheries products is also changing extension practices in the country in terms of service delivery.

Studies conducted in Nigeria show that the majority of extension personnel have access to computers, radio, telephones, television and video recording equipment, which they could put to use in the provision of all their activities if provided with the necessary training, infrastructure and funding. Indeed, positive changes have been recorded in the use of ICTs by extension officers, who acknowledge that the issue of farmer reach has been abridged to a large extent through the technologies. And, whilst the use of ICTs has not been totally adopted by extension officers in all of their activities, there is hope that, in the next few years, the technologies will be absorbed into the majority of extension duties on a large scale.

Electronic inputs

In 2012, the Federal Government of Nigeria introduced the Growth Enhancement Support (GES) scheme, which was designed to deliver government-subsidised farm inputs

directly to farmers via GSM phones. The GES scheme is powered by e-Wallet (an electronic distribution channel), which provides an efficient and transparent system for the purchase and distribution of agricultural inputs based on a voucher system implemented by public extension services. The scheme provides registered farmers e-Wallet vouchers with which they can purchase fertilisers, seeds and other agricultural inputs from agro-dealers at half the usual cost – the remainder being covered by the federal and state governments in equal proportions. About 20 million people have benefitted from this scheme, and while awareness is increasing, teaching in the use of the technology, through extension, is still required to harness the rewards.

ICTs vs traditional extension

Considering the urgent need for continuous and up-to-date agricultural information by farmers, the use of conventional communication channels as entrenched in the training and visit (T&V) extension approach, such as farm/home visits, personal letters, and use of contact farmers for disseminating agricultural information, is becoming less effective. This has prompted the use of ICTs as a faster medium for communicating agricultural information. However, T&V extension methods and ICTs can be used interchangeably for optimum effect.

In cases where the T&V approach is still being used, ICTs serve a complimentary role. Extension officers can, for instance, use ICTs to propagate agricultural techniques taught during T&V. ICTs can also be used by extension officers to monitor farmers' progress in terms of adopting such techniques, and serve as a channel for farmers to seek advice when they encounter problems.

One such application that requires traditional extension methods is RiceAdvice, which was launched by the Deutsche Gesellschaft für Internationale Zusammenarbeit's Centre for Green Innovation in 2016. The aim of the smartphone application is to bolster rice yields in Mali and Nigeria by generating optimum fertiliser rates for farmers, and increase youth employment by training them to advise farmers on how to use the app. Currently, the application is used by public sector extension agents who provide production recommendation printouts to individual farmers.

Women's inclusion in extension

The Women-in-Agriculture sub-component of Nigeria's Agricultural Extension Programme (ADP) was designed to source, adapt, generate and disseminate agricultural information for the purpose of increasing food production, maintaining food value and raising the income of women farmers. The aim is to improve and raise the standard of living for rural women. The institutional framework of the ADP has been designed to achieve this aim by employing female extension workers at every level of operation – from state headquarters down to villages – in every state. These women work directly with women farmers, identifying and organising them into groups, then registering these groups as cooperative societies. As cooperatives, the women farmers have better access to farm inputs and credit than they would as individuals.

Until now, the rate of ICT use by rural women farmers has revealed the constraints they face when it comes to taking advantage of such technologies. A number of gender studies have shown that the main ICT users (especially of computers, the internet and e-mail) are young men, and that women are marginal users, suggesting a gap between discourse and the reality of women's empowerment through ICTs. However, more women have access to ICTs with their increasing availability, enabling extension officers to reach women directly without depending on the influence or ownership of ICTs by men/husbands. Despite this, women who are not financially independent of their husbands usually have to ask for help towards maintaining the ICTs in question, which could pose a threat to their effective use by women.

ICTs for the future

To further support extension practices with ICTs, certain conditions need to be put in place. Provisions should be made for subsidies in phone recharge cards and internet subscriptions to increase affordability for farmers at all times to seek information on agricultural practices. More so, erratic power supplies and network fluctuations should be reduced through the development of necessary infrastructure to better serve rural farmers. ●

About the authors

Professor Agwu Ekwe Agwu is the dean of the Faculty of Agriculture and teaches in the Department of Agricultural Extension at the University of Nigeria Nsukka. He was also the National President of the Agricultural Extension Society of Nigeria from 2014 to 2018. ekwe.agwu@unn.edu.ng
Nwokorie Uchechi has a Master's degree in agricultural extension specialising in agricultural communication from the University of Nigeria, Nsukka and a Bachelor's degree in Agricultural Extension. maychekorie@gmail.com

The enduring power of radio for agricultural extension in Africa

Karen Hampson and Blythe McKay

A radio programme that works across sub-Saharan Africa has adopted interactive digital tools to better reach men and women farmers with agricultural and climate information to support production decisions.

Charles Wandera is a farmer in Masindi district, Uganda. The area was recently hit with an infestation of the invasive Fall Armyworm, which caught farmers off guard in Masindi, leaving them unaware of how to defend their crops against the pest. Wandera turned to the radio for a solution. He started listening to a programme on Radio Kitara, supported by Farm Radio International (FRI), a Canadian NGO that works with radio broadcasters to deliver programmes aimed at small-scale farmers and their communities.

With funding from funding from the non-profit organisation, CABI, FRI trained Radio Kitara to produce and air programming about Fall Armyworm. "All along we have been lacking information on how to fight Armyworm, but from the time we got a chance with this project with Radio Kitara, we are getting information Monday and Fridays," says Wandera. The radio programme describes how to recognise the pest, how farmers should monitor their fields for Armyworm and what control methods are most effective.

Like other projects it is involved with, FRI conducted audience research to identify which radio stations farmers trusted and listened to most, as well as what specific information was needed by female and male smallholder farmers. FRI then worked closely with experienced farmers, topic specialists and radio broadcasters to design the programmes, ensure accuracy of content and respond to listeners questions and information needs using a suite of digital tools.

The programme on Fall Armyworm is not unique among FRI projects. Across sub-Saharan Africa, the international NGO also runs interactive radio programming on agriculture, nutrition, climate services, gender issues and mental health.

It has been 40 years since FRI first started work, sending information in the form of radio scripts and tapes to broadcasters across the developing world. Like technology itself, FRI's work has evolved substantially since its inception in 1979. However, its focus on improving the lives of farmers and their communities by supporting rural radio broadcasters has not wavered. The radio landscape has changed greatly over the years, with diversification and expansion of radio stations, widespread use of local language programming and the possibility for greater audience interactivity. Adapting to these changes, FRI has also been inspired by the arrival of ICTs and digital tools. Contrary to what might be assumed, 'new' ICTs and digitalisation have not heralded the death of radio. Instead, they offer many exciting opportunities for radio producers and listeners alike, and make radio all the more powerful as an extension and digital advisory service.

In 2007, FRI was given the chance to gather evidence of radio's effectiveness, with the launch of the Bill & Melinda Gates Foundation-funded African Farm Radio Research Initiative (AFRRI). FRI implemented an action research project across five countries that sought to capture hard evidence – for the first time – on the ability of participatory radio campaigns to educate small-scale farmers and support them in making productive changes on their farms. The research, reported in 2011, showed that farmers throughout the areas covered by a broadcasters' signal could be expected to listen in large numbers (66% of potential listeners), learn from what they heard, and introduce the practice featured in the radio campaign (21% of listeners, on average).[1] The results spoke for themselves. FRI expanded its operations into proactively promoting the use of interactive radio as an efficient and proven means for communicating, sharing good practices and delivering a range of development outcomes at scale – sometimes to hundreds of thousands of rural listeners at a time.

FRI continues to see results similar to this original study and the project's multi-stakeholder approach offers development partners the ability to use interactive radio to help bring improved practices to scale. Since 2007, the 232 radio stations that FRI has directly partnered with serve an estimated 141 million Africans, including 46 million adults in the rural areas of 11 countries. In 2017 alone, an estimated 20 million rural adults tuned in to interactive agricultural radio programmes in these countries, broadcast as part of 30 FRI projects, and 4 million of those listeners improved their practices as a result. These figures alone show the continued appeal of radio, and radio's unique reach and scale in sub-Saharan Africa.

Contrary to what might be assumed, 'new' ICTs and digitalisation have not heralded the death of radio. Instead, they offer many exciting opportunities

Nebiyu Yetsedaw/FRI

FRI runs interactive radio projects across sub-Saharan Africa, develops interactive tools aimed at social inclusion and audience responsiveness, and shares content and training resources with close to 900 radio partners.

Is radio still relevant today?

With good information, small-scale farmers can make better decisions. Access to information and free discussion is a tool of empowerment, especially for citizens who are geographically, economically or socially disadvantaged. Indeed, freedom of information and expression is a fundamental human right[2], and the internet, TV and newspapers are still out of reach for the majority of rural smallholder farmers. Plus, face-to-face agricultural extension is often insufficient, leaving smallholder farmers, particularly women and those in very remote locations, without access to the information they need to improve their harvests. Greater access to mobile phones and the internet provide many opportunities, but barriers remain regarding connectivity, cost, electricity, access, language and literacy. Radio, on the other hand, is established in people's homes, cultures and daily lives; it is responsive to current events and farming topics, and is available in local languages. Today, radio is more attractive and effective than ever as it takes advantage of mobile phones and the internet, and can harmonise and benefit from various digital tools. Radio listeners can access text or voice information offline, take part in call-in programmes, hear their questions answered and get linked to service providers. Through interaction, listeners themselves can help shape programmes to respond to their own needs and those of their communities – making them all the more likely to tune in.

Radio is also significantly less expensive[3] than traditional face-to-face extension models. FRI estimates that the cost of a participatory radio campaign is approximately US$1 per farmer. In places where extension agencies are often understaffed, radio is able to reach rural and spread out audiences with farming knowledge, and so build market connections.

Interactive radio programming

Building on the results of the AFRRI project, FRI continues to experiment with ways to combine radio, mobile phones and the internet to provide the most cost-effective and impactful digital services to farmers – for both men and women. *Uliza* ('ask' in Swahili) is FRI's innovative solution for audience engagement, monitoring and quality assurance. The online platform allows the radio stations involved to engage hundreds, often thousands, of radio listeners – who lack internet access themselves – using their mobile phones before, during, and after farm radio programmes air. Listeners can vote, register for alerts, access additional information or content and get their questions answered. Listeners also leave messages on *Uliza* saying what they think of the programmes and how these can be changed to suit their needs. Content can be delivered to listeners in their own language, eliminating literacy barriers, and, using a 'beep for call-back' service, calls can be triggered free of charge. Broadcasters upload episodes each week to *Uliza*, and then FRI staff and subject matter specialists involved in the project listen to the episode and provide feedback to the station team so they can improve subsequent episodes.

Above: Farmers in Ethiopia listen to an agricultural radio programme as they work.

Right: FRI staff test the *Uliza* platform – a suite of tools aimed to make radio more interactive than ever and connect farmers with broadcasters.

Below left: An example dashboard of the *Uliza* platform and what broadcasters can see and access.

Below right: In a world of digital technology, radio remains accessible, inexpensive, and easy to use and, above all, effective, which is why FRI continues to use radio, in combination with other digital technology, to reach farming families and their communities.

Nebiyu Yetsedaw/FRI

Measuring impact

Measuring radio's impact on audiences is complex as it is difficult to identify true control communities. Some stations have national coverage, while in areas without a signal, listeners communicate with those who cannot listen to programmes. Radio's effectiveness can be assessed through estimates of listenership as well as changes in knowledge, attitudes and practice. FRI uses mapping of FM radio transmitters, quantitative household surveys and qualitative techniques to measure the impact of specific radio interventions. FRI has generated a range of results in recent years, showing that interactive radio, when carefully designed with broadcasters and monitored by audiences and experts, increases knowledge and promotes the use and scaling of agricultural techniques among small-scale farmers[4]. For example, in 2016, interactive radio promoted forest landscape restoration among 270,000 listeners to the Voice of Lango radio station in eastern Uganda. Eighty three percent of listeners tried drought resilience practices following the radio programmes, with radio cited as the most important influence on uptake.[5]

Women's participation

As well as sharing essential agricultural information with farmers, radio can give women a platform to have their voices heard[6], increase their confidence and contribute to their civic engagement[7]. FRI developed the 'Her Voice on Air' approach – funded by the International Fund For Agricultural Development – training broadcasters and working with women's community listening groups to solicit and share women's perspectives and experiences as content in radio programmes. The aim of the approach is to foster a sense of empowerment and self-confidence for the women involved. In this approach, all that is needed is one phone in the hands of a community listening group and some technology behind the scenes. During designated weekly radio programmes, each group listens together, discusses the question set during the radio programme and then decides on their response. By calling a special number and leaving a free missed call, the group will receive an immediate call back. The recorded voice on the returned call invites them to give their thoughts over the phone. Each woman's voice is automatically recorded on the *Uliza* platform, from which broadcasters can easily download the audio file and edit for use in their next broadcast.

Hiwot Tirfneh is the leader of the women's radio listening group in her community in Ethiopia, which meets regularly to listen to agricultural programmes aired on Dimtsi Weyane Tigray radio station. Using their smartphone, Tirfneh's group was able to inform Dimtsi Weyane Tigray about the lack of rain they were experiencing. Soon afterward, they were listening to programmes on topics such as water harvesting. This topic, that they once knew almost nothing about, is helping a lot. "We have learned that we have to save every drop we get from the rain. I am applying the techniques and I got good results. You can see a difference even between the crops where water harvesting has been practiced and not," says Tirfneh, who rotates grain crops on her field. Prior to taking up the practice, Tirfneh would harvest about 200 kg of grain during periods of infrequent rains but since adopting the water harvesting techniques, she can harvest 500 kg despite the severe and ongoing drought.

FRI uses this gender responsive approach in many of its projects, where radio stations typically work with up to 10 listener groups. In the 'Her Voice on Air' project, FRI partnered with 13 radio stations whose broadcasts reached over 8.1 million listeners, including 134 community listening groups with over 2,300 members.

Simon Scott/FRI

Right: Elinora Shayo, the leader of a community listening group in Kikwe Village, Tanzania, practices using a smartphone during a training session as part of a radio project that aimed to empower women over the airwaves.

Kathryn Burnham/FRI

Conclusion

Radio is still, on average, the most common method by which farmers access agricultural information – after friends and family. It is estimated that over 80% of populations in sub-Saharan Africa have access to a radio set and use it regularly.[8] Even outside of sub-Saharan Africa, radio attracts regular listeners, and podcasts have seen a surge in popularity. Despite the overwhelming number of sources or types of information and entertainment available to those of us with access to all of the latest ICTs, radio and audio still have a place in our lives – FRI thinks they always will. With the advent of digitalisation, radio offers huge reach and opportunity for tools or apps which gather data, so we can tailor information for specific communities and individuals. FRI has endorsed the 'Principles for Digital Development', and is exploring data-driven advisory services, integration of visuals via mobile tools, machine learning and AI for interpretation of data, so ensuring closed feedback loops and gender responsive programming. In addition, FRI is exploring new business models for sustainability of radio programming. Advances in technology, coupled with the reach of radio and its current place in our lives, present an exciting future for listeners and radio stations alike. ●

About the authors

Karen Hampson, senior manager, programme development, FRI Karen has over 20 years' experience in international development, supporting farming communities on three continents. Karen supports organisational and programme strategy, as well as building partnerships with international organisations and research centres to use radio and ICT-enabled approaches for reaching and engaging with farmers. khampson@farmradio.org

Blythe McKay, director of broadcaster resources, FRI. With over 15 years' experience in radio for development, Blythe has been with FRI since 2005. Her department serves broadcasters with resources and distance training that help them create interactive radio programmes for farmers. She has an MSc in rural extension studies and a BSc in agriculture. bmckay@farmradio.org

References

1 These figures were originally reported in Participatory Radio Campaigns and Food Security (Perkins, Ward & Leclair: Farm Radio International, 2011). They have since been corroborated by more than 50 survey-based outcome evaluations of African farmers in interactive radio program intervention areas, in which FRI has found that a typical interactive radio programme about agriculture on a radio station is listened to regularly by 40-60% of potential listeners (depending on country and region) and on average leads to 20% of listeners applying new practices on their farms. https://bit.ly/2ZEAfrI
2 UNESCO: https://bit.ly/1gFC9fI
3 Percy, Koopman, & Toomey: Landell Mills Ltd, 2019: https://bit.ly/2MNZG8f
4 Hudson et al., 2017: https://bit.ly/30RBKEI
5 Hudson et al., 2016: https://bit.ly/2PqFlbx
6 Farm Radio International, 2017: https://bit.ly/2ZmXbR8
7 IFAD, 2018: https://bit.ly/2FmEwe6
8 UNESCO, 2013: https://bit.ly/1wJad7I and https://bit.ly/2zI06ot

"Smallholders need to be involved in the decision-making"

Sophie Reeve

Tim Unwin, UNESCO Chair in ICT4D and Emeritus Professor of Geography at Royal Holloway, University of London, discusses what is needed in ICT for Development (ICT4D) initiatives to ensure technology and data truly benefit smallholder farmers.

Q *What do you think needs to change in terms of the project design of ICT4D initiatives so that they have a wider impact?*

One of the fundamental problems with ICT4D initiatives is that they are often designed as pilots, not necessarily as sustainable and scalable projects. Unless an initiative is designed at scale, it is highly unlikely that it will ever be able to be implemented at scale. In essence, civil society organisations, start-ups and global corporations often come up with an idea and provide the resources to make sure the pilot works well, then try to persuade donors and governments to pay for scaling so they can roll it out. But invariably, the business model is wrong because it was never designed at scale in the first place. The solution is to design at scale from the very beginning.

If we want to use digital in delivering scale, you've got to begin by increasing technology access – if you haven't got access, you don't even reach stage one. Yes, you need literacy and, of course, any content needs to be relevant, but I'm a great believer in universal access because if you haven't got that, the playing field isn't level. This can be achieved creatively through partnerships where the private sector and governments work creatively together to support the world's poorest.

Q *The private sector is a key implementing partner in ICT4D initiatives, yet, in your blog, you state that the private sector is driven by profitability and cannot have the interests of the poor at heart. Is this contradiction not problematic?*

The private sector is essentially concerned with delivering profit to its owners and shareholders. If it doesn't it goes bust! This a totally different mentality from spending on the poorest and most marginalised without an expectation of generating profit. There is a burgeoning, expanding middle class which the private sector wants to exploit for profit – so it's interested in the 'next billion' not in what is often called the 'lowest billion' (but what I call the 'first billion' because it is of most importance). If you deliver the solution to the poorest and the most marginalised through a business model that enables that, you would be undercutting everyone providing services and marketing to the next billion.

The private sector, the public sector and civil society need to work together collaboratively, but to do that well takes a lot of time and resources. Central to achieving strong partnerships is having a reciprocal agreement in advance – what are you going to give and what do you expect to receive in return.

Q *How is the research of the UNESCO Chair in ICT4D helping to ensure relevant and usable data is generated for the world's smallholder farmers?*

Researchers of the Chair are working, for example, on the algorithms for drones that could be used in agriculture and there is a lot of work being done on relevant and usable data around the Internet of Things (IoT).[1] Having remote sensors at different levels of the agricultural framework and enabling farmers to access and use that data can be effective. For instance, imagine a pastoralist nomad in West Africa who is using historical routes on which to take their livestock to graze at certain times of the year. But due to environmental changes caused by climate variability, the usual pastures have now gone. If they had access to IoT information and remote sensors to provide data on moisture levels and pasture availability at certain locations, accessible on a mobile phone, they would know where to go.

There's not enough knowledge on how smallholder farmers and their families are using digital technologies, so at the Chair we explore this first of all. Once we understand how they are using technology, then we can start working with them so they can really benefit from it. Smallholders have the farming knowledge – they know the local context and the fields, they know

There's not enough knowledge on how smallholder farmers and their families are using digital... Once we understand how they are using technology, then we can start working with them so they really benefit
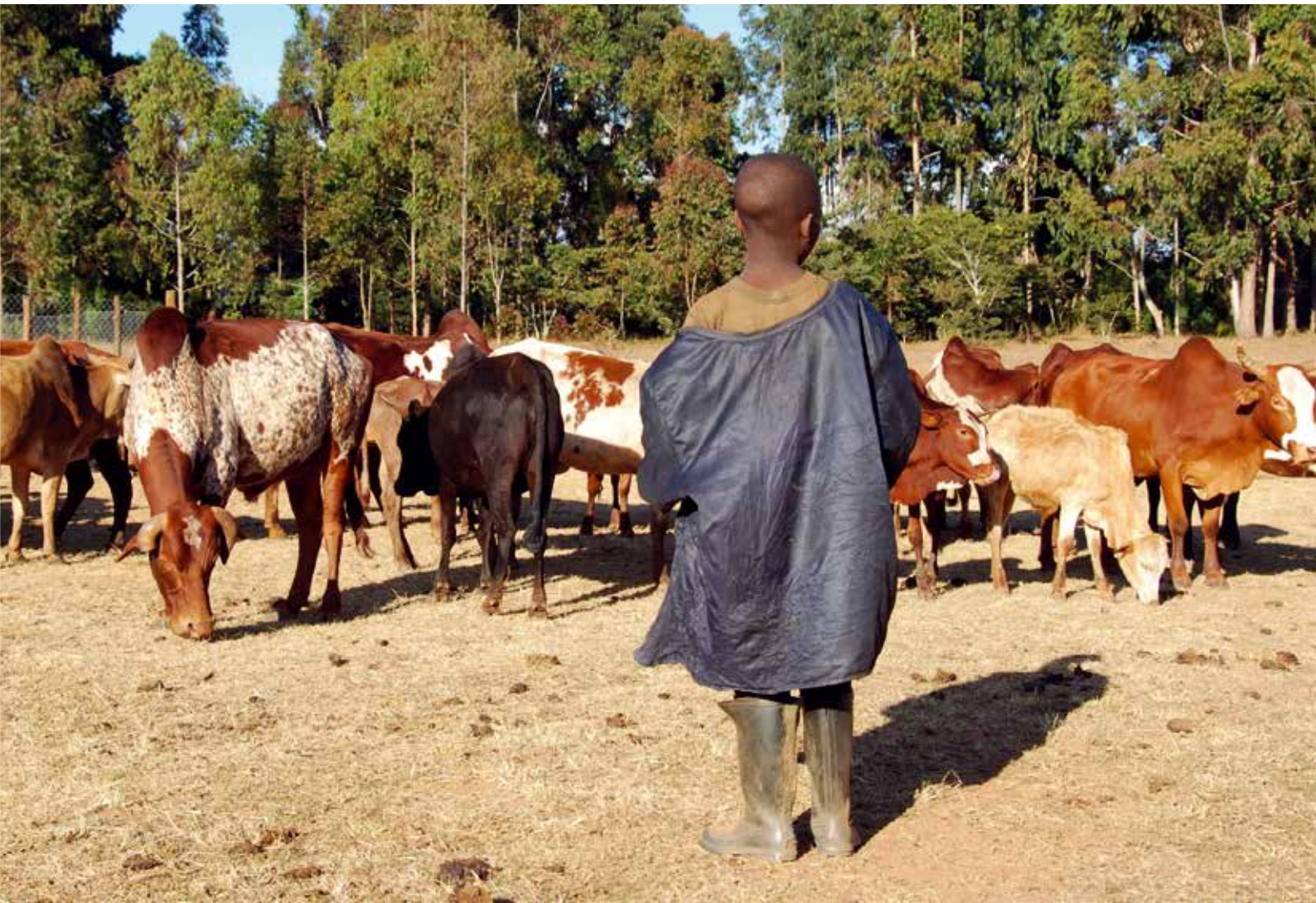
what grows and what doesn't grow, but we have some knowledge on technology. Working together to pool our knowledge would enable us to think about what would really benefit smallholder farmers, instead of coming in with our own ideas. I believe very passionately that if people are not involved in designing the solutions, they will never be truly emancipated by them.

Q *Big Data is expected to have a large impact on 'smart' farming for the future. How can policy help to stimulate the inclusion of smallholder voices in the development of new technologies and digital initiatives?*

In many parts of the world, digital is associated with 'male' but in the same parts of the world, often it's the women who do a lot of the agriculture and are still excluded from using digital technologies. If women are doing much of the smallholder farming, that needs to change to enable them to benefit from it. Policymakers need to look at the multidimensionality of poverty and marginalisation, and think holistically around technology and development. This is one reason we have created TEQtogether[2] to change men's attitudes and behaviours towards women and technology.

Big Data will only help the poor and marginalised be emancipated when they can use it and analyse it themselves. They need to be involved in the decision-making if we are really serious about eliminating rural poverty and improving farming for smallholders. It's not about training them to use our technologies, it's about designing the technologies so that they can use them easily in their own interests. ●

About the author

Sophie Reeve is a writer, editor and designer at WREN*media*, a communications company in the UK.
s.reeve@wrenmedia.co.uk

References

1 See, for example, Sara Bernardini's research on algorithms for drones: http://www.cs.rhul.ac.uk/home/sara/; and Maro Zennaro's work on the Internet of Things: https://www.theinternetofthings.eu/marco-zennaro.
2 https://teqtogether.org/.

Multimedia communication enables innovators to coalesce and thrive: An experience among digital operators in Africa

Giacomo Rambaldi

To bring together and support a Community of Practice (CoP) around Unmanned Aerial Systems (UAS) in Africa, CTA established a WhatsApp thread to encourage digital interactions. This article explores how the platform has helped the community members access new business opportunities.

CTA is an international organisation established by statute, with headquarters in the Netherlands. Its mission is to advance food security, resilience and inclusive economic growth in African, Caribbean and Pacific countries through innovations in sustainable agriculture. Throughout the last decade, CTA has been at the forefront of identifying cutting-edge technological innovations, promoting digital literacy and skills, and providing training and capacity-building for agricultural stakeholders to innovate and utilise digital agricultural solutions.

In 2018, CTA held an Experience Capitalisation Workshop in Ghana to draw out and capitalise on the lessons of its Eyes in the Sky, Smart Techs on the Ground project. The workshop was attended by 12 African start-ups, the initial project partners. Participants were eager to deploy and upscale the use of UAS services (also known as drone-based solutions)

within agriculture and other sectors in Africa. Dr. Abdelaziz Lawani, CEO of partner organisation Global Partners SARL in Benin, suggested the idea of establishing a formal entity, which would represent digital operators in Africa. 'Africa Goes Digital' was born.
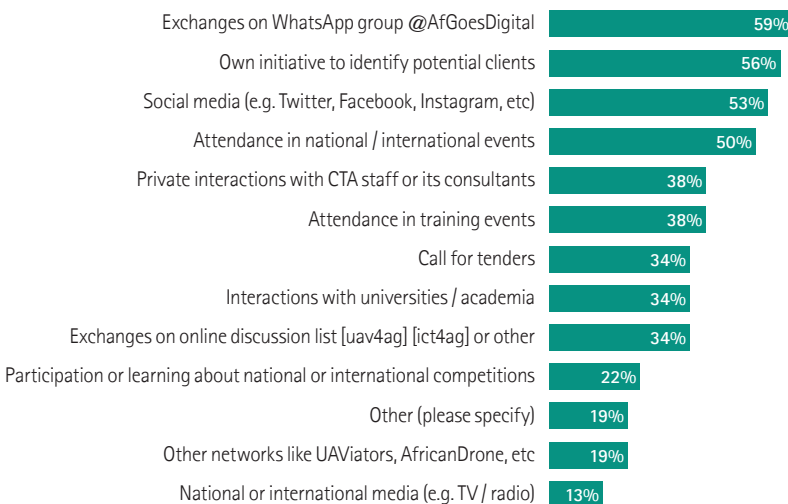
A UAS COP

Wenger (2002)[1] defines a CoP as a group of people who (i) bond on a voluntary basis by exposure to common problems, (ii) share a common sense of purpose, (iii) use common practices and language, (iv) embody themselves a store of knowledge, (v) hold similar beliefs and value systems and (vi) collaborate directly, share knowledge and learn from each other.

Starting with the Ghana workshop, CTA has been incubating the Africa Goes Digital CoP, which now consists of over 40 African start-ups based across 21 African countries. The member companies provide digital services in the sectors of agriculture, energy, surveying, geographical information systems, engineering, construction, oil and gas, disaster risk management, humanitarian research and capacity building in the use of drone technology.

With advisory support provided by Ernst & Young's Ripples Project and TrustLaw, the Thomson Reuters Foundation's global *pro bono* legal programme, CTA is in the

Figure 1 Sources for UAS business opportunities (% of mentioned by 32 respondents)

Exchanges on WhatsApp group @AfGoesDigital	59%
Own initiative to identify potential clients	56%
Social media (e.g. Twitter, Facebook, Instagram, etc)	53%
Attendance in national / international events	50%
Private interactions with CTA staff or its consultants	38%
Attendance in training events	38%
Call for tenders	34%
Interactions with universities / academia	34%
Exchanges on online discussion list [uav4ag] [ict4ag] or other	34%
Participation or learning about national or international competitions	22%
Other (please specify)	19%
Other networks like UAViators, AfricanDrone, etc	19%
National or international media (e.g. TV / radio)	13%

Source: June 2019: Outcome and Impact Survey

Figure 2 Sample exchange on the WhatsApp group
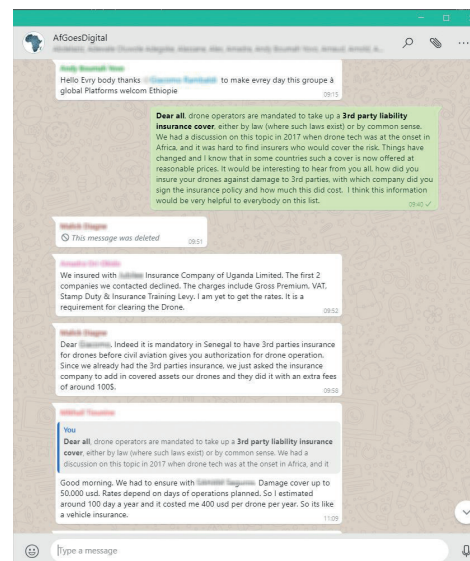
process of establishing Africa Goes Digital as a separate legal entity. The objective of this is to provide members with: marketing and advisory support, exclusive networking opportunities and cooperation, access to discounted rates on software and hardware, joint capability to support business pursuits and access to a knowledge database. The CoP will not engage in any for-profit activities, although its members will.

Determining the most appropriate exchange platform

When Africa Goes Digital was initiated, a WhatsApp group was established to facilitate interactions between members. The group has become the pulsating heart of the CoP and has continued to grow – consisting now of approximately 60 members from across 20 different African countries.

An online survey carried out in June 2019 among 32 English and French-speaking members of the CoP, each representing a different organisation on the network, revealed that the WhatsApp group was considered the best source of information leading to business opportunities for 59% of respondents. This was followed by 'own initiative' (56%) and social media platforms (53%) as shown in Figure 1. Interestingly, those who cited the WhatsApp group as the best source are also the most active members of the group. Those who did not mention the WhatsApp group as a source of business opportunity may not be regular followers of the platform exchanges.

Traditionally, CTA has supported interactions within specific interest groups via dedicated DGroups (email-based discussion lists), but in this particular case, a WhatsApp group was the preferred platform of project beneficiaries. Project members were also invited to join relevant DGroup communities like UAV4Ag or ICT4Ag. The UAV4Ag discussion list is specific to drone technology for agriculture in developing countries and hosts more than 1,150 members from 117 countries. However, results of the June 2019 survey indicate that exchanges on the DGroups have been a source of business opportunities for only 34% of respondents.

Table 1 summarises key differences between the two platforms and may explain the preference for the WhatsApp group. It is evident that members of the WhatsApp group had the opportunity to develop closer interpersonal relations thanks to the fact that the group is small, confined to one continent, and that the platform offers multiple channels and means for communicating (text, images, voice and video). The group embodies all criteria listed by Wenger in his definition of a CoP, but in addition to this description, Africa Goes Digital members take joint actions in terms of branding, marketing, social media promotions, participation in calls for tenders and contract implementation.

Communication is and has been at the core of the development and consolidation of the community, with the WhatsApp group playing a key role in the process. Both the WhatsApp and DGroups platforms benefitted from inputs from one or more animators – committed individuals who inject content and stimulate discussion and exchanges. Still, the success of the smaller WhatsApp group has been driven by the trust between members which exists to a greater extent than within the DGroup community. Hence, exchanges are frequently aimed at pooling resources or solving problems and challenges faced by one or more members, and highlighting business opportunities or calls for tenders from development actors. The benefits are immediate, just like the multimedia communication, flowing easily between members and their mobile devices. ●

Table 1 Comparison between the WhatsApp group and UAV4Ag DGroup community

Criterion	WhatsApp @AfGoesDigital	DGroup UAV4Ag.org
Launch (year)	2017	2016
Size of the community	Small (57 members)	Large (1,156 members)
Members	Mainly entrepreneurs (invited)	Mixed backgrounds, including entrepreneurs, researchers, development agents, government officials, students, etc.
Countries represented	20	117
Familiarity among platform members i.e. they already know and see each other	High	Low
Frequency of exchanges	Daily	Weekly
Moderation of posts	None	In place
Geographic coverage	Continental (Africa)	Global
Language	Bilingual – Google Translate supported	Mainly English
Face-to-face meetings among members	Planned, once a year	Random / occasional and involving few members
Platform allows one-to-one messaging as well as group chats	Yes	No
Platform allows voice interactions	Yes	No
Platform allows for image sharing	Yes, directly from the device (smartphone)	Complex. Involves the use of a dedicated app and the email client
Platform enables sharing of recorded voice messages	Yes, directly from the device (smartphone)	Complex. Involves the use of a dedicated app and the email client
Platform allows for video conferencing	Yes, via the smartphone	No
Platform allows for searching past exchanges	Yes	No
Access	Private (upon invitation only)	Public (as chosen by the administrator)
Technology	Mobile device app and computer interface	No app Linked to email client

About the author

Giacomo Rambaldi is senior ICT programme coordinator at CTA. Areas of professional interest include cutting-edge digital solutions including drone technology, documenting indigenous spatial knowledge for improving communication and managing territorial conflicts, and strategic use of social media. rambaldi@cta.int

Reference

1 Wenger E., McDermott R., Snyder W. 2002. Cultivating Communities of Practice, a Guide to Managing Knowledge, Harvard Business School Press, USA

ICTs for development in the Pacific

Sheikh Izzal Azid and Varunesh Rao

To help address social and economic areas for development in the Pacific, such as agriculture, human health and extreme climate, innovative ICT tools are being created and implemented in the region.

The development of ICTs in the Pacific Island Countries (PICs) is a key factor associated with sustainable and economic development in the region. Communication and information dissemination on PICs is hampered by various factors, including the scattered nature of the populations, small markets, a lack of infrastructure and human resources, and high costs of connectivity.

ICT development can be beneficial for various aspects of Pacific agriculture, including improved production and marketing efficiencies, especially in rural areas. Communication between farmers and buyers has broken down in the absence of a proper pathway to connect. The development of ICT tools can help to bridge this gap, providing farmers and buyers a platform through which to communicate on agriculture-related issues such as produce quantities, delivery and costs, etc. The development of ICT tools would also allow for more efficient marketing as it would generate the platforms needed to promote farmer goods and attract buyers.

ICT development can be beneficial for various aspects of Pacific agriculture, including improved production and marketing efficiencies, especially in rural areas.

Another example of ICT benefits on PICs is their ability to help combat non-communicable diseases (NCDs), which are prevalent in the region. WHO has stated that, *"NCDs are a leading cause of premature death and disability in the Pacific. Efforts to reduce risk factors for NCDs such as creating supportive environments to make healthy choices, strengthening community action, and increasing accessibility to prevention and management services are essential to preventing NCDs and their complications"* [1]. Through the development of ICT tools, such as the MyKana App, which works by tracking dietary intake on a daily basis, more and more Pacific islanders are able to monitor their calorie intake and develop better health regimes.

As well as the spread of NCDs, PICs are being immensely impacted by extreme weather patterns such as tropical cyclones, flooding, droughts, etc. In order to adequately provide surveillance, transmit timely information to raise awareness, observe the impacts and collect data, appropriate forms of technology have to be developed and implemented. Such developments will help to create a more rigorous weather-monitoring system in PICs for use during natural disasters. The development of high intelligence drones with appropriate connectivity tools, for example, would be useful for surveillance and evacuation during floods and tropical cyclones.

The adoption of appropriate ICT tools for the PICS is, however, the adoption of appropriate ICT tools for the PICs is restricted by connectivity challenges. Internet connectivity is as an enabling technology; without it, high precision agriculture devices and other advanced technologies cannot be operated to their full capacities.

Innovations in Pacific connectivity

A few innovative developments in the Pacific region which will boost connectivity are:

1. Fiji

a. The University of the South Pacific (USP)
In 2016, consultations between USP and the New Zealand Ministry of Foreign Affairs had commenced regarding the upgrade of the USPNet (a NZ\$4M project), a USP-owned satellite-based network. The network allows the University to deliver flexible learning and assist in educational opportunities in its 12 member countries in the Pacific region. The upgrading of this technology allows the region to communicate more effectively with scope for restoration of connectivity in the event of a disaster.
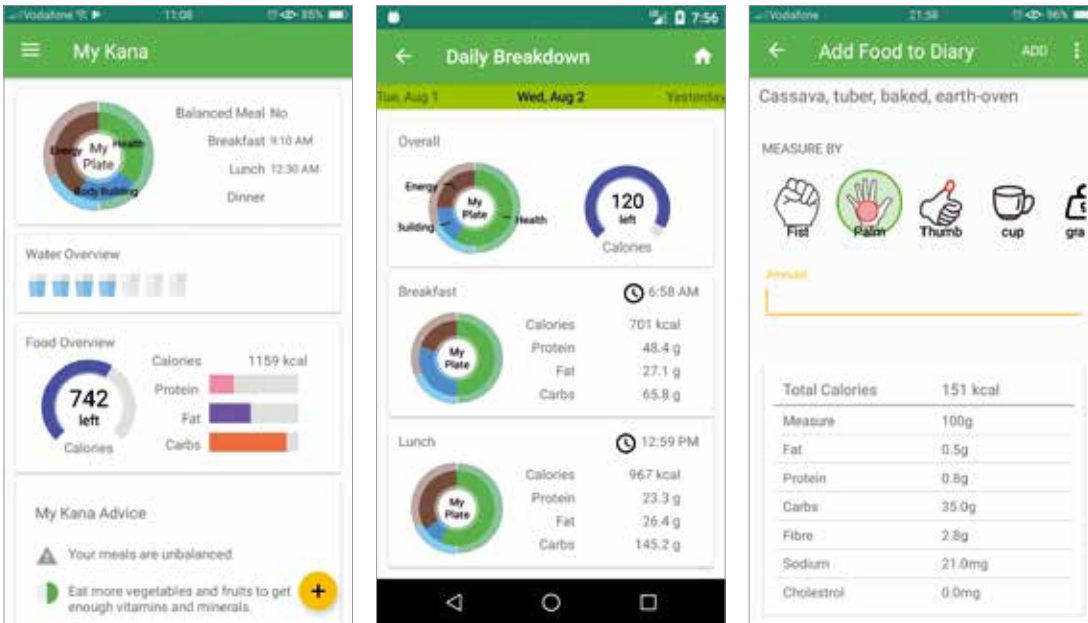
b. Digital Fiji
Digital Fiji is a digital transformation programme run by the Fijian Government to improve its ICT infrastructure and the quality and accessibility of government services. Under the project, an online application was developed through which citizens can communicate more directly with their local government to raise queries and gain access to relevant information.

2. Samoa
a. Tui – Samoa Submarine Cable
The Tui – Samoa Submarine cable is part of Samoa's National Cybersecurity Strategy 2016-2021, which connects Samoa to Fiji (while also branching to Wallis and Futuna and Vanua Levu in Fiji). It is now connected and serving the Pacific region with fast, reliable and affordable connectivity.

3. Vanuatu
a. Kava World
Digital platform, Kava World, is an innovative solution of Pacific Digital Transformation Consultants. The technology bridges the digital divide to connect growers, sellers and consumers of Kava on a global scale, and support small-medium sized enterprises.

Whilst innovations such as the above have proved successful, poor connectivity in PICs remains a barrier to the efficient implementation and use of appropriate ICT tools. For ICTs to be utilised to the full potential, their development should occur simultaneously with improved connectivity in the region. ●

About the authors

Sheikh Izzal Azid is a lecturer at the Faculty of Science, Technology & environment at the University of the South Pacific. sheikh.azid@usp.ac.fj
Varunesh Rao is an ICT professional with a background in computing science and information systems from University of the South Pacific. varunesh.rao@usp.ac.fj

References
1 World Health Organisation (2017). Pacific Island Countries and Areas – WHO Cooperation Strategy 2018–2022. https://bit.ly/2m9hIpv

Above left: The MyKana app has been developed to promote a healthy way of living using local foods in the Pacific

Above: Tropical fruits and vegetable selling at Nadi produce Market Fiji.

Expanding the reach and benefits of digital agriculture

Helen Hambly Odame and Dorothy Okello

Below: Gbagyi Women in Nigeria participating in the African Radio Drama Association listener's club

The Gender, Agriculture and Rural Development in the Information Society initiative was established in 2002 to support projects aimed at leveraging ICTs to enhance farmer knowledge and productivity. But did the programme help to close the gender and urban-rural gap in ICT access? Or is there a need for the scheme to be rolled out again?

This article reflects back to 17 years ago, when CTA held its 5th observatory meeting in September 2002. At the 'Gender and Agriculture in the Information Society' observatory, ACP experts were joined by staff from the Canadian International Development Research Centre and two international organisations based in the Netherlands, the International Institute of Communication and Development and the International Service for National Agricultural Research. Participants discussed how to move forward to address gender issues related to ICTs in agriculture and rural development. It was apparent that more direct action was needed from gender initiatives, such as ICT training, women's leadership in agricultural technology policy, and relevant content development and testing in rural communities.

To the interdependent end goals of reducing poverty, empowering women and ensuring gender equality in agricultural systems and rural areas, ICTs provide a very powerful means of accessing information, and creating and mobilising knowledge to strengthen financial and human capacity, and a security of food and wellbeing. However, the development of ICT infrastructure is often concentrated in urban centres which excludes a large rural population – mostly women and youths – and limits their ability to fully and actively participate in, and benefit from, the information society. It's against this back-drop that Gender, Agriculture and Rural Development in the Information Society (GenARDIS) was initiated by the participants of the observatory meeting.

The GenARDIS programme and projects

From 2002-2010, GenARDIS released three rounds of small funds of between €2,000 and €7,000, with a total programme investment of €200,000, for 21 wide-ranging projects.[1] Given these relatively modest seed grants, expectations were kept in check, but it was anticipated that the funding would make a significant difference for those groups looking to set up radio programmes, acquire computers and handheld devices, cover the costs of cellular services, conduct hands-on training and start up new agri-businesses.

The beneficiary projects aimed at leveraging the use of ICTs – both traditional and modern – to enhance farmers' knowledge and information, promote productivity and enhance smallholder revenues, amongst other goals. For instance, the Toro Development Network (TORODev) in Uganda used a combination of information dissemination channels to reach out to farmers, such as providing access to timely agricultural information, finance and credit facilities, as well as weekly radio talk shows in two districts in Western Uganda.

The Women of Uganda Network (WOUGNET), with the support of CTA, has been a long-standing implementing partner of the GenARDIS project, even though it was not amongst the grantees supported under the scheme. WOUGNET sought to increase women farmers' access to agricultural information and knowledge using multi-channelled ICT-enabled platforms, such as radio talk shows and audio documentaries, web-based platforms, smartphone applications, as well as through face-to-face discussions. Partnerships were initiated with community radios to air weekly agricultural programmes in local languages, coupled with the establishment of a multi-dimensional information centre to provide access to ICTs and agricultural information.

ARDA

The development of ICT infrastructure is often concentrated in urban centres which excludes a large rural population – mostly women and youths, and limits their ability to participate

Left: Women-led Community Information Centre in Tigray Region, Ethiopia

Right: 2006 GenARDIS workshop in Uganda

A 2010 CTA impact study[2] using the capacity-centred impact pathway analysis – a framework for evaluating impact using participatory approaches – observed that the CTA-supported GenARDIS project with WOUGNET led to positive contributions in the social, economic, wealth and political domains of beneficiary groups in northern Uganda.

Today, TORODev and WOUGNET continue to work on gender-related issues and ICT4Ag initiatives. For instance, WOUGNET over the years has deepened its partnership with its partnership with Ugandan stakeholders, including Makerere University, among others, to implement community action-oriented research projects that promote testing and deployment of agricultural technologies to smallholder farmers aided by the use of digital technologies.

Gender inequality and ICTs

There is an on-going need to ensure the evolving knowledge-base and digital tools used in agriculture and rural communities are attentive and responsive to gender issues. Conclusions of the recent CTA/Dalberg report, *Digitalisation of African Agriculture Report 2018-2019*, support this notion, and confirm that despite efforts of some companies and donor agencies, little progress has been made on gender equity in the D4Ag sector:

"In sub-Saharan Africa, where 40–50% of smallholder farmers are women, only 25% are registered users of D4Ag solutions. Companies that explicitly target female farmers and make this an important measure of their success tend to do better. Overall, the data suggest that companies are not sufficiently prioritising gender as part of their product design, marketing and user engagement efforts."

At the 2002 observatory meeting, ICT and gender expert, Nancy Hafkin, offered a definition of gender bias in ICT, noting that it is likely happening at all levels – from local to national and international settings.[3] First, there are still fewer women than men in science and technology disciplines, as well as fewer women leaders in agricultural organisations, research and policymaking. Second, there are attitudes that information technology and data-intensive digital tools used in agriculture are 'not for women', or at least there is little recognition that some social groups have suffered disproportionately from a lack of digital literacy resulting from lower access to resources and capacity building. Finally, there are many cultural aspects limiting women's access to information 'spaces', including public telecentres (popular at the time). The virtual information spaces that we find in D4Ag today, such as the Internet of Things, are scarcely different. And while the online, mobile world has made video, audio (radio) and many channels of communication possible, they are not always secure or free

from dominant social constructions of gender and cultural attitudes about women and youth. Thus, there remains a need for D4Ag spaces to enable all users/producers of data and media to feel respect for who they are, what they know and what they are doing.

Inclusive ICT4Ag

For rural areas to benefit from ICTs, policy recommendations must include the deployment of network infrastructures beyond urban areas; a reduction in the cost of broadband connectivity to ensure affordable internet; training and capacity building for local communities on the benefits of ICTs; and the provision of content in local languages. It is important to underscore how government commitments and changes in policy landscapes enable access to ICTs for rural development.

What we might wonder now is if there is a need for another round of GenARDIS today, and, if so, whom should it target? Is the methodology developed 20 years ago robust enough for today's challenges? Perhaps, but we must remember to start with ICT users. There are reasons why only 25% of D4Ag solutions have registered women users. When ICTs are accessible, affordable and able to be put to effective use, women will gain skills and innovate, despite a persistent gender divide in the ICT sector.[4] ●

About the authors

Helen Hambly Odame is a faculty member of the MSc programme in capacity development and extension and PhD programme in rural studies at the School of Environmental Design and Rural Development, Ontario Agricultural College, University of Guelph (Canada). Her research focuses on information, knowledge, communication and media for agricultural, environment and rural development. Helen is a founding member of GenARDIS. hhambly@uoguelph.ca

Dorothy Okello is chairperson of WOUGNET. She is Africa's first-ever 'Digital Woman of the Year' awardee and winner of the 2012 'Women Achievers Award' for her service in empowering women and girls through science and technology. dokello@wougnet.org

References

1 Odame, H.H. 2010. In the Blue Sky: A Brief History of GenARDIS, In Association of Progressive Communication (APC), GenARDIS 2002-2010: Small grants that made big changes for women in agriculture. Retrieved from: https://www.apc.org/sites/default/files/Genardis_EN.pdf
2 Ibid
3 Hafkin, N.J. & Odame, H.H. 2002. Gender, ICTs and Agriculture. Report for the 5th consultative expert meeting and CTA Observatory held September 11-13, 2002 in Wageningen, NL.
4 Tandon, N. 2012. A Bright Future in ICTs Opportunities for a new generation of women. Report submitted to the Telecommunication Development Sector, International Telecommunications Union, (ITU), Geneva. https://bit.ly/2HuOM2Z

Laying out Africa's D4Ag landscape

Yentyl Williams

We spoke with **Ben Addom**, ICT4D programme coordinator of CTA and one of the authors of the recent CTA/Dalberg report on D4Ag in Africa, about the key recommendations of the study and the future of the sector.

Q *The Digitalisation of African Agriculture Report 2018–19 highlights that (i) 30 million smallholders are registered in digital applications but this represents just 10% of the market; (ii) only 25% of users are women and (iii) 75% are in the 'youth' age group, despite the average farmer age being much higher. What are the key findings of the report on how D4Ag can boost the potential of Africa's agricultural sector?*

In this report, we took a different approach – we decided not to look at individual solutions and provide cases for them like we have done in earlier reports. Rather, we have summarised the 'use-cases', which can serve as a guide for further research by those interested in the sector. In general, the most exciting solutions are those that address increased productivity, access to finance and market linkages.

Firstly, on increased productivity, I am excited by the fact that most of the solutions are shifting away from traditional SMS/text-based communication with registered farmers. New approaches are based on geolocation, identifying where a farmer is located using remote-sensing data from drones or satellites, and allowing for customised and more precise messaging. Yet, one of the biggest challenges of these solutions is the business model because most are not sustainable. Why? Their services are based on generic messages as opposed to specific, targeted ones. For example, if a farmer receives a text about a pest or disease and it is not relevant to them, they are likely to stop using the service and eventually drop off the radar. It is here that the move towards targeted messages can retain users. Real-time data from drones and satellites facilitate this process as part of the broader model of precision agriculture. Such information can help farmers cope with climate change, with advice sent on, for instance, which seeds are better suited to the season.

Second, on access to finance, consider that you are a smallholder farmer in Mali or Senegal and you receive these recommendations. If you do not have money to buy recommended seeds, or fertiliser, it is not useful. However, today, there are a number of solutions actively working on access to finance and credit, based on farm data. The reality is that banks need to give credit to farmers, but the banks do not know the farmers. This is where there is a need to create digital identities of farmers to gather information on their crops and acreage, to create an alternative credit score based on a short history of 2-3 seasons. This makes the farmer bankable and increases a bank's trust in the farmer to provide credit for input purchases.

As well as soliciting loans from the bank with their data (see the models in chapter 2 of the report), farmers can also access crowdfunding mechanisms to pool their resources. Indeed, the report shows that, "Bundling financial access, advisory services and market linkages can increase income by more than 57% and yields by more than 168%".

But, do the farmers trust the banks? Where the answer is no, initiatives and platforms can play an intermediary role, informing farmers about financial institutions and opportunities for these institutions to support them. This creates awareness on the sort of finance available and, in turn, facilitates relationships between banks and farmers.

Q *There are numerous advantages of D4Ag: growth in digital solutions is phenomenal, from 41 in 2012 to 390 in 2019; and 60% of solutions will incorporate advanced technologies (Big Data, blockchain, AI and IoT). Yet, as a continent, Africa's import bill is still €30 billion – do we run the risk of both over and underdevelopment in D4Ag?*

Based on our research and experience in ACP countries, it will take a number of years for smallholder farmers to deal directly with some of the systems discussed in the report. This is why we need agent networks. We do not believe that it is time for smallholder farmers in the ACP context to deal directly with the advanced technologies as they still require added support. Here, our efforts to improve digital literacy not just for the farmers but for the intermediaries, especially youth, are vital. Youth can be business agents between the technology companies and the smallholder farmers. This is not a role for traditional extension agents, rather, the digitally literate intermediaries employ themselves and receive commission through selling products and inputting data into the systems.

With the move from smallholder to semi-commercial farms, the farmer can begin to deal directly with technology companies; but here again, local languages will play a decisive role in this relationship and roll out of the initiative.

I recently attended the European Conference on Precision Agriculture, where the European farmers know how to use the technology and consult directly with the tech providers. When I took a moment to describe the situation in Africa, they responded by saying there is no difference! After all, older European farmers with larger farms are not interested in certain precision agriculture tools, but the younger generation taking over from their parents are more receptive to the technology. Yet, there is still the issue that the young generation do not necessarily want to take over the farms. This is a generational issue and a lot of factors need to be considered.

Do the farmers trust the banks? Where the answer is no, initiatives and platforms can play an intermediary role

Q *What are your key recommendations for government, private sector and donors in particular?*

There are detailed recommendations in the report, but let us consider where we are now in terms of digitalisation for agriculture. We need to acknowledge what the donors have done until now in laying the foundations – hackathons, competitions, conferences, pilot studies.... If we trace the funding on the ground, we can see that these activities have been funded by foundations and donors. Governments have also helped by supporting the enabling environment, namely through strategies and policies. Yet, now is the time for the private sector to take advantage of this and scale the solutions. We need to find ways of blending these kinds of roles – *donor-government-private sector* – so that they build on each other. After all, governments should not work in isolation. Equally, donors should not just put money into 5-year programmes for output figures. This would be a risky environment for the private sector to come in to in order to invest and scale. Therefore, the summary of the recommendations is that all stakeholder groups need to work together.

We need to consider the proof of concept and the cases tested over the years should be developed to support scaling and investment in new technologies. This is precisely where the private sector comes in; work must be done to de-risk investment and provide business opportunities. The report details specific recommendations and when they can all come together, this leads to impact. This is summed up in our last recommendation, which refers to an alliance on D4Ag with all stakeholders, including the users and farmer organisations, and in that alliance, we see a clear role for each stakeholder to avoid duplication and scattered investment. ●

For the video version of the report, see: https://bit.ly/2ZmiRJ7

About the author

Yentyl Williams is a social entrepreneur and founder of the Africa, Caribbean and Pacific Young Professionals' Network (ACP YPN). y.k.w@hotmail.com

Framing youth in food systems: The 'push-pull' model

Thomas Tichař, Judith Ann Francis and Jennie van der Mheen

To improve opportunities for young women and men in the field of agriculture, CTA and Wageningen University & Research (WUR) have developed a new model for supporting agricultural initiatives and entrepreneurship. This article looks at the projects benefiting from this model.

It is well-known that agriculture is a challenging sector to work in and, as a result, deters many young people from taking over from their parents. However, many in the next generation are also recognising the opportunities; a rising middle class with more money and dietary preferences, closer ties between rural and urban areas

through roads and transport, and the rise of new technology and digitisation – otherwise known as 'the knowledge economy'.

New initiatives and innovations need to be fostered for two fundamental reasons; first, the agricultural sector must change with the times so that traditional practices are reinvented through new ideas that create investment, business and growth opportunities. Second, for the more fundamental need to sustain the growing human population as well as the ecosystems we rely on.

Because of these interlinking reasons, CTA and WUR, with input from a Community of Practice coordinated by AgriProFocus, worked together to develop a framework for youth employment and entrepreneurship in agri-food systems, referred to as the 'push-pull' model.

As a 6-page document, the framework provides an overview of the barriers and opportunities facing the younger generation to take the lead in reinventing food systems. More practically, it prompts practitioners to identify what young women and men need to find or create employment in agricultural production or processes – this is the 'push' factor. Also identified are factors that need to change in the financial, private and public sectors to make agriculture and food systems an attractive career choice for young people in the first place – the 'pull' factor. These are illustrated in the model below (see Figure 1). Both the model and the text are intended to be further developed from a broad-level framework into more practical guidance.

So how does the model help frame and inform the practice? The following five cases illustrate areas and types of interventions. Projects 1, 3 and 5 are funded by CTA, and projects 2 and 4 are managed by WUR.

Figure 1 The CTA/WUR push-pull model
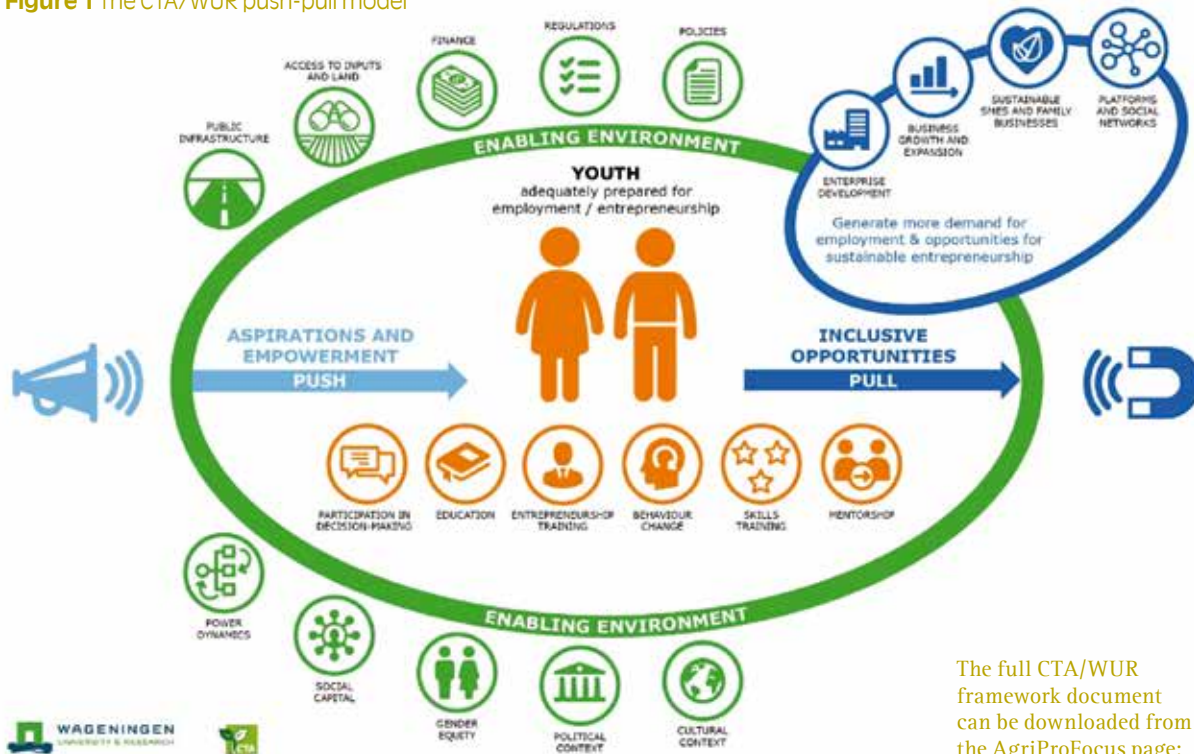
The full CTA/WUR framework document can be downloaded from the AgriProFocus page: https://bit.ly/2KbJTN5

1. Pitch AgriHack. In its 4th year, the Pitch AgriHack competition is a part of the AgriHack Talent initiative to identify and support innovative e-agriculture start-ups across Africa, the Caribbean and the Pacific. While ICT4D initiatives have been around for years, the value-addition of digitisation has only more recently really started to penetrate and reshape services, production, processing and finance in the agricultural sector. Whittling down the list from 104 semi-finalists to 22 (50% women-led), the final seven are selected during the African Green Revolution Forum, held each year in early September. The winners are provided with up to €15,000 funding as well as promotion and business growth support. To date, 30 ICT hubs have been supported from about 40 countries.

Focus areas:

2. HortiFresh. The HortiFresh programme targets the horticulture sector in Ghana, working with smallholder farmers, start-ups, and medium and large-scale businesses in the country. Youth is a cross-cutting theme across all interventions, which revolve around working with farmer groups focused on specific produce, and providing training explicitly targeted towards young farmers to develop their skill set and proactively include them. Another aspect of the programme supports access to finance by both facilitating bank loans as well as providing three different types of grant funds – one of which is a youth-targeted fund (total €200,000) to help scale up businesses that are either run by, or intend to employ, more young people. The seven enterprises being provided grants – which total up to 80% of total applicant budgets – cover a range of activities, from developing an app to connect farmers to buyers and consumers, to setting up a station to process and add value to produce, such as mango and coconut. Alongside grants, the enterprises receive business support.

Focus areas:

3. VIJABIZ was launched by CTA and its Kenyan partner USTADI after being awarded a grant from the International Fund for Agricultural Development. VIJABIZ has so far supported 166 youth agribusiness groups in the Kilifi and Nakuru counties of Kenya to develop entrepreneurial skills and businesses growth, focusing on the cereal, dairy and fisheries value chains. Working with local and national government, training sessions have been organised around agribusiness development, use of ICTs and social media. Mentoring and access to markets are facilitated in order to favour growth and job creation. Grants ranging from US$1,000-$20,000 (€900-18,000) will be provided to the start-ups showing the greatest potential.

Focus areas:

4. BRIDGE. The Building Rural Income through inclusive Dairy Business Growth (BRIDGE) programme is a partnership between public and private partners in Ethiopia, which focusses on strengthening the commercial dairy sector. There is a demand for new services in the sector, such as cow hoof trimmers (known as 'clawers') and advisors, who can guide farmers on how to run more complex dairy businesses and get access to the required inputs, including capital. One group of young people has been trained by

BRIDGE to set up a private information service whilst another were trained as clawers, and both are now earning income through these roles. The programme has shown that youth are interested in dairy entrepreneurship opportunities and more strategies are being developed to increase their role within the sector.

Focus areas:

5. PEJERIZ focuses on youth entrepreneurship along the rice value chains in Mali and Senegal – from production and input services, to marketing and consulting. The project will support start-up innovation and small-scale businesses that employ young people by training them in business, finance and credit management, alongside technical support in soil preparation, harvesting and crop storage. A number of the businesses will also receive additional financial support, either through loan facilitation or grant provision.

Ten mechanisation centres are being established in partnership with the Syngenta Foundation, some of which are already providing services to the young entrepreneurs.

Focus areas:

As indicated by the focus areas, the WUR and CTA-supported programmes provide a wide range of interventions to improve opportunities for young women and men, which in turn, aim to improve the systems of food provision.

However, while the cases are just a selection, their focus areas also point to the relatively greater and lesser emphases of the intervention areas; political context is only identified once for example, whilst areas like cultural context, policies and regulations are mostly absent. Put in simple terms, the focus tends to be more on the 'push' side, e.g. working more directly with specific groups to promote enterprises, businesses and potentially scalable pilots. The 'pull' side is certainly there – working with universities, financiers, businesses and government ministries on a transformation of the agro-food sector – though to a lesser extent. Finding a better balance in getting the push and the pull is potentially the next step for WUR and CTA in helping to drive systemic change in food systems that can benefit young women and men. ●

For more information on the
WUR/CTA projects, see the links below:
https://bit.ly/2HCG3fs
https://www.cta.int/en/youth

About the authors

Thomas Tichař is the youth & gender advisor in Food Systems at Wageningen Centre for Development Innovation, a part of WUR. He supports projects and courses and leads on youth and gender strategy and portfolio development. thomas.tichar@wur.nl
Judith Ann Francis is senior programme coordinator, science and technology policy at CTA, and chair of the Tropical Agricultural Platform. Since joining CTA in 2003, she has championed capacity development on innovation systems, the application of the innovation systems approach and empowerment of women scientists to enhance agri-food systems performance in the ACP. francis@cta.int
Jennie van der Mheen is the manager of International Cooperation Africa at WUR. She connects stakeholders with WUR and *vice versa*, and supports colleagues in identifying new leads in Africa. jennie.vandermheen@wur.nl

'Uber-ising' access to tractors for improved productivity in and Kenya and Nigeria

Jehiel Oliver and Ken Lohento

Hello Tractor

African agri-tech company, Hello Tractor, is using an Internet-of-Things (IoT) technology to link smallholders directly with tractor owners for increased planting times and reduced labour costs. In 2019, the company signed a contract with CTA to further develop its technology and business model.

As the world's population continues to increase, it is projected that crop yields will need to double to achieve food security. Sub-Saharan Africa alone holds 60% of the global inventory of uncultivated farmland; yet average crop yields continue to fall well below global averages. In addition to food security, increased agricultural productivity remains critical to alleviating entrenched poverty and improving livelihoods for the millions of farmers that survive on less than US$2/day.

Tractor owners lack the data, knowledge and experience to efficiently deploy tractors in a systematic way. Historically, low levels of mechanisation have been cited as the primary reason for stagnant agricultural productivity in sub-Saharan Africa since the 1960s. In fact, many experts believe that a lack of mechanisation access is responsible for 50% of Africa's yield gap.

Hello Tractor

To confront these challenges, Hello Tractor has developed technology to increase and optimise tractor activity across developing markets around the world. This technology uses an IoT digital solution to connect tractor owners to farmers, bridging the gap between traditional farming and more technologically advanced approaches. By running a shared economy model, Hello Tractor's technology allows smallholder farmers to access tractors on demand, enabling them to plant 40 times faster and at a third of the cost.

Hello Tractor aims to radically transform how the smallholder agricultural ecosystem interacts with and derives value from technology, and, as such, much effort has been put into creating a synergy amongst its stakeholders. To ensure that tractor owners are running a profitable business, Hello Tractor's solution provides a fleet management app that lets them engage with smallholder farming demand through booking agents they engage through the app. These agents, primarily young people from rural farming communities, perform critical market aggregation and ensure idle tractors are connected to farmers, whilst earning a sustainable livelihood. When a Hello Tractor booking agent submits a request, it is routed to tractor owners on the platform based on proximity and tractor availability. This ensures that farmers, who are the
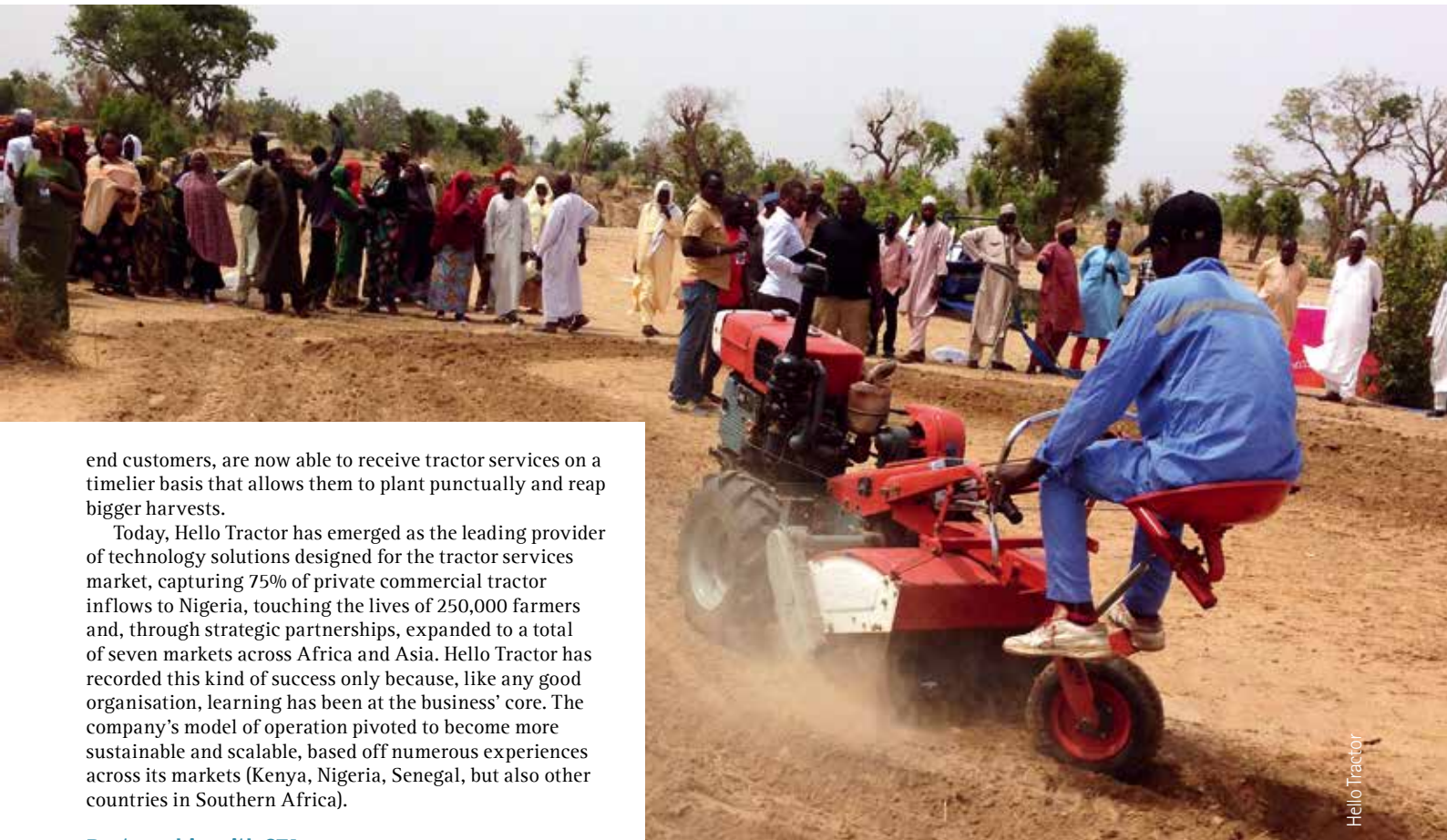
Hello Tractor

end customers, are now able to receive tractor services on a timelier basis that allows them to plant punctually and reap bigger harvests.

Today, Hello Tractor has emerged as the leading provider of technology solutions designed for the tractor services market, capturing 75% of private commercial tractor inflows to Nigeria, touching the lives of 250,000 farmers and, through strategic partnerships, expanded to a total of seven markets across Africa and Asia. Hello Tractor has recorded this kind of success only because, like any good organisation, learning has been at the business' core. The company's model of operation pivoted to become more sustainable and scalable, based off numerous experiences across its markets (Kenya, Nigeria, Senegal, but also other countries in Southern Africa).

Partnership with CTA

In 2019, Hello Tractor and CTA signed a contract to collaborate and facilitate access to digitally-enabled tractors. This contract was signed following a call for proposals launched by CTA and won by Hello Tractor with its project, *'Connecting Smallholder Farmers to Tractors Powered by Hello Tractor'.*

As part of the project, product demonstrations will be held for demand aggregation; a key objective of these activities will be to raise awareness among farmers and farmer organisations in target areas. Four tractor demonstration days have already been held in Nigeria in April and May 2019: in Yola (Yolde Pate, Fufore communities); Illora community of Oyo State; Ijebu Ode community of Ogun State; and Tsaragi Edu community of Kwara State. Three further days are planned for Kenya, in Eldoret, Meru, and Nakuru. These activities are being implemented in cooperation with tractor owners, and through these events, farmers are educated on the benefits of mechanisation, particularly using Hello Tractor services.

Another activity of the project has been the selection and training of booking agents. The booking agents' role is to aggregate tractor demand and manage the hiring of tractors by farmers. These consumer-facing collaborators have been equipped with relevant tractor technology management and customer management skills. A variety of digital materials – including videos, website and app content – are used for the capacity-building sessions. So far, 100 agents and tractor operators have been trained across Kenya and Nigeria, included via virtual training activities.

The booking agents have been selected by responding to requests for expression of interest via social media, but young farmers are also informed about opportunities through the tractor demonstration days. A closed Facebook community for booking agents has been created; furthermore, an SMS gateway has been developed to support Hello Tractor in disseminating information to booking agents, which is currently being tested. As a result, agents are already facilitating the deployment of tractors to meet farmer demand.

In total, at least 5,500 farmers are expected to benefit from tractor services in the 1-year project timeframe, and 50 booking agents will eventually be involved. Some project activities, such as facilitation of networking with farmers, are implemented in partnership with the Agricultural Technology Foundation. Hello Tractor and CTA will both monitor and evaluate the impacts for farmers, booking agents, operators and service providers.

The project will help Hello Tractor improve its technology and business model, and knowledge generated from the project's implementation will be captured, including on business modelling in digital entrepreneurship. Two knowledge-sharing workshops will be organised in the timeframe of the project to communicate about the project's results and learning. ●

Above: A tractor rotary tiller demonstration.

Opposite: Hello Tractor booking agent in the field.

About the authors

Jehiel Oliver is the founder and CEO of Hello Tractor. hello@hellotractor.com

Ken Lohento is senior ICT for agriculture programme coordinator at CTA. lohento@cta.int

Resources

Digitalisation of African agriculture

Digitalisation for agriculture can be a game changer in supporting and accelerating agricultural transformation. This extensive research by Dalberg and CTA maps the current state of digitalisation in African agriculture, based on data from 175 D4Ag enterprises and analysis of use cases from seven different sub-Saharan countries. The report makes recommendations for the D4Ag sector to ensure sustainability and scalability in the future. https://bit.ly/2MjlgkW

Events: Strike Two accelerating technology adoption and innovation in food systems

The Strike Two Summit is an annual series of events in Amsterdam, the Netherlands. The summit is set up to discuss innovation and the acceleration of adoption of digital solutions that support a more circular, sustainable and future-proof food system. CTA will organise sessions on Blockchain and Artificial Intelligence use in food systems. To join the events in September and November 2019, and January 2020 go to: https://striketwosummit.com/

E-Agriculture in action: big data for agriculture

FAO-ITU has released its fourth publication in the series E-agriculture in Action, which promotes sustainable ICTs and emerging technologies for agriculture. This publication discusses the data driven digital revolution in agriculture, using different case studies. Read the full report here: https://bit.ly/2LkCEW7 Earlier publications in the series are: *Blockchain for Agriculture*, *Drones for Agriculture* and *E-agriculture in Action*.

Experience capitalisation for continuous learning

Experience capitalisation is a process in which experiences are identified, documented and capitalised. This enables organisations to draw lessons from previous successes and failures and to identify best practices. For almost 3 years, CTA has implemented this approach and encouraged its adoption by partners. Find the publications of diverse experience capitalisation workshops in CTA's CGspace: https://bit.ly/2kdtXkw For more information on CTA's experience capitalisation project, go to: http://experience-capitalization.cta.int/

Digital technologies in agriculture and rural areas

The Fourth Industrial Revolution produces disruptive digital technologies that transform many sectors, including agriculture. This 2019 FAO report paints a picture of the use of digital technologies in agriculture and rural areas. It identifies basic and enabling conditions for technology adoption and digital transformation in agriculture, while highlighting disparities in access and risks for a digital divide. https://bit.ly/2KMVghh

ICT4D and digital inequality

Can digital technologies really be used to reduce inequalities? Tim Unwin, UNESCO Chair in ICT4D, critically reflects on unequal access to technology, resulting in digital divides and insecurity, due to the persistent paradigm that technology itself can reduce inequality. He urges governments and international organisations to take the lead in ensuring inclusive adoption of digital technologies and ensuring that digital transformation works with and for poor and marginalised populations. https://bit.ly/2T8Dwl0

Digital interdependence and cooperation

The need for partnerships is a recurring recommendation in this issue of *ICT Update*. The UN High-level Panel on Digital Cooperation set out to define mechanisms for global digital cooperation and governance of the digital landscape, to maximise benefits of digitalisation and minimise harm. Its report discusses three main themes; inclusive digital economy; human rights and security; and mechanisms for digital cooperation. You can find the full report here: https://www.un.org/en/digital-cooperation-panel/

Scaling digital innovation

Sustainability is problematic for many development projects as many innovations fail to last after the initial pilot phase. How to ensure that innovations serve generations of farmers, beyond short term projects and funding? This *Scale Up* Sourcebook is an easy-to-use guide on scaling to catalyse durable systemic change. It promotes a re-examination of project design and assessment. https://bit.ly/30t6tri To revisit the presentations and discussion on which the Sourcebook is based, go to: https://bit.ly/2ZaebK8

Future of food

Digital technologies and innovations have the potential to significantly benefit food systems. This World Bank report addresses the question of how these opportunities can be better harnessed to tackle sustainable development challenges. It looks into opportunities, contemporary utilisation of digital technologies in food systems, risks and public action points to support digital technology adoption, specifically in low-income countries. https://bit.ly/2MAuXM8

Policy innovation for food system transformation

The Malabo Montpellier Panel, an international group of agriculture and food security experts, presents the findings of their analysis of seven African countries at the forefront of digitalisation of the agricultural sector. It shows that institutional innovations and innovative policymaking are key to support an enabling environment for digitalisation. For the full recommendations and action agenda, go to: https://bit.ly/2Np8TVU

ICT Update archives

The first issue of *ICT Update* dates back to 2001, but before the release of *ICT Update* as a bulletin, CTA sent out an e-mail newsletter from 1999-2001 from which *ICT Update* evolved. You can find these resources at afagrict-I forum: https://bit.ly/2NsjEVC To go through *ICT Update's* earliest copies, visit the archive page: https://bit.ly/2ZqpPfz Or revisit all *ICT Update* publications on CTA's CGSpace here: https://bit.ly/2MvD2S5