POLICY POINTERS

ICTs for AGRICULTURE

MAKING IT HAPPEN

“Building on how the communications revolution could transform the lives of hundreds of millions of farmers in developing countries is one of the great opportunities of our times”

Michael Hailu,
CTA Director

The conference *ICT4Ag: the digital springboard for inclusive agriculture*, took place from 4 to 8 November 2013 in Kigali, Rwanda. It was organised by the Technical Centre for Agricultural and Rural Cooperation (CTA) and hosted by the Rwandan Ministry of Agriculture and Animal Resources (MINAGRI) in collaboration with the Rwandan Ministry of Youth and ICT (MYICT).

Other institutions which collaborated on the activity are: ACDI/VOCA, Agri-ProFocus (APF) Rwanda, Alliance for a Green Revolution in Africa (AGRA), Broadband Systems Corporation (BSC Ltd), CGIAR Consortium, CIO East Africa, e-Agriculture@FAO, East Africa Exchange (EAX), Eastern Africa Farmers Federation (EAFF), Ecobank Rwanda, EU Delegation in Rwanda, Farm Radio International, FHI 360 USA, the Food and Agriculture Organization of the United Nations (FAO), Forum for Agricultural Research in Africa (FARA), Global Broadband and Innovations (GBI), Global Forum for Rural Advisory Services (GFRAS), Grameen Foundation AppLab, Groupe Jeune Afrique, GSMA mAgri, Integra LLC-USAID, International Fertilizer Development Center (IFDC), International Food Policy Research Institute (IFPRI), International Institute for Communication and Development (IICD), International Livestock Research Institute (ILRI), International Water management Institute (IWMI), IT News Africa, KINU Hub Tanzania, Microsoft 4Afrika, the New Partnership for Africa’s Development (NEPAD), Orange, Oxfam GB, Rwanda Development Board (RDB), Rwanda Telecentre Network (RTN), SINFA Uganda, The Africa Report, United Nations Development Programme (UNDP), United Nations Institute for Training and Research (UNITAR), United States Agency for International Development (USAID), University of British Columbia (UBC Okanagan), Women of Uganda Network (WOUGNET), the World Bank and Yam Pukri Association.

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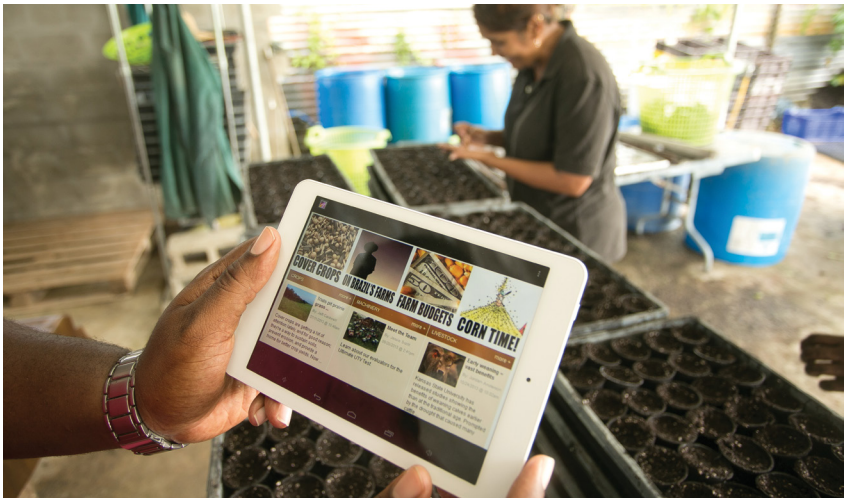

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TABLE OF CONTENTS

ICT4Ag – 10 keys to a more productive agriculture

The ICT4Ag conference discussed a wide range of policy issues. Some of the most important are described below. They address issues such as developing better partnerships to improve the impact of ICTs in agriculture, strengthening the role of young men and women in ICT initiatives, supporting ICT4Ag entrepreneurship and promoting adequate infrastructure for ICTs in rural areas.

1. Developing partnerships to ensure positive impacts of ICT4Ag initiatives

All too often, ICTs for agriculture initiatives are developed in isolation, with companies and individuals producing comparable applications (apps) for similar purposes in different countries. Those involved in ICT development should build partnerships and communities of practice that encourage greater collaboration. They should also build on existing models and approaches to develop solutions that have a real impact. Indeed, positive and measurable impact will be difficult to achieve without partnership and collaboration. CTA seeks to be a partner of choice with like-minded institutions and is initiating a number of activities that aim to take advantage of the convergence of ICT channels, such as mobile phones, radio, video, and the internet, for agricultural information delivery.

2. Supporting ICTs for extension and advisory services

ICTs have a vital role to play in getting information to farmers and *vice versa*. Extension and advisory services should take full advantage of the potential of new technologies. They need to focus on proven and innovative ICT tools which recognise the importance of two-way communication. ICTs should be used more innovatively to achieve the goals of extension, and efforts should be made to attract women and young people to work in extension and advisory services. CTA is exploring the opportunities for developing a 'living database' of ICT applications and a framework for assessing their effectiveness in support of extension and advisory services.

3. Supporting open and big data for smallholder farmers

Smallholder farmers need to benefit more from 'big data' – datasets which are large, complex

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Rwanda's Minister of Agriculture, Hon. Dr. Agnes Kalibata, welcoming the international gathering of ICT experts at ICT4Ag 2013.

and difficult to handle – and information derived from such data should be made available in a format they can readily use. The conference stressed the importance of good data visualisation, and the importance of providing real-time data via multiple channels to smallholders and others involved in value chains. There is an urgent need to create a public information platform to reduce data duplication. CTA is promoting participatory ICTs for adding value to traditional knowledge in areas such as climate change adaptation, advocacy and policy processes.

4. Ensuring the reliability and availability of high-quality information

Developing farmers' trust in ICT services and the content they provide is important. They should never be bombarded with information that is unreliable, of poor quality or difficult to use. Indeed, the content – rather than the mode of delivery – should always be the first consideration for those involved in disseminating information to farmers. The conference affirmed that what goes into the content box is more important than the technology; this is a signal for better linkage between research and extension.

5. Ensuring grassroots access to ICT solutions

Many rural communities still have little or no access to ICTs. We need to ensure that they can take advantage of these technologies, in terms of cost, availability and usability. Providers

The conference affirmed that what goes into the content box is more important than the technology; this is a signal for better linkage between research and extension

All too often, women and young people are disadvantaged, in a variety of ways, in rural areas. ICTs have an important role to play in empowering young people and women

should focus on the household level and adapt information to the local context. They should also recognise the multidimensional needs of farmers and their families, and encourage grassroots community engagement in policy processes related to ICTs. CTA is promoting new approaches, such as participatory 3D modelling (P3DM), coupled with the use of video, Web 2.0 and social media. These are proving highly effective when it comes to empowering marginalised communities and helping them to document their spatial knowledge and interact with the authorities.

6. Strengthening the involvement of young people and women in ICT4Ag initiatives

All too often, women and young people are disadvantaged, in a variety of ways, in rural areas. ICTs have an important role to play in empowering young people and women. Women are the pillar of the family in terms of smallholder agriculture and they should be provided with the resources and information they need to improve their productivity and gain access to markets. ICTs should also be used to attract young people to agriculture and ensure that they can develop their potential. CTA is fostering youth entrepreneurship and supporting the organisation of activities such as 'hackathons', which are encouraging young agri-entrepreneurs to develop ICT solutions to address farming problems.

CTA Director, Michael Hailu, opening the ICT4Ag conference.

7. Supporting ICT4Ag entrepreneurship and promising business models

Policy makers and others working in the field of agriculture need to encourage smart entrepreneurship and ensure that those developing ICT applications develop sound business models. If they fail to do so, then their apps are unlikely to survive or be scaled up for wider use. Apps should be designed to help not just farmers, but all those involved in value chains, from field to fork. CTA has already taken a number of steps to support youth entrepreneurship and the development of sound ICT business models, and it will continue to encourage others to do the same.

8. Supporting sound strategies and high-level political buy-ins for ICT4Ag

ICTs have a transformative influence on farming and food production in countries where governments and policy makers are committed to developing comprehensive e-agriculture strategies. In particular, the conference heard about the successes in Côte d'Ivoire and Rwanda. These two countries are pioneering the development of e-agriculture strategies to support the efficiency and effectiveness of ICTs for agriculture. CTA is undertaking a variety of activities to encourage governments and civil society to get more involved in developing viable e-agriculture strategies.

9. Promoting adequate infrastructure and energy for ICTs in rural areas

Most of the policy pointers above are concerned with the software of ICT development. But the hardware – broadband infrastructure, mobile phone masts, energy provision – is just as important. Governments should be encouraged to provide access to energy, devices and infrastructure, especially in remote areas. This often works best when they act in tandem with the private sector. Local entrepreneurs also have a key role to play in achieving connectivity, but if they are to do so, they need to develop sound business models. Universal service and access funds (USAF), which are taxes collected from communication operators, have considerable potential.

10. Promoting sound knowledge management activities

In addition to the above nine conference recommendations, this tenth recommendation emerged from the six-month follow-up survey that was conducted with the conference participants to validate the nine recommendations. Participants suggested the need to address issues arising from awareness-creation, information-gathering and capacity-building on ICT4Ag. They identified the need for more inclusive learning models that promote the existence of knowledge providers at grassroots level using the value chain model. CTA's project on strengthening methodologies, skills and tools for knowledge management aims to apply knowledge for improved understanding and involvement in ARD. ■

ICTs have a transformative influence on farming and food production in countries where governments and policy makers are committed to developing comprehensive e-agriculture strategies

Agriculture's digital springboard

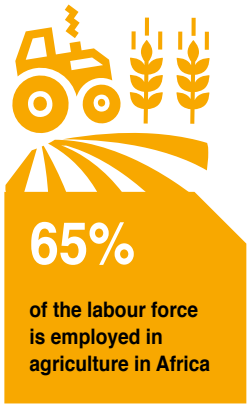
Information and communication technologies (ICTs) could transform agricultural activities in many parts of the world. In some countries, ICTs are already helping farmers to increase yields and incomes, but much remains to be done. The Kigali conference – the largest of its kind ever held on the subject – looked at our progress to date, and where we should go next.

In Trinidad and Tobago, farmers use ICTs to transform their agricultural activities.

Farming is still the most important economic activity in many developing countries. In Africa, for example, 65% of the labour force is employed in agriculture and the sector generates 32% of GDP. However, millions of farming families, pastoralists, forest dwellers and fishers remain trapped in poverty. Low productivity, high energy prices, lack of access to credit and poor or non-existent advisory services are among the many factors preventing them from fulfilling their true potential.

Yet there are reasons to be optimistic. After years of neglect, governments and the private sector are increasing their investment in agriculture, and rising commodity prices are making farming and fishing more profitable. Farmers and fishers are also beginning to benefit from the digital revolution. Information and communication technologies (ICTs) – radio, video, the internet, geographic information systems, satellites and mobile technology – can help to transform small-scale resource-based livelihoods from a subsistence activity into a viable business.

This was the focus of a major international conference, 'ICT4Ag: the digital springboard for inclusive agriculture', held in Kigali, Rwanda, in November 2013. "We will be building on how the communications revolution could transform the lives of hundreds of millions of farmers in developing countries," said CTA director Michael



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A farmer using her mobile phone in Rwanda, where mobile phone penetration has increased from 6 to 60% in just five years.

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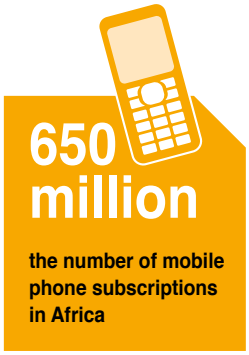
In many ACP countries, infrastructures are being developed to speed up the use of ICTs.



Hailu in his opening address. "I believe this is one of the great opportunities of our times. That is why this conference is so important."

Co-hosted by CTA, Rwanda's Ministry of Agriculture and Animal Resources (MINAGRI) and Rwanda's Ministry of Youth and ICTs (MYICT), the Kigali conference provided an opportunity for 475 delegates from over 60 countries to share their knowledge about ICTs, review research and development, exchange solutions, compare the impact of different technologies and foster new partnerships. "Conferences this size are nearly always PowerPoint-led," said CTA's Giacomo Rambaldi, one of the organisers. "But right from the outset, we decided that this one would be different – that interaction would be at the core of the conference." And that was exactly how it turned out.

HOW IT ALL STARTED

In 1980, there were just 11 million mobile phone subscriptions worldwide; now there are over 4 billion. In 2000, there were 16.5 million mobile phone subscriptions in Africa; today there are over 650 million. Worldwide, more people now own a mobile phone than a toothbrush, according to Eric Qualman, a social media guru. In

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Susan Oguya and Jamila Abass, founders of Akirachix, developed a mobile phone application for farmers in rural areas, called M-Farm.

Rwanda, mobile phone penetration has increased from 6 to 60% in just five years. Much the same has happened in the Caribbean and Pacific regions, where CTA operates. Likewise, increasing numbers of people now have access to high-speed internet.

However, there is still a considerable disparity in access to innovative ICTs between countries and between urban and rural areas. In 2010, 65% of people in Europe had access to the internet, compared to 9.6% in Africa. In Mozambique, 67% of urban dwellers own mobile phones, compared to less than 30% in the rural areas. The equivalent figures for Ethiopia are 51% and 11%; for Ghana, it is 63% and 30%. There is also a significant gender imbalance, with men having greater access to ICTs than women, especially in developing countries.

MANY VIEWS, MANY VOICES

The conference brought together people who wouldn't traditionally spend much time together. As Rwanda's Minister of Agriculture, Hon. Agnes Kalibata, said at the closing ceremony, "A very cool field – ICTs – has been married to a not-so-cool field, agriculture." Private enterprises accounted for 19% of those present; ministries

9.6%

the percentage of people in Africa having access to the internet in 2010

and public agencies 17%; regional, international and donor agencies 16%; civil society organisations 12%; research institutes 9%; media organisations 8%; academic organisations 8%; and farmer's organisations and cooperatives 6%. In other words, a wide variety of interests and institutions met under one roof for four days of intensive interaction.

The organisers made an explicit attempt to involve as many young people and as many women as possible. Approximately 43% of delegates were under the age of 35, and 25% were women. "For too long, youth in Africa has been seen as a problem that needs to be solved," said Catherine-Rose Barretto, a social media entrepreneur from Tanzania, during the opening ceremony. "Instead, we need to look at youth as an asset." She pointed out that many successful mAgri innovations have been set up by people under the age of 30, citing the M-Farm app developed in Kenya by three young women.

Rwanda's Minister of Youth and ICTs, Hon. Jean Philbert Nsengimana, made a similar point in his speech. "Youth constitute an incredibly valuable asset that needs to be harvested," he said. It was an indication of his government's commitment to young people that responsibility for their affairs had been moved from the social cluster of ministries to the economic cluster. "Young people should be seen as part of the profit sector," he said.

THE RIGHT PLACE, THE RIGHT TIME

Rwanda is leading the way in using ICTs to stimulate agricultural transformation and economic growth. This made it the ideal venue for the ICT4Ag conference. "Agriculture is one of the low-hanging fruits for poverty reduction, and ICTs are another low-hanging fruit," said Hon. Agnes Kalibata, one of five government ministers to attend the opening ceremony.

The conference took place immediately after the Transform Africa 2013 Summit, which was also held in Kigali. This event set out a vision for how ICTs could stimulate economic growth on the continent. "ICTs are not a luxury good, but an instrument for transformation," said Kenyan President Uhuru Kenyatta, capturing the mood of the times. The summit coincided with the launch of a new network that will provide high-speed broadband access to 95% of Rwanda's population within three years. This will help Rwanda to achieve the objectives of 'Vision 2020'. This maps out a development path that seeks to transform the country into a middle-income, knowledge-based economy.

Before the official opening of the ICT4Ag conference, the majority of conference delegates attended 'Plug & Play Day'. This was an opportunity to learn about a wide range of ICT applications for agriculture, many designed to help farmers, traders, extension officers, researchers and policy makers improve their productivity and incomes. During the following three days, there were three plenary sessions attended by all delegates, and 33 parallel sessions devoted to the three conference streams: emerging innovations in ICTs, capacity strengthening, and enabling environments.

There were other interesting side events organised by institutions such as AfDB, AGRA, CTA, IFPRI, and UNDP on different issues within the general theme of the conference. At a separate venue, groups of young people competed in a 'hackathon', a competition to design mobile

Internet sign in the Caribbean.

apps for farmers, fishers and others involved in the agricultural sector. Peer-assist sessions were organised based on a number of innovative ideas to gain constructive critique from peers as a way to support the development of future apps for agriculture. Field trips at the end of the week provided delegates with the opportunity to visit a range of different ICT4Ag projects in and around Kigali.

During the conference, "making it happen" emerged as a slogan. Making it happen hinged on high levels of interaction among participants. For example, each of the parallel sessions began with brief presentations from four to six speakers. Eight facilitators and knowledge management experts, aided by a team of local students, then steered the sessions into an interactive mode, encouraging everyone to contribute, to question and to debate. During the final plenary, the facilitators summarised the thematic discussions. This was a key event in formulating the recommendations that were later developed into the conference policy pointers. ■

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Participants attending 'Plug & Play Days' learn about a wide range of innovative applications for agriculture.

Meet the geeks

On the first day of the conference, participants learnt about a wide range of ICTs that were developed to help farmers and fishers improve their livelihoods. 'Plug & Play Day' provided an ideal and fun, practical introduction to this complex and exciting topic.

Over 300 people attended 'Plug & Play Day'. As a taster session to the main conference, the day began with a brief introductory session. Didier Nkurikiyimfura, Director General of Rwanda's Ministry of Youth and ICTs (MYICT), acted as master of ceremonies. "Today is all about interaction, having fun and learning about innovations in the use of ICTs," he said.

The Ministry's permanent secretary, Rosemary Mbabazi, provided a brief explanation of how ICTs were helping to transform Rwanda into a knowledge-based economy. "If we can improve the lives of farmers, we will improve the lives of 80% of the population," she said. If that is going to happen, farmers need information to improve their productivity and provide better access to markets. "They want quick solutions, and that means the quick delivery of information," explained Ernest Ruzindaza, Permanent Secretary to the Ministry of Agriculture and Animal Resources (MINAGRI).

Benjamin Kwasi Addom, the CTA programme officer who co-ordinated the day, encouraged both the innovators and the audience to "learn and share", and he gave the assurance that the needs and expectations of each participant would be met at the end of 'Plug & Play Day'. During the course of the day there were six parallel sessions, each with eight presentations. The presentations were followed by up to 15 minutes of interaction between presenters – frequently the designers of mobile apps – and delegates, with the latter being given the opportunity to test-drive the apps on display. Here is a summary of some of the ICTs featured during 'Plug & Play Day'.

BRAVE NEW WORLDS

One of the most eye-catching mobile phone apps was iCow, developed by Green Dreams Tech in Kenya. Its services include a cow calendar for use by small-scale dairy farmers. Farmers register their cows by gestation date and SMS alerts them when to use artificial insemination (AI). Another iCow service provides farmers with a list of AI providers. Since it was set up, around 128,000 Kenyan dairy farmers have benefited, with the iCow apps helping to increase milk production by 2–3 litres a day and incomes by the equivalent of US$30 a month.

Fishing communities are also benefiting from the use of smart ICTs. For example, mFisheries, a suite of mobile and web applications developed at the University of the West Indies, is improving the efficiency and welfare of small-scale fishers. Using a smart phone, fishers can access weather reports, navigational tools and training tips on first aid and emergency boat repairs. "They can also use one of the apps to find out fish prices in different markets," explained software developer Daryl Samlal. Onshore buyers using mFisheries can get in touch with suppliers to make a transaction. Launched and tested in Trinidad, these apps could soon prove useful in other parts of the world.

Counterfeit agricultural inputs, such as fertilisers, livestock medicines and pesticides, can have a devastating impact on the productivity and welfare of small-scale farmers. In Uganda, for example, it is thought that the probability of a farmer buying

Both innovators and the audience were encouraged to "learn and share" during the 'Plug & Play Day' in Kigali.

counterfeit products is 50%, and one ministry estimates that fake agrochemicals account for 30% of the market. To tackle this problem, the International Fertiliser Development Centre (IFDC) has developed a mobile application that can be used by farmers to assess whether the products they are buying are genuine or fake.

Many of the apps on display during 'Plug & Play Day' were designed to improve communication between farmers and buyers. For example, Mobile Agribiz links some 400 farmers in the DRC with 100 buyers in the capital, Kinshasa. Farmers can get information about market prices and requirements, while buyers can find out where they can get the product they want. "Better crops and better prices means farmers make more money, and that means better education for their children and better health care," explained Narcisse Mbunzama, CEO of Mobile Agribiz.

Some applications showcased at Plug & Play Day have been designed to help researchers. For example, the Open Data Kit tools developed by Google enable organisations such as the International Livestock Research Institute (ILRI) to collect and manage data on smartphones. This system has many advantages over traditional paper-based data collection. "Open Data Kit is very versatile, works for all sorts of data, and makes it much easier to manage data," explained ILRI's Absolomon Kihara. It is easy to adapt questionnaires in mid-research, and scientists can do pre-analysis of their data on their smartphones before coming back from the field.

50%

the probability that a farmer buys counterfeit products in Uganda

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mFisheries is a set of mobile and web applications for fishermen.

Members of the Fertilizer Logic team from Rwanda who participated in the hackathon.

One of the other apps on display is helping to empower communities. "Participatory mapping is all about communities putting themselves on a map, and influencing decision-making," explained Jon Corbett from the University of British Columbia. He and his colleagues developed GEOlive as a web-based mapping application for Canada's indigenous communities. Since then, this has proved useful to a wide range of organisations, including universities in Australia and local farmer's groups in Canada. Multiple users can contribute data simultaneously to a map, and GEOlive makes large amounts of data both manageable and meaningful.

Delegates also had the opportunity to learn about more traditional methods of disseminating information, such as video and radio. Farm Radio International, for example, now works with over 400 broadcasters in 38 African countries. It provides training in scriptwriting and works with its partners to develop programmes and campaigns, with a strong focus on helping small-scale farmers. As the vast majority of people in sub-Saharan Africa do not have access to the internet, radio will continue to play a vital role in the continent's agricultural development.

At the end of 'Plug & Play Day', CTA's Senior Programme Coordinator Krishan Bheenick asked the participants to organise themselves into small groups and discuss and answer three questions: 'What did you discover? What are the complementarities we have seen today? What do you want to see more of?' Participants were then invited to share their views, most of which were positive. However, an Indian participant with 20 years of business experience said: "This sounded like a non-profit session. For me, business should come first, technology second."

Ensibuuko from Uganda was selected as the overall winner of the hackathon in Kigali.

HACKING FOR A SMARTER FUTURE

Several months before the conference, hacker's marathons, or 'hackathons' – events during which computer programmers develop an ICT application to address a specific challenge – were held in six East African countries. The aim was to showcase new apps for agriculture. Nine teams of national hackathon winners were then invited to attend a regional hackathon during conference week, hosted by KLab, a technical hub in Kigali.

During the hackathon, participants received training from the judges and ICT experts, and from people involved in agro-entrepreneurship. This included advice on business models, awareness training on what investors want, exchanges with farmers, and the fine-tuning of the products they were developing. Rebecca Enonchong, hackathon judge and CEO of AppTech, was fulsome in her praise: "I was so excited to see many women involved in creating new technologies."

Ensibuuko, from Uganda, was declared the winner for its web and mobile application, which enables cooperative societies of smallholder and rural farmers to mobilise savings, and receive and disburse loans. Second prize went to MAgric of Ethiopia for AgriVas, a resource centre for farmers that delivers information via radio, SMS and the internet. Third prize was awarded to the all-women group, Agrinfo, which developed a web-based and mobile geographic information system platform for mapping farms. The teams received cash prizes. The three national hubs which nominated the teams, Outbox Hub in Uganda, IceAddis in Ethiopia and Buni Hub in Tanzania, received grants to undertake post-competition incubation and business support for the winners. ■

Making the most of innovation

Much time was devoted to exploring emerging innovations in ICTs. Speakers and participants described a wide range of different ICTs, although many people highlighted the problem of duplication. There was a strong focus on developing partnerships, making the best use of ICTs for agricultural extension, and supporting open data.

The majority of parallel sessions and the first plenary – *Why the hype for mAgriculture?* – focused on emerging innovations in ICTs. The parallel sessions covered a wide range of topics, including the use of ICTs for aquaculture and fisheries, livestock farming, market information systems, climate-smart agriculture and data collection. This chapter provides a brief overview of some of the key themes that emerged, specific to the policy pointers outlined at the beginning of this booklet.

POINTER 1: DEVELOPING PARTNERSHIPS TO ENSURE POSITIVE IMPACTS OF ICT4AG INITIATIVES

"One of the first things we identified, as early as 'Plug & Play Day', was the problem of duplication," says CTA's Benjamin K. Addom, coordinator for the Emerging Innovations stream. "Very similar applications have been designed in different parts of the world, and there has been a serious lack of collaboration among developers." This needs to be urgently addressed, and so Benjamin and his colleagues at CTA decided to partner with app developers and other interested parties to create a 'living' database. This will serve as an open platform that can be updated as new innovations emerge, thus ensuring that ICT developers are not 'reinventing the wheel'.

Experience suggests that multi-stakeholder partnerships can create the most successful and sustainable ICTs. For example, the mFisheries app, developed by the University of the West Indies, benefited from the engagement of all those involved in the value chain, including fisheries scientists, research agencies, fisher organisations and fish buyers. Likewise, during the development of a market price information system for inland fisheries in Kenya, a wide range of individuals and organisations were involved, including small-scale fishing communities, local governments and ICT experts.

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Developing partnerships in Trinidad and Tobago to make the best use of ICTs.

© Frederic Courbet/Bill & Melinda Gates Foundation

The Nguruman Maarifa center in Magadi, Kenya. The center is an information hub where local knowledge is documented by communities with the support of field officers and shared widely.

ICTs have a vital role to play in getting information to farmers and vice versa. Extension and advisory services should take full advantage of the potential of new technologies

When it comes to providing information, radio programmes, drama, videos, face-to-face encounters with extension workers and the new ICTs, such as mobile apps, all have a role to play. Different groups of farmers may require different sorts of information and different modes of delivery. For example, illiterate farmers will prefer local language radio and voice messaging, while those with better literary skills can benefit from internet services.

POINTER 2: SUPPORTING ICTS FOR EXTENSION AND ADVISORY SERVICES

Several presenters discussed the use of ICTs for agricultural extension. Mark Bell of the University of California, Davis, described an e-Afghan programme that targets extension officers in Afghanistan, where most people are nomadic, illiteracy is high and connectivity to ICTs is poor. The aim was to provide information to rural communities through an informed group of extension workers who have access to ICTs. Mark concluded his presentation by introducing the "ASK ME" approach to extension. This stands for **A**udience and needs (assess the relevant needs), **S**olutions (identify appropriate solutions), **K**ey messages (identify the key messages related to the solutions), **M**essage form and delivery (package and deliver the information), and **E**valuation (evaluate continually to improve).

The majority of mobile apps developed for the agricultural industry have focused on increasing farmers' and fishers' access to markets. "We need to address other issues as well, such as post-harvest losses, which can be as high as 40%, and helping farmers gain access to microfinance," said Michael Nkonu of GSMA, an association of mobile operators and associated companies during the first plenary session on 'Why the Hype for m-Agriculture?' David Bergvinson of the Bill and Melinda Gates Foundation (BMGF) made a similar point on the same panel. "mAgri needs to supply a diverse range of information – about markets, weather, soils, seeds and financial services," he said.

The parallel session on 'ICTs/Mobile Apps for Access, Distribution and Application of Agricultural Inputs' heard of several examples of large integrated systems targeting a variety of needs, involving a wide range of partners and using a mix of technologies. mFarms is now used in over 17 African countries by individuals and organisations across the value chain. It addresses a wide range of issues, including production, input costs and monitoring. AMITSA provides a market information system on agro-inputs in nine Eastern and Southern African countries. AMITSA covers far more than basic pricing information. It offers multichannel dissemination and communication, using social media where appropriate, a GIS and mapping option and a range of other technical information.

POINTER 3: SUPPORTING OPEN AND BIG DATA FOR SMALLHOLDER FARMERS

Discussions around access to agricultural data began at 'Plug & Play Day' with the showcasing of new tools to support the work of researchers in data collection and analysis. It was acknowledged that ICTs are making it easier for researchers and international development organisations to make food security decisions based on accurate data from

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Good data visualisation is needed for smallholder farmers to benefit more from 'big data'.

the field. The session on 'ICTs/Mobile apps for Management and Use of Agricultural Data', organised by the International Food Policy Research Institute (IFPRI) covered areas related to the capacity strengthening of different stakeholders in the agricultural sector for data measurement tools, and crowdsourcing for improved data.

John Tull, the Global Director of Mobile Agriculture Innovation at Grameen Foundation, explained how measurement tools can increase transparency for organisations in making investments or launching new services that benefit the poor. He highlighted the future importance of sensor-based data collection for agricultural development work. Others on the panel talked about the way real-time data recorded by farmers are being used to support the management of their enterprises. They also discussed other management tools that can lead to the wider availability of data, thereby narrowing the information gap between farmers and other stakeholders.

The conclusion was that smallholder farmers need to benefit more from 'big data' – datasets which are large, complex and difficult to handle – and information derived from big data should be made available in a format they can readily use. Hence the need for good data visualisation, and the importance of providing real-time data via multiple channels to smallholders and others involved in value chains. ■

Building skills and capacity

This chapter looks at the second of the three conference themes, strengthening capacity. High-quality information needs to be reliable and available. The people who matter most – the food producers – need to have access to ICTs, and the skills to use them. Delegates agreed that greater efforts needed to be made to involve young people and women in the use of ICTs.

Reliable high-quality information should be made available to a large group of people.

There are many examples of ICTs that seemed promising on paper, but failed to strengthen the skills and knowledge of the farming communities where they were deployed. This begs the question: 'What needs to be done in order to ensure that ICTs fulfil their potential?' This was at the heart of many of the discussions about capacity strengthening, both during plenary sessions and the eight parallel sessions devoted to the subject.

The parallel sessions covered a broad range of topics, including capacity development and young people, capacity development and women, capacity development for grassroots organisations, the impact of ICTs for agricultural development interventions, and the use of social ICTs.

POINTER 4: ENSURING THE RELIABILITY AND AVAILABILITY OF HIGH-QUALITY INFORMATION

Creating technologically smart solutions is not enough on its own; the content delivered to farmers, fishers, pastoralists and others in the value chain must be timely, relevant, accessible and accurate. Ensuring that the content is accurate will involve public sector organisations, such as agricultural ministries and research institutes, as well as the private sector, farmer's organisations and food processors.

"I'm a soil scientist, and I've seen a lot of lousy content," said Bashir Jama from the Alliance for the Green Revolution in Africa (AGRA). He stressed the importance of engaging farmers in the development of content, which should be always checked by experts before being used.

CTA is promoting new approaches, such as participatory 3D modelling (P3DM), coupled with the use of video, Web 2.0 and social media.

This point was forcibly made by Andrea Bohn, the programme manager of USAID's Modernising Extension and Advisory Services (MEAS), University of Illinois. She described a donor project where the managers had been committed to developing a certain ICT tool, but failed to understand the needs and capabilities of their clients. "They were putting the cart before the horse," she said, "and they were filling the cart with content before they knew where the journey would take them." Project managers need to understand their clients' abilities and needs. They should never pre-commit to specific ICT applications. When defining messages, they should consider issues of gender and levels of literacy and education.

Presenters and delegates repeatedly stressed the importance of trust. Projects and programmes using ICTs will fail if there is a lack of trust between all those involved. Indeed, that is why the multi-stakeholder, participatory approach to the use of ICTs is so important; everyone needs to pull in the same direction, in harmony with their partners.

Reflecting on the week's discussions, Saskia Harmsen, the organiser of the capacity-strengthening stream, highlighted the case of Catherine Molua Mojoko, President of Walana Wa Makwasi, a grassroots organisation in Cameroon. "Take Catherine as an example," she said. "She was an extension worker for 25 years and worked in the communities that she is still serving today. These communities know her, trust her. She has the agricultural knowledge, and her organisation is trusted because of that long-standing relationship."

POINTER 5: ENSURING GRASSROOTS ACCESS TO ICT SOLUTIONS

Delegates stressed the importance of involving a wide range of organisations and individuals in activities that are designed to create a better enabling environment. Experience suggests that the most successful e-agriculture programmes involve the public and private sector, as well as local communities. Encouraging a multi-stakeholder approach frequently involves strengthening grassroots community engagement in policy processes. New ICT approaches, such as participatory 3D modelling (P3DM) coupled with video, Web 2.0 and social media, have proved an effective way of empowering marginalised communities and helping them to document their spatial knowledge, and make use of it to influence policy.

Farmers and farmer's organisations will only benefit from more sophisticated ICTs, such as the internet and SMS messaging services, if they receive adequate training. The nature of the training will depend on knowing exactly what they require. As Saskia Harmsen put it when interviewed for the post-conference issue of *ICT4Ag* magazine: "It's really important that you become part of the communities – visit the people on their plots, build one-on-one relationships with them – and stop seeing them as a focus group with whom you will assess needs." In other words, capacity strengthening needs to be demand-led.

POINTER 6: STRENGTHENING THE INVOLVEMENT OF YOUNG PEOPLE AND WOMEN IN ICT4AG INITIATIVES

The session on ICTs and youth heard about a number of initiatives that were transforming the welfare of rural communities. There is plenty of evidence to show that the combination of youth and social media can do much to improve awareness about the importance of agriculture as an enterprise. Furthermore, farming communities and

young people's groups can benefit synergistically from using social media, for example to promote market specialities such as organic produce. However, young people need to recognise that governments cannot always provide financial backing. Ideally, young people should be involved in ICT initiatives from the outset.

Many presenters were provided examples of ICTs that have led to greater empowerment, increased incomes and improved the welfare of rural communities. To give just one example, Catherine Molua Mojoko, President of Walana Wa Makwasi, talked about her experience of working with rural women.

As a result of Walana Wa Makwasi's training programmes, some 2,000 people in 15 rural communities are now using their phones to receive information on production techniques and markets. Many women farmers with literacy issues can gain access to information, with help from their children. The farmers have also formed closer ties with buyers, thus cutting out middlemen. As a result, mobile phone companies have been installing masts in new areas where the project operates.

The main conclusion of the session on gender was that an inclusive family-centred approach is the best way of ensuring project success and improving female farmers' access to ICTs. Drawing on their experience in Benin, Burkina Faso, Cameroon and Uganda, presenters highlighted some of the reasons why this approach works best. Men often need to be included in the training process so that they do not feel left out, and to ensure that they do not prevent their wives from participating. As ICTs, such as radios and mobile phones are often controlled by men, gaining their trust and support is essential. At a practical level, training programmes need to be held at a time that fits in with women's busy work schedules. ■

Students from Tonga's Tailulu College making the most of new high-speed broadband services at 2013 World Telecommunication and Information Society Day celebrations in the Tongan capital, Nuku'alofa.

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A customer uses his mobile phone to get cash from a Tigo Cash outlet in Ghana. Tigo Cash provide mobile financial services to people who are typically unable to access traditional banking services.

Creating the conditions for success

This chapter is about an enabling environment for ICTs, and the conditions needed to ensure the greatest uptake of ICTs in the agricultural sector. Governments and the private sector should support and promote entrepreneurship and encourage the development of effective business models. Experience in countries such as Rwanda demonstrates the importance of strong political buy-in in creating the right conditions for success.

Eight parallel sessions and several presentations during the plenary sessions focused on various aspects of the enabling environments. This is a broad subject, covering policies and practices, as well as infrastructure and investment. The parallel sessions sought answers to a number of questions. 'What sort of policies and strategies can enable ICTs to be more effective for agriculture and rural development? What sorts of investments are needed, and who should the investors be? What are the skills citizens need to take advantage of ICTs? How can we create business plans that stimulate the interest of young people in rural areas, and encourage them to stay within the agricultural sector?'

POINTER 7: SUPPORTING ICT4AG ENTREPRENEURSHIP AND PROMISING BUSINESS MODELS

Over the course of the week, many speakers stressed the importance of having a good business plan. Addressing the 'Why the Hype?' plenary session, Judy Payne, an ICT advisor for agriculture to the United States Agency for International Development (USAID), said there was plenty of good news about the use of ICTs in agriculture; but there was plenty of "not good news" too. Most of the ICT applications developed for farmers have proved unsustainable, not least because they have been donor funded. Few have been scaled up to reach hundreds of thousands or millions of users. Their impact is often poorly documented and most apps are designed by smart young entrepreneurs, who often lack strong business experience.

Judy suggested that those involved in developing apps for agriculture would do well to learn from the experience, both good and bad, of ICTs in the

Policy makers and others working in the field of agriculture need to encourage smart entrepreneurship and ensure that those developing ICT applications develop sound business models

health sector. She also said that there was much to learn from the activities of mobile money providers, which were the subject of one of the parallel sessions. She said we need to consider honing market segmentation and satisfying the specific demands of different types of farmers. All this requires good business planning.

Philip Abrahams of CAB International (CABI) pointed out that the use of ICTs in agriculture should be considered from the perspective of both the mobile providers and the farmers who use mAgri services. "As far as the mobile companies are concerned, it comes down to money. They are running a business, not an emotion," he said. "As far as farmers are concerned, there are some very specific needs which must be satisfied. Information must be made swiftly available, and it must be relevant to the farmers' location. Services must be accessible to a wide range of users, and they should be demand-driven, rather than supplier-led."

POINTER 8: SUPPORTING SOUND STRATEGIES AND HIGH-LEVEL POLITICAL BUY-INS FOR ICT4AG

In many ACP countries, the agricultural sector has lagged behind sectors such as health, finance and education when it comes to tapping the potential of ICTs. However, several countries are in the process of developing successful ICT4Ag policies, and delegates heard about the experience in Côte d'Ivoire, Kenya and Rwanda, three leaders in the field.

Côte d'Ivoire provides an excellent example of a country whose government has committed itself to developing a comprehensive e-agriculture strategy. Its aim is to modernise the agricultural sector, improve productivity of export crops such as

Rwanda's Minister of Youth & ICTs, Hon. Jean Philbert Nsengimana, stated that youth constitute an incredibly valuable asset that needs to be harvested.

cocoa, and reduce imports of foodstuffs through the intelligent use of ICTs. Its strategy has involved modernising infrastructure, creating the legal and institutional framework for the use of ICTs, training farmers and others along agricultural value chains, and establishing market information systems.

Delegates also heard about the progress made in Rwanda. Between 2000 and 2005, Rwanda established a strategy for ICT development, focusing on creating a better enabling environment. Since then, the country has developed the infrastructure to speed up the use of ICTs, and it is currently developing ICT policies for five sectors, including agriculture. Rwanda was the second country in Africa, after Namibia, to introduce 4G high-speed broadband.

POINTER 9: PROMOTING ADEQUATE INFRASTRUCTURE AND ENERGY FOR ICTS IN RURAL AREAS

One of the presenters in a parallel session suggested that many African countries have the resources to expand ICT infrastructure and improve availability in rural areas, but lack the political will to do so. In Rwanda, President Paul Kagame's enthusiasm for ICTs has been an important factor in the creation of a comprehensive e-agriculture strategy. There are now over 100 rural telecentres, providing internet access and training to farmers and villagers, and within the next few years there will be many more: the land of a thousand hills will soon be the land of a thousand telecentres.

Several discussions focused on the subject of investment. "Governments have an important role to play in terms of creating broadband infrastructure, especially in remote areas," said Máximo Torero, Director of Markets, Trade and Institutions at the International Food Policy Research Institute (IFPRI). "However, the private sector also has a key role to play, and deregulation creates efficient competition."

Governments should be encouraged to provide access to energy, devices and infrastructure, especially in remote areas

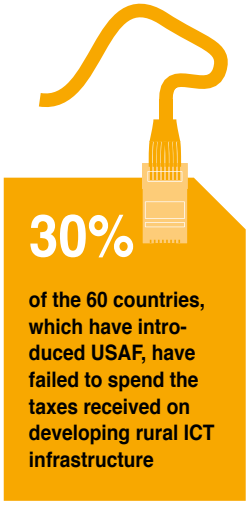
The public sector will nearly always be responsible for major infrastructure work, such as the laying of cables. To give just one example, Côte d'Ivoire significantly improved its connections through the installation of three high-capacity submarine cables in 2011 and 2012, which were funded by the government. And governments, rather than the private sector, will generally have responsibility for the provision of electric power in rural areas.

However, the private sector also has a role to play, especially when it comes to small-scale projects. The session on 'ICT Infrastructure Provision in Agricultural Development' noted that new technologies are helping to reduce costs, with mobile towers now being sold as kits to local entrepreneurs, and less expensive TV frequencies being used for connectivity.

Drawing on case studies from West Africa, Kenya and India, presenters pointed out that there are both advantages and disadvantages to local ownership of transmitters or solar power supply. Local entrepreneurs may provide the key to achieving local connectivity, but they need to develop a sound business case if the current rate of failure – 60% according to Orange in Kenya – is to be reduced.

Several sessions focused on the potential of public-private partnerships. To give just one example,

Maintaining the solar panels which power Radio Douentza. This radio station was opened in 1993 and broadcasts in local languages.



universal service and access funds (USAF), which are taxes collected from telecommunication operators by governments and reinvested in rural connectivity, have considerable potential. According to one of the presenters, approximately 30% of the 60 countries, which have introduced USAF, have failed to spend the taxes received on developing rural ICT infrastructure. An estimated US$12 billion remains unspent worldwide. While several models for the management of USAF have been identified, it seems that the most successful funds are managed by independent regulatory agencies, that have a high degree of transparency and multi-stakeholder participation, rather than the national telecommunication regulatory agencies.

There is a need to address issues arising from awareness-creation, information-gathering and capacity-building on ICT4Ag

POINTER 10: PROMOTING SOUND KNOWLEDGE MANAGEMENT ACTIVITIES

One of the conference streams on 'Capacity Strengthening' called for discussion on gender mainstreaming through ICTs for effective and efficient agricultural activities; monitoring and assessing the impact of ICTs for ARD projects and programmes: and capacity building models and approaches. Although not from a specific conference session, participants identified the need to collate various experiences and lessons learned from efforts to build knowledge-management capacity across ACP partners. This was substantiated through the feedback survey conducted six months after the conference to validate the conference recommendations. It centred on the need to create an enabling environment for the adoption of knowledge-management practices and the importance of indigenous-knowledge assets as inputs to ARD strategies. Respondents highlighted chal-

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Children practice their computer skills on new robust laptops. Rwanda is one of the first African countries to be part of the One Laptop per Child (OLPC) project.

lenges in "efforts towards building effective communication strategies and building a 'knowledge friendly culture'".

A case for the need to understand knowledge management as a social practice based on people-to-people interactions – where technology could be used to facilitate the way people already work, rather than be the means by which a new way of working is imposed – was made. If the motivation to share knowledge did not already exist, then ICTs become more ways of *not* managing knowledge. Referencing the diversity of capacity-building activities required for effective and sustainable use of ICT in agriculture, especially at institutional and grassroots level, conference participants believe the future of the sector depends on knowledge management. Capacity strengthening needs to be clearly understood in broader terms, not only as training interventions, but for coaching and mentoring, knowledge-sharing, relationship-building and networking with local ICT technical providers and resource persons.

The capacity to design, develop, implement and maintain ICT solutions requires guidance and support through the business transformation processes that take place when ICT tools are adopted for agricultural purposes, especially when ICT solutions and the resulting altered processes/procedures are to be scaled up beyond proof-of-concept stage or use by small numbers of users. Knowledge management provides insight into taxonomies and linkages using structured data, the assignment of uniform resource identifiers (URIs) for authors, publications and data, implementation of application programming interfaces (APIs) so others can reuse the information. To be able to share knowledge, it is important to have information and data in the right form. ■

What next?

"There's no point in organising conferences like this if there isn't any significant follow-up." This was one of the key messages that emerged from the final sessions. Many delegates said they were preparing to take action when they returned to their home countries.

Eight year old Piscace holds a guinea pig and listens to a radio outside his home in the DRC. His family breeds the animals and the income gained from this activity pays for his and his sibling's school fees.

Reflecting on the week's events, conference organisers Benjamin Addom and Giacomo Rambaldi wrote: "The true extent of this conference's success can only be measured once it is clear how much positive change delegates will have managed to bring about as result of the conference's takeaways. Although it may be too early for a definitive verdict, there were already encouraging signs of delegates taking action during the conference – for example, innovators and investors sitting together and discussing their future plans. Indeed, people felt that it was the right conference, on the right topic, at the right moment, in a country that is at the forefront of ICT innovation in Africa."

Opportunities were created right from day one for peer-to-peer collaboration, developer–investor partnerships and partnerships between technology and agricultural stakeholders. There was also a great deal of one-on-one networking and that was a sign that action was likely to be taken after the conference. "In my opinion, nothing will happen if the conference participants wait for the organisers to make it happen," said Benjamin Addom. "We all have to take initiative. Having said that, as the lead organiser, CTA has invested a great deal in this conference and has plans of continuing the dialogue to make things happen."

CTA'S INITIATIVES

As the convener of the conference, CTA has learnt that ICTs are playing a critical role within the agricultural and rural development sector in ACP countries. The technologies still offer great opportunities for process management, networking and sharing experiences and information on production, market and finance, among others. However, the speed at which the applications are being developed has led to a huge diversity of applications with little coherence, and vast areas of overlaps and gaps. This has led to the majority of the ICT4Ag initiatives ending at pilot stage after the removal of donor support, with expected uptake by millions of smallholder farmers remaining at disappointingly low levels.

As an umbrella organisation spearheading the integration of ICTs into the agricultural and rural development sector in ACP countries and beyond, CTA will continue to partner with like-minded institutions to mobilise technical and financial resources to accelerate the process of adoption, uptake and upscaling of ICT solutions for extension and advisory services, value-chain development, ARD policy processes, climate change resilience and food and nutrition security. This, we believe, could be done through the following three steps:

Enhancing institutional and grassroots ICT capacity

- Web 2.0 and social media training opportunities and institutionalising the use of Web 2.0 and social media for ARD and VCD among the stakeholders.
- Participatory geographic information systems (GIS) for empowering grassroots spatial information management; communication for empowering grassroots in climate change adaptation, advocacy and policy processes.
- Strengthening capacities/capabilities of users and intended users of ICT4Ag solutions; breaking down the barriers to adoption for widespread use of applications for agricultural development.

Promoting an enabling environment for the use of ICT4Ag solutions

- Supporting sound e-agricultural strategies through

strategy development and implementation at national and regional levels.
- Bringing ICT4Ag practice into policy through convening that shows the potentials and the challenges to the growth of the sector.
- Raising awareness on infrastructure and energy for ICTs through research and development that reveal trends, challenges and opportunities.

Supporting entrepreneurship and the use of ICT4Ag solutions
- Fostering sound ICT-enabled innovation for agriculture by the youth to fill existing innovation gaps.
- Supporting ICT capacity of young agro-entrepreneurs to enable them to take advantage of the new technologies.
- Supporting diverse models of ICT4Ag value-added service provision for scaling and better impact.
- Raising awareness and sharing knowledge and information on power and potentials of ICTs for agriculture and rural development.

INITIATIVES BY SOME OTHER PARTNERS

As a democratic process to validate the outputs of the conference, the organisers shared the preliminary findings with the participants through an online survey, six months after the conference. As part of this survey, participants were asked to share some of their completed, ongoing, proposed initiatives as a result of their participation in the ICT4Ag conference. Below are a few initiatives selected from the survey results:

• "We are working with the Ministry of Agriculture and Food Security to enhance the efficiency of the Farm Inputs Subsidy Programme using ICTs. We are replacing paper vouchers with electronic vouchers during the implementation of the Farm Inputs Subsidy Programme (Mphatso Dakamau, electronic voucher manager, African Institute of Corporate Citizenship, Malawi)."

• "We are leveraging mobile technologies to improve access to finance for smallholder rural farmers. Ensibuuko is a mobile and web application which enables saving and credit cooperatives (SACCOs) of smallholder rural farmers to mobilise savings, pay and disburse loans easily and quickly using mobile money and SMS. To achieve this, we have embarked on building a database and network of SACCOs that are the immediate source of finance for smallholder rural farmers (David Obwangamoi Opio, founder and CEO, Ensibuuko, Uganda)."

• "We are pilot testing new telecommunications technologies that will make it cost-effective for private networks to expand in rural areas. Additionally, we are looking at running mini-electric grids off cell towers (Eric White, managing associate, Integra Government Services Limited, USA)."

• "We plan to use data mining approaches to manage data for smallholder farmers and use the data to build knowledge and provide decision support as an on-farm tool (Devotha Nyambo, student, Nelson Mandela Institute of Science and Technology, Tanzania)."

• "We are currently testing mFisheries software with many applications to suit the needs of fishers; we are encouraging the development of small business enterprises in the sector (Kim Mallalieu, senior lecturer and leader, communications systems, University of the West Indies)."

• "We are brokering relationships between a financial institution, an MNO and agricultural content providers to develop bundled mobile services (financial and agricultural) for smallholder farmers (Agri-Fin Mobile Innovations) (Pierre-

André Cordey, Era-ARD national coordinator, Swiss Agency for Development and Cooperation [SDC])."

- "We are developing a mobile phone application to deliver messages on the management of aflatoxins in peanuts (Abel Atukwase, assistant lecturer, Makerere University, Uganda)."
- "We are planning a system that ensures access to quality content in the region through ICT (Dydimus Zengenene, Info master, Centre for the Coordination of Agricultural Research in Southern Africa, Zimbabwe)."
- "We are developing an online GIS agricultural database for USAID and other donor sponsored projects in Ghana. The platform has data on soil type and suitability, rainfall, access routes, markets, post-harvest sites, etc. to enable farmers, investors and policy makers make informed decisions for agricultural interventions (Emmanuel Antoh, Geographic Information Systems (GIS) Analyst & Web Developer, CERGIS, Ghana)."

For millions of smallholder farmers, ICTs for agriculture is the avenue to pursue

For access to accurate and time-sensitive agricultural information for millions of smallholder farmers globally, ICTs for agriculture could be one avenue to pursue as we look forward to the Post-2015 Development Agenda which calls for: (1) no one to be left behind; (2) putting sustainable development at the core; (3) transforming economies for jobs and inclusive growth; (4) building peace and effective, open and accountable institutions for all; and (5) forging a new global partnership. Information and communication technologies should be seen as catalyst in development and integrated into all activities. ■

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The true extent of the Kigali conference's success can only be measured once it is clear how much positive change delegates will have managed to bring about as result of the conference's takeaways.

The Technical Centre for Agricultural and Rural Cooperation (CTA) is a joint international institution of the African, Caribbean and Pacific (ACP) Group of States and the European Union (EU). Its mission is to advance food and nutritional security, increase prosperity and encourage sound natural resource management in ACP countries. It provides access to information and knowledge, facilitates policy dialogue and strengthens the capacity of agricultural and rural development institutions and communities. CTA operates under the framework of the Cotonou Agreement and is funded by the EU.

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

"A very cool field – ICTs – has been married to a not-so-cool field, agriculture"

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