Harnessing the potential:
ICTs and Knowledge Sharing in Agriculture

A UK Parliamentary Report exploring ICTs and knowledge sharing in agriculture, on behalf of the All Party Parliamentary Group on Agriculture and Food for Development

APPG on Agriculture and Food for Development

The All Party Parliamentary Group (APPG) on Agriculture and Food for Development brings together Parliamentarians concerned with agriculture, nutrition and food security in developing countries. The APPG was established in 2008 in response to the growing concerns over heightened food prices and the chronic underfunding of agricultural development by bilateral and multilateral organisations and national governments. Chaired by Lord Cameron of Dillington, the APPG is a cross-party initiative drawing members from both Houses of Parliament.

The APPG recognises that a vibrant, resilient and environmentally sustainable agricultural sector is key to development and that agriculture is one of the most effective tools to ensure economic, social and political well-being in developing countries. Smallholder farmers are central agents in addressing global hunger, eradicating poverty and increasing national productivity. In recognising this, the APPG uses its cross-party membership to facilitate informed and progressive debate to deepen understanding of the needs, opportunities and challenges of the 500 million smallholder farmers who feed 2 billion people worldwide.

Why ICT4Agriculture?

Information Communication Technologies (ICTs) are tools that can be used to enable specific development and poverty-reduction goals. They are being widely employed in programmes ranging from humanitarian relief, agriculture and livelihoods, governance and health. Across developing countries, around 40% of people now actively subscribe to mobile services, with 130 million new subscribers every year, and 2G mobile coverage at around 95% of the population. Mobile technology growth, and increasingly pervasive internet connections

coupled with private sector investment and improved infrastructure have all been key drivers in the proliferation of ICTs for development.

The 'ict4ag' conference held in Kigali, Rwanda in November 2013 was a key milestone in promoting the application of ICTs in the agricultural sector. The international conference brought together stakeholders from the private sector, governments, civil society, entrepreneurs and research institutes from both the technology and agricultural sectors in order to showcase the developments and possibilities in this rapidly evolving field. The conference advocated that

ICTs should be used as effective drivers of agricultural growth and transformation, as well as having the potential to improve the lives of smallholder farmers in developing countries.

Harnessing the vast potential of ICTs in agriculture, in particular to help smallholder farmers to access information or public advisory services on a regular basis or indeed ask questions or share their own experience, is the focus of this report. Whilst less than 10% of farmers in Africa and South America have access to the internet, almost 90% have access to basic mobile technology, including SMS. This rapid increase in mobile communication enables farmers in even the most remote locations to receive timely and targeted agricultural advice, bridging the information gap that conventional

public extension services cannot span. In India, for example, only 6.8% of farmers get support from traditional extension services, and in Africa the average farmer to extension ratio is 4000:1. In this context, ICTs have the potential to be powerful tools in agriculture.

The potential of ICTs in agriculture

The APPG evidence sessions brought together experts and practitioners in the field from NGOs, the private sector, government and research institutes, who demonstrated the broad range of ways in which ICTs are already being utilised across the agricultural value chains. Although a wide variety of fascinating case studies were presented to the APPG, this report has had to be selective.

There are a wealth of services offering access to information about inputs, agronomic practices, weather forecasts, pest control and the market. iCow, for example, is a mobile phone application developed in Kenya, which tracks each cow in order to inform the farmer about the gestation period, artificial insemination, feeding, milking and disease control. This application has compensated for the lack of extension services to dairy farmers in Kenya and helped farmers to increase their milk production by 2-3 litres a day, thereby increasing their incomes by $30 a month.

The majority of information services are top-down, however, the APPG also heard about a number of farmer-to-farmer knowledge exchange programmes, which are more likely to promote behavioural change and adoption of new practices than conventional top-down approaches. WeFarm, for example, is a platform that enables farmers to share questions, solutions and ideas. The peer-to-peer approach aims to create a knowledge bank of farmer ideas, questions and answers, sourced from farming communities and made available to anyone, anywhere on any device, even the most basic mobile phone. It all starts with an idea or question from a farmer being sent by SMS to the local WeFarm. This is immediately put online and distributed to farmers and extension staff in the local area. Volunteers translate the question, therefore increasing the network. A farmer responds in his or her own language, which is then translated and sent to all the respondents. Using simply SMS to communicate, WeFarm is designed to be the 'Internet for People with no Internet'. Instead of competing with the local extension service, WeFarm seeks to complement existing services. Whilst WeFarm currently only works in a few countries, it has the potential to be replicated anywhere in the world.

In addition to information services, ICT applications are providing access to financial services; facilitating access to mobile banking, micro-credit and micro-insurance. Some services support procurement and enable value chain linkages; providing online trading platforms for producers and buyers. The Natural Resources Institute at the University of

Greenwich conducted, with the UN World Food Programme (WFP), a pilot project in Zambia where tablets were used to record real time information for the quantity and quality of maize sold by farmers to the national food reserve agency, thus making data available via the cloud from 24 purchase points in real time. This use of ICT in stock management enabled both producers and buyers to monitor the quantity and quality of the maize, to query missing stock and to provide feedback.

The APPG also heard about the variety of ways in which ICTs are being used to support research and training. Projects span the different communication channels, including radio, internet, TV, video, tablets, basic phone features and smart phone applications, and range from SMS-based broadcasts and surveys to online training and teaching courses, to radio extension and the use of tablets for questionnaires. Clearly ICTs are powerful tools for both farmers and practitioners working towards agricultural development.

Positive impacts

Throughout the APPG's meeting and briefings on ICTs and agriculture, it was abundantly clear that ICTs are already playing a critical role in agriculture and offer great opportunities for smallholder farmers to improve their livelihoods: increasing their resilience, productivity and incomes.

Programmes that foster peer-to-peer knowledge diffusion and sharing, such as WeFarm, can also empower communities and democratise knowledge by bringing smallholder farmers and their indigenous knowledge together through conversation. As well as sharing experiences, ICTs offer great opportunities for sharing information on production, markets and finance. Farmers use services to learn new farming methods, to plan activities based on weather predictions, to control pests and diseases and to find out current market prices.

With the potential to engage all parts of the value chain, ICTs help to improve transparent information flows and the visibility of data. They create market efficiencies, reduce operation and transaction costs and reduce wastage. A product security programme has been developed in Uganda to combat the issue of illegal, contaminated and counterfeit agro-inputs. The programme utilises special label codes, which can be verified by a mobile authentication service using SMS. Furthermore, financial services, such as mPesa, are promoting financial inclusion by making banking and credit accessible to vastly more people.

Interestingly, GSMA reported that early adopters of the new technologies are mostly young

farmers (50% of users are below the age of 25). Eager to learn, improve and succeed, they actively search for information and opportunities. Comfortable with mobile technology, literate and quick to learn, they share information and teach fellow farmers and family how to use the services. However, this finding was tempered with the strong belief that ICT alone will not be enough of an incentive to encourage young people to stay in agriculture.

Case study: Extension services via digital video

Digital Green, a non-profit international organisation, developed a peer-to-peer approach to agricultural extension based around locally-produced videos. This approach originated in India as a response to the difficulty of connecting a remote farmer with an expert, due to language barriers, illiteracy, and the challenges of rural development, including lack of credit, market access, energy and roads. Agricultural extension services in India reach a very small number of farmers, thus farmers rely on their peers, neighbours and agro-dealers for information.

Harnessing digital video for extension has had the immediate benefit of saving resources and being instantly accessible to non-literate farmers. Digital Green has a database of over 2,900 videos in 20 different languages lasting 8-10 minutes each that have been distributed to more than 250,000 farmers across 3,000 villages in India and have been viewed online, on Digital Green's website and YouTube, more than 2 million times. These videos are produced by extension agents and other trained participants and feature local farmers sharing their knowledge. The videos are then uploaded via a memory card and shown to groups of farmers from the same region using a battery-operated mobile projector.

Fundamental to the Digital Green approach is the importance of participatory content production, meaning that local people speaking their native language appear in the videos so that farmers hear from individuals that they can relate to and therefore trust. The audience learns information about land management, planting, and new technologies that is appropriate to the location and season and can be immediately put into practice. A key strength of the Digital Green model is that it is user-driven: the location-specific content, delivered in the appropriate language, sparks the curiosity of farmers to learn about and replicate the small steps demonstrated in the videos. By disseminating information about sustainable practices based on indigenous knowledge and with low dependence on external inputs, farmers are much more likely to adopt the practices.

Equally important is the approach to distributing the content. A local mediator is supported by area extension agents and conducts the screenings at a time and location chosen by the participants. This mediator ensures that there is active engagement by asking questions, encouraging participation and capturing and relaying feedback, as well as ensuring that there is a gender balance amongst participants. Mediators typically screen a new video to each group of farmers on a fortnightly basis to create a space for regular learning and knowledge sharing. Mediators also record data and feedback from farmers during each screening and on follow-up visits to their farms to inform and target the production and distribution of new videos.

Digital Green has worked closely with India's Ministry of Rural Development and aims to further the Ministry's goals in terms of agricultural extension by scaling its approach to engage 1 million farmers over the next two years. Digital Green is also extending its approach with Ministry of Agriculture in Ethiopia and with commercial extension systems in Ghana. Digital Green consults with its partners on content development and involves their extension agents in programming. These collaborations increase partners' capacity and reach, as well as the sustainability of Digital Green's services.

An evaluation of the impact of Digital Green concluded that its approach is at least 10 times more effective per dollar spent than classical extension and that the rate that featured practices are adopted is 7 times higher as a result of the videos than through traditional extension services. In addition, in India, 80% of the audience are women, with the videos primarily being used by women self-help groups.

The challenges: A 'digital divide'

At the APPG evidence sessions panellists spoke candidly about the challenges of ICT in agriculture and the many lessons that have been learnt from success and failure, especially of scaling up services and securing regular usage.

Whilst telecommunications advance into 4G, apps and smart devices, the reality is that mobile phones are still not universal. Access

to ICTs favours people depending on location, age, gender, education and income. A 'digital divide', in part due to coverage and technology, could further marginalise already isolated or vulnerable groups. This is particularly acute in rural Africa where there is inconsistent access to ICT infrastructure, and connectivity is limited by rural power supplies and the absence of a mobile signal.

The majority of people living in rural areas of developing countries have access to basic or feature phones, not smart-phones. This is frequently accompanied by limited private investment in improved rural network coverage supporting data services. These factors combined limit the capability of people to accessing only voice and text messages through their mobiles. Ensuring accessibility and relevance of the information is complicated by the need to accommodate different languages, literacy levels, cultural constraints and media usage. Using multiple delivery channels (i.e. mobile, radio, internet, TV and face to face) is essential to increase the outreach of the services, promote behavioural change, and achieve economic sustainability while creating feedback loops for increased accountability.

Broadcast tends to reach large populations, but a clear disadvantage is that it is a one-piece-of information-for-everyone means of communication, yet farmers are individuals in localities with unique circumstances and challenges. The need to personalise content: to adapt and tailor agricultural information to the climate and to the specific crop and location presents a challenge for service providers as they often lack information about the social, economic and ecological conditions of the target audience. Poor content relevance has been identified as a key bottleneck to the regular usage of services.

Notably, the uptake of services by millions of smallholder farmers, beyond the registration and trial period, is often low. In addition to poor content relevance and contradictory messages between different sources (e.g. mobile service, extension services and indigenous knowledge), barriers to regular usage include users not understanding the services that are available, and their potential benefits, and not understanding how to use them. This is particularly the case amongst older farmers. These problems are further exacerbated when there is a user fee. Landless or subsistence farmers often do not see the economic motivation to pay a subscription charge for the type of information that is available, while in general they are willing to pay for financial services. A further challenge is the retention of customers and increasing the 'stickiness' of the SIM card. Disloyalty to networks by mobile subscribers results in a churn rate of 70%. The poorest customers have pre-paid SIM cards, which are thrown away after 30 days.

A critical challenge for the scaling up of services, which was repeatedly highlighted in the presentations to the APPG, is the sustainability of the finance and business models. The vast majority of information systems are partially or totally subsidised. Even though many subscribers are willing to pay, this amount needs to be supplemented if the model is to be made donor free. Services offered by non-subsidised initiatives rarely offer a single service, apart from financial services. Instead they offer a combination of different services, which is more favourable for revenue generation. Panellists therefore recommended that a holistic and integrated approach be adopted which thinks beyond a service with a single component, such as information, and builds an entire ecosystem by adding finance, insurance and the ability to buy and sell products. Nonetheless, it is critically important to provide the poorest of the poor with ICT services, for which subsidies and donor-funded interventions are still the only way forward.

Gender and inclusivity

Concerns about who might be left behind and how to achieve equal access to ICTs between men and women were of special interest to the APPG. Oxfam highlighted the opportunities presented by mobiles to address women's time and mobility constraints, to facilitate their access to relevant information, to increase access to financial services for income generating or care related activities, to facilitate participation in political processes, to address power imbalances at the household and community levels and to gather sex-disaggregated data. However, these were moderated by the challenges, which included women's financial constraints to buy mobile phones and pay for services, high levels of technological and language illiteracy, cultural constraints preventing women from accessing services and the unequal distribution of work at the household level, which results in women's time poverty and prevents them from changing behaviours.

The APPG wishes to stress the importance of explicitly addressing issues of gender equality. Women face more social than economic challenges to own and use mobile phones. Interventions to improve women's access to ICT4Agriculture must therefore address the family as a whole and understand the household power dynamics in order to change attitudes. Women's groups can facilitate peer to peer knowledge exchange for behavioural change, using multiple delivery channels and involving women in the design of services are all key measures to ensuring that the benefits of ICTs in agriculture are maximized and experienced equally.

Plugging the gaps: Next steps

To date there has been a lack of evaluation, resulting in insufficient evidence of the impact of mobile advisory services supporting or altering behaviour change or affecting livelihoods. As this report illustrates, the evidence of impact that does exist is mainly anecdotal.

The Department for International Development (DFID) has a number of programmes that have an ICT component, although many of them are at an early stage. DFID highlighted the need for more evaluation, both of the quality of information, and of the effectiveness of converting information into knowledge. In response to this, the MobileNutrition (mNutrition) initiative,

part-funded by DFID and aiming to improve nutrition levels of 3 million women and children as a result of behaviour change promoted by accessible nutrition based agricultural and health information delivered at scale through sustainable business models, is one example where effective evaluation has been incorporated into the programme design.

In addition, moving towards improved standardisation of content – provision of holistic information, which helps farmers in their work (not just weather and market prices, but access to finance and transport services, or pest and disease information) – would assist. Another area of improvement is in the quality of advice, ensuring that it is both objective and safe. Farmers need to be assured that recommendations are driven by their needs, and not provided indirectly or excessively to promote products, which may not either be internationally recommended, or safe to use without proper precautions. The concept of a 'Content Kite mark' that CABI has established appears to be a rare example, whereby all messages are validated through peer-review by experts and farmers, and confirmed as appropriate against international agri-chemical protocols.

ICTs are more than just mobile. Technologies become more powerful when combined. Whilst, radio remains the best way to communicate with the majority of people in Sub-Saharan Africa, the radio can be augmented with mobile phones to allow for SMS feedback. Digital tools alone will not close the digital divide. ICTs are not a replacement for face-to-face interaction but rather a complement. To create behavioural change, the existence of spaces for discussion and co-creation of knowledge (i.e. cooperatives or self-help groups) remains critical.

ICTs are a tool and not a solution. Physical infrastructure, human capital, political institutions and finance are necessary precursors to the gains that technology can provide. It is therefore critical to partner with government, NGOs and private sector actors that already work with farmers, and to see where technology can improve their efficiency and broaden the participation of the communities that they work with. Linking to existing government extension services is important to ensure complementarity and to ensure that ICTs are seen as an aid to their work rather than a rival. Engaging politicians

is also vitally important to create a shared understanding of the value of ICTs in agriculture, to facilitate the development and approval of supporting policies, and ultimately to promote government's ownership of these kinds of interventions.

To ensure financial sustainability, funding models for initiatives need to incentivise innovation and cover real costs. Given the enormous potential, it is problematic that traditional institutional development donors perceive innovation differently and thus there is a mismatch between donor models and the dynamism of the ICT sector. This is amplified by the fact that mobile operators and service providers consider such programmes to be risky business cases.

There is an urgent need to address the enabling environment for the adoption of ICTs by smallholder farmers, and predominantly women, in the rural context. Measures to incentivise supply chain stakeholders to connect smallholder farmers are vital. Stakeholders must consider the role of ICTs to introduce farmers to agri-businesses wanting to source produce from new growers. Favourable policies to encourage rural infrastructure development, improved land rights, and policies that reduce time poverty (e.g. providing childcare services, installing water pumps or improving transportation to markets), are also key catalysts. There are also opportunities for women-centred services to ensure women don't lose out.

Recommendations

Consensus that ICTs have enormous potential was abundantly clear from all of the APPG's research and evidence sessions. ICTs are powerful tools with benefits that go beyond delivering and collecting information. However, ICTs are not a panacea. Significantly, the challenge of fulfilling the opportunities offered by ICTs includes realising them in an inclusive way. ICT4Agriculture is an area that is active, diverse and has the potential to deliver increasingly positive impacts for the lives and livelihoods of smallholder farmers.

The All Party Parliamentary Group on Agriculture and Food for Development recommends that national governments, donors, the private sector, NGOs and wider stakeholders:

- Recognise that for rural communities and smallholder farmers to benefit from ICTs in agriculture, rural infrastructure development must be incentivised.

- Prioritise effective evaluation of the impact of ICTs and strengthen the evidence base. A database cataloguing successes and failures should be developed to help with learning and avoid repeating unsuccessful practices.

- Harness the potential to combine delivery channels, including face-to-face interaction, to reach an even wider audience.

- Promote user-driven services and supporting government policies. Addressing women's time and financial constraints to access the technology and act upon the services, should be given the highest priority.

- Harness the potential to combine multiple delivery channels to reach disadvantaged populations.

- Explore ways to enhance informal farmer-to-farmer mobile supported discussion for co-creation of knowledge and increased behavioural change.

- Ensure that ICTs are linked to existing extension services, including government-run programs. Engaging national governments in ICT4Agriculture programmes to promote a sense of ownership and to facilitate the development and approval of supporting policies.

- Ensure that the content of extension messages disseminated via ICTs is based on sound and appropriate science in an open and transparent manner.

- Promote sustainable and innovative business models, ensuring that revenue models cover real costs.

The All Party Parliamentary Group on Agriculture and Food for Development wishes to thank all those who presented to the group on their 'ICT and Knowledge Sharing in Agriculture' Seminar Series in July 2014. A full list of participants can be found on the APPG website.