ICT Update

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CTA

e-agriculture

Ivory Coast has kick-started the process of developing an e-agriculture strategy

An ICT-triggered rural knowledge revolution is underway in India

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e-agriculture strategies

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Guest editor

Harnessing ICT strategies for ACP agriculture

The 2003 and 2005 World Summits on the Information society called for the development of ICT strategies for all sectors. But more is needed for effective e-agriculture strategies in ACP countries.

Today, there is barely a community in our 'global village' that has not felt the effects of the ICT revolution. Most of these people are now regular users of mobile phones and keen consumers of ICTs. Governments in both the developed and developing worlds have responded by formulating ICT policies, putting in place regulatory frameworks and establishing institutional infrastructures. Their aim is to facilitate and bring order to these e-developments that are rapidly changing the world we live in.

The World Summits on the Information Society (WSIS) held in Geneva in 2003 and Tunis 2005 aimed to bridge the global digital divide by expanding access to ICTs in developing countries. Agriculture was less of a focus than health and education during these events, but a call to develop ICT strategies for all sectors, including agriculture, was issued at these summits.

Since these world summits, some countries in the ACP group of nations, such as Rwanda, have massively accelerated their efforts and have already advanced from building early e-government trial websites to developing next-generation smart devices and apps. By contrast, other countries such as Nauru and Burundi were much slower to develop e-strategies and risk missing the boat as far as mainstream ICT developments are concerned.

Slow adoption of e-agriculture strategies

e-agriculture is a field of activity related to the use of modern information and communication tools and technologies that increase agricultural productivity and make available information that is relevant to agricultural research, planning, extension, production, monitoring, marketing and trade. The Food and Agriculture Organization of the United Nations – coordinator of the *Action Line* for e-agriculture in the WSIS 2003 Plan of Action – has referred to e-agriculture as an 'emerging field in the intersection of agricultural informatics, development and entrepreneurship'.

Whereas other sectors feature prominently in most ACP countries' national e-strategies, agriculture is conspicuous by its absence in these policy documents. In its 2010 report *National e-strategies for Development: Global Status and Perspectives*, the International Telecommunication Union noted that hardly any developing countries had developed and adopted a national e-agriculture strategy, while in contrast 'many e-government, e-business, e-learning and e-health strategies are in place'. In fact, in 2012 only four countries (Ivory Coast, Ghana,

At present, e-agriculture strategies are only being developed in a handful of ACP countries

Related links

ICT Observatory 2013: Strengthening e-agriculture strategies in ACP countries
➔ http://ict-observatory.cta.int

The 2003 and 2005 World Summits on the Information Society:
➔ www.itu.int/wsis and http://goo.gl/2HHVGx

National e-strategies for development: Global Status and Perspectives 2010:
➔ http://goo.gl/prbcq5

CABI Direct2Farm
➔ http://direct2farm.org/

Mali and Burkina Faso) were reported to have formally prepared e-agriculture-related strategies (according to desk research undertaken by CTA in preparation for its ICT Observatory meeting held in April 2013).

Booming isolated projects

The absence of formally adopted e-agricultural strategies does not mean that there is no activity in this field. On the contrary, there is an important boom in ICT-for-agriculture projects in developing countries, triggered by the ever-expanding mobile signal penetration that has already surpassed 90% in South Asia and is rapidly approaching 70% in Africa. Mobile phones are easy to use, are increasingly able to bypass the barriers of illiteracy and affordability, and provide access to a wide range of very useful services, such as transferring money, checking market prices and gathering weather information. And a new generation of 'smart devices' such as smart phones and tablets are extending the potential uses of these mobile devices into a new generation of tools for obtaining personal agricultural extension and other professional advice.

With the support of the World Bank, the Nigerian government has distributed a staggering 10 million mobile phones among its farmers. In India, CABI has developed Direct2Farm, a mobile-enabled agriculture infomediary service aimed at making high-quality information readily accessible to farmers, via SMS, voice messaging and apps. This project has successfully completed its pilot stages and is now being scaled up. In Kenya, mFarm provides a very popular market information service to farmers that mobile phone operators failed to reach.

In the Caribbean, networks such as the Jamaica Agricultural Marketing Information System are increasingly making use of mobile phones to deliver their information services, and in the Pacific the National Agricultural Research Institute of Papua New Guinea is working on a project that will gather feedback from farmers through SMS.

However, in most ACP countries, these and other similar initiatives are mostly isolated projects generally implemented on an ad-hoc basis. They tend to lack a clear vision or approach that would ensure everybody in the value chain can actually access their services and help to rationalise budgets and resources. This situation calls for the development of

specific coherent ICT strategies for the sector.

Lessons from strategy development

The development of e-agriculture strategies has only been undertaken in very few ACP countries. However, in the overall national ICT4D policy documents adopted by most ACP countries in early 2000s – with the help of institutions such as the United Nations Economic Commission for Africa (UNECA) and IICD – agriculture was one of the sectors under consideration. The plan was to develop comprehensive sectoral strategies separately in many countries at a later stage. But in Africa, for example, key agricultural stakeholders were hardly consulted when the sections on agriculture were drafted in the general ICT4D strategy documents. This eventually led to an absence of ownership or follow-up for the development of dedicated e-agriculture strategies.

For example, in Ghana the policy document *Implementation Strategy and Action Plans for Modernisation of Agriculture and Development of Agro-Business Industry in Ghana* was developed and released for implementation in 2007. A lack of ownership by the Ministry of Food and Agriculture, however, meant that there was no follow-up to this strategy. It was not until 2013 that the ministry resumed work on this strategy. In Mali and Burkina Faso the ICT strategy documents for agriculture and rural development were developed in 2011 with the support from UNECA, but are still waiting to be officially endorsed. And in some countries the momentum often petered out because so much time was being taken to formulate the policy documents.

There is a silver lining, however. Ivory Coast developed an e-agriculture strategy document in 2012 thanks to efficient collaboration between the ministries in charge of agriculture and ICTs. Follow-up action is now in progress and a related workshop was held in July 2013.

A new trend is being observed today in some countries working on specific value-chain segment strategies. The segmentation of strategies can be effective, if not planned in isolation, and if ultimately all value-chain segments are dealt with coherently. The specific sub-sectors covered in these strategies may include agricultural extension,

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agricultural trade and markets, agricultural research, post-harvest and risk management, and improved access to ICTs for agricultural stakeholders

Some of the key recommendations to come out of the 2013 ICT Observatory include improved multi-stakeholder collaboration and stronger ownership by ministries in charge of agriculture, which would support the implementation of effective e-agriculture strategies. These strategies have to be fully in line with current agricultural policies. e-agriculture strategies should be promoted by regional institutions and programmes, such as the Comprehensive Africa Agriculture Development Programme. ◀

Many national and international policy debates across the world present ICTs as a major driver for economic growth. The US economy is often cited as an example. The country showed strong growth in the early 2000s, which coincided with the rapid expansion of the internet and mobile phone networks, and the emergence of many online services that could be accessed through these networks. It is now generally accepted that ICTs and which outlined a country-by-country planning process for national ICT policy development. The process promoted Africa's inclusion in the digital and global economy, and provided a policy framework for integrating ICTs into national development strategies.

The pioneering National Information and Communications Infrastructure processes generated comprehensive national ICT4D policy outlined in Ivory Coast's national e-agriculture strategy document, which was validated in late 2012.

To backtrack, in 2000, in anticipation of the arrival of the first submarine fibre optic cable SAT3 that would connect Ivory Coast to the global data communication networks, the country's government adopted its National Information and Communications Infrastructure plan, which outlined its national ICT

e-agriculture strategies: the case of Ivory Coast

Many African countries have developed national e-governance, e-health and e-education strategies, yet many still lack an e-agriculture strategy. One exception is Ivory Coast, which has just started to develop an e-agriculture strategy.

these online services enhance economic growth, good governance, job creation and the dissemination of knowledge. Indeed, a 2009 report by McKinsey & Company, *Broadband for the Masses*, suggests that a 10% increase in internet penetration may cause GDP to grow by at least one percentage point. Even though this correlation strongly depends on the influence of other conditions, it recalls the importance of strategically leveraging ICT for development (ICT4D) in developing countries.

In the late 1990s, the African Information Society Initiative, launched by the UN Economic Commission for Africa, created the National Information and Communications Infrastructure,

plans in many African countries. Increasingly, sector-specific strategies for e-government, e-education and e-health are being put in place. The policy processes for developing national e-agriculture or ICT for rural development strategies have also been set into motion in some countries, but little progress has been made so far. This is not to suggest that no ICT for agriculture (ICT4ag) initiatives are being undertaken, but they are scattered projects, which sometimes duplicate efforts, leaving key segments or issues of agriculture unaddressed.

The case of Ivory Coast

Ivory Coast is one of the countries in Africa which recently started to develop a comprehensive e-agriculture strategy. In June 2013, a meeting took place in Agboville, Ivory Coast, convened by the country's minister of agriculture, Sangafowa Coulibaly, and the minister of post, information and communication technologies, Bruno Nabagne Kone. The seminar focused on setting priority actions and projects within the framework

strategy. Since then Ivory Coast has established connections via three other high-capacity submarine cables, in 2011 and 2012.

These developments are in line with the government's decision to modernise the country's agricultural sector and enhance its productivity. These measures were considered necessary to increase the country's income from the export of cocoa, coffee and other produce, and to decrease its dependence on food imports, which have the added benefit of strengthening its national food security.

With widespread connectivity to global markets and networks, the government decided that ICTs were a credible way of achieving its goals and decided to develop a national e-agricultural strategy. It had to correspond to the government's larger ambition to see Ivory Coast attain the status of emerging nation by 2020.

The minister of agriculture and the minister of post, information and communication technologies in Ivory Coast were put in joint charge of developing this e-agricultural strategy.

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Ivory coast is modernising its agricultural sector to enhance its productivity

They appointed an interdepartmental committee of experts and instructed them to formulate and implement a national strategy for using ICTs to develop and modernise Ivory Coast's agricultural sector, and promote good governance in the sector.

More specifically the committee was to develop an e-agricultural strategy that would ensure the creation of a modern ICT infrastructure for the agricultural sector, a legal and institutional framework for the use of ICTs and comprehensive real-time, multipurpose agricultural information services. In addition the strategy would have to ensure that farmers and all other people involved in this modernised agricultural sector, particularly young people, would have adequate access to the information services and receive training to learn how to use them.

A balanced, home-grown strategy

The committee of experts adopted an impressive participatory approach to the development of this e-agricultural strategy by involving a wide range of stakeholders in their work. They consulted and sought advice from their colleagues in other governmental departments at the national, regional and sub-regional levels. They also approached representatives from different divisions in the *Conseil du Café-Cacao*, the professional organisations affiliated with the *Association Nationale des Organisations Professionelles Agricoles de Côte d'Ivoire* and the 2,000 cooperatives of producers of cacao, coffee, cotton, banana, pineapple, cashew, rubber and animal products representing several million members.

The committee also sought advice from ICT4D experts and various agricultural educational and research institutes and other professional organisations serving the agricultural sector. They also consulted sector strategy plans for e-government, cyber security, e-education and e-health as well as the national ICT4D strategy document. And last but not least, they examined current agricultural policy plans, such as *Le Plan Directeur de Développement Agricole Ivoirien 1992–2015, Le Programme National d'Investissement Agricole 1992–2015*, and documents from the Comprehensive African Agricultural Development Programme (promoted by the African Union's New Partnership for Africa's Development), the Regional Agricultural Policy for West Africa and the national Poverty Reduction Strategy Document.

All these detailed analyses of plans and strategies ensured that their e-agriculture strategy would be aligned with current ones for other sectors and that it would build on their plans and achievements rather than duplicate their efforts. The result of these consultations and research is a balanced, home-grown national e-agricultural strategy that focuses primarily on key interdependent axes:
- ICT infrastructure and equipment;
- agricultural market information system;

Ivory Coast's e-agriculture strategy will modernise its agricultural sector and promote good governance in the sector

LINEAIR/MARK EDWARDS

Information needs to be processed and translated into farmer-friendly advice

- applications and services tailored to the agricultural world;
- a legal and institutional framework;
- ICT capacity building programme;
- agricultural information system; and
- national communication system for the ministry of agriculture.

This comprehensive national e-agricultural strategy document was the subject of a previous validation seminar organised by the ministers of agriculture and post, information and communication technologies in November 2012. The seminar held in June 2013 was a final step in an extended process of studying plans and deliberating with the many stakeholders in the national e-agriculture strategy.

Seven strategic axes

The e-agriculture strategy is held together by seven strategic axes. They represent an ambitious effort to modernise Ivory Coast's agricultural sector and develop good governance in the sector. A key element of this effort is to build a robust ICT infrastructure in rural areas. This requires a reliable energy supply throughout the country, from hydroelectric or alternative sources. Moreover, the main agricultural institutions need to be equipped with relevant ICT hardware and have good internet access, while their staff need to be trained to use and maintain the equipment.

The strategy also calls for a main data centre and many community multimedia centres as part of the ICT infrastructure package. This package will use a new generation of market information systems that make real-time information available via mobile phones and tablets. The technology will also be used to upgrade existing marketing information systems, such as the *Office de Commercialisation des Produits Vivriers*, responsible for marketing food crops.

This part of the strategy also intends to improve the market information systems of ANADER, an agency that provides rural development extension services, and other organisations that provide market information on livestock. Agricultural ICT services and applications targeting specific activities will be acquired or developed as well when needed, such as alert systems and portals.

Stakeholders consulted during the development of the strategy have expressed their wish for an enabling legal framework that favours the adequate use of ICT in agriculture, such as electronic translation. Although this specific item was already part of the framework for the national ICT policy, a separate decree may be adopted to include it in the e-agriculture strategy.

Finally, various capacity building initiatives will ensure that all agricultural stakeholders have basic ICT skills. This includes farmers other stakeholders in rural areas, and government officials working in the agricultural sector. The strategy will explore ways of using ICTs to improve literacy and integrating ICTs into agricultural training and training institutions.

The strategy aims to strengthen and coordinate various national agricultural information systems. Better coordination will improve the governance of the various chains of the sector and the communication between the Ministry of Agriculture and other stakeholders. Better communication will ultimately improve the exchange of knowledge and collaboration between all the other private and public institutions that work in the sector.

An example for other countries

Ivory Coast's decision to develop an e-agriculture strategy is a first step towards modernising its agricultural sector. The strategy is holistic: it covers a range of agricultural activities and is aligned with e-strategies in other sectors. Implementing policy documents remains a challenge, however. The number and types of initiatives prioritised by the various stakeholders consulted during the meeting in Agboville in June 2013 require substantial funding.

It is therefore encouraging that partners such as the World Bank, the China Great Wall Industry Corporation and some national private-sector organisations from Ivory Coast have offered their assistance in implementing the e-agricultural strategy. The goals of the strategy are important and the Ivory Coast government is counting on all interested partners to do their share.

The Ivory Coast government has used an inclusive, multistakeholder approach to develop its e-agriculture strategy. The collaboration in Ivory Coast between the Ministry of Agriculture and the Ministry of Post, Information and Communication Technologies is rare in Africa, where collaboration on ICT4ag policy has been decidedly weak. The increasing penetration, and lower cost of mobile phones and better internet connectivity, will certainly accelerate the deployment of e-agriculture projects and strategies in Africa. ◀

African countries with e-agriculture strategies

Only a handful of countries have launched initiatives to develop e-agriculture strategies:
- **Ghana:** *The Ghana ICTs in Agriculture Implementation Strategy* was developed in 2005. It is unclear whether this strategy has actually been implemented.
- **Ivory Coast:** Ivory Coast recently developed a comprehensive national e-agriculture strategy.
- **Rwanda:** Rwanda is currently formulating its *Strategic Plan for Agricultural Transformation*, a national plan to integrate ICTs into agriculture and natural resource management programmes across the country.
- **Mali and Burkina Faso:** Together with the United Nations Economic Commission for Africa, these two countries are developing a cyber strategy for agricultural and rural development.

Source: CTA, Benjamin Addom, (2013) *e-Agriculture Policies and Strategies in ACP Countries*, background report in preparation of the 2013 ICT Observatory, CTA Wageningen.

A telecom operator in West Africa

With a presence in 18 African countries, Orange is an important telecom operator in Africa. Making its services available to small farmers is one of the company's priorities.

e-agriculture strategies

Orange believes that mobile phones and the explosive growth of apps for these ICT devices are key levers of socio-economic development in rural Africa. Mobile phones can be used to access agricultural information services and can play a particularly important role in sub-Saharan Africa, where the majority of the rural population are often illiterate farmers in remote areas.

Agriculture is the principal economic engine of most African countries, sometimes employing over 60% of their workforce. It therefore makes good commercial sense for telecom operators to focus on agricultural areas, where they can use their expertise to set up mobile networks and address the challenges facing farmers. A Vodafone and Accenture study from 2011 estimates that the farming populations of Africa, once properly connected to mobile value-added services (VAS) such as information, marketing and banking services, represent an additional 237 million new voice, SMS and USSD connections per year

A number of telecom operators have recently decided to promote VAS to farmers by delivering these to their

REUTERS/ERIC GAILLARD

mobile phones. To mention just one of many examples, in India the large mobile network operator Airtel partners with the Indian Farmers Fertilizer Cooperative to provide free voice-based agricultural information services to farmers. This partnership has resulted in a triple-win situation: the cooperative improved the reach and quality of its services; the farmers were able to access agricultural information services on their mobile phones; and Airtel saw a substantial growth of the use of its mobile phone network.

At Orange we have been inspired by this and other initiatives and decided to offer VAS to meet the particular needs of smallholder farmers in West Africa.

Labaroun Kassoua in Niger

In 2011, the Network of Chambers of Agriculture in Niger (RECA, Réseau National des Chambres d'Agriculture du Niger) and Orange Niger jointly launched Labaroun Kassoua, a mobile agricultural value-added service (Agri VAS) providing continuously updated market prices of agricultural produce in over 70 markets in Niger. This Agri VAS was well received and by October 2012, Labaroun Kassoua had already over 8,000 regular unique users of its information service. And, these users had initiated thousands of SMS and USSD connections with Labaroun Kassoua's servers using their mobile phones.

In early 2013, building on these results, RECA and Orange Niger started a pilot project to vocalise Labaroun Kassoua's services using IVR (Interactive Voice Response protocol). The instant positive response shows that there is great appetite for agricultural information that can be obtained in French and Hausa (the local language) through interactive voice services.

Grant to launch mFarmer in Mali

In April 2012, Orange Mali received a grant of €300,000 to test and roll out the mFarmer initiative in Mali. This Agri VAS provides smallholder farmers with access to agricultural information and advice including weather forecasts, market prices, agronomy tips and advice

on dealing with pests and diseases. *mFarmer* uses the same technologies – SMS, USSD – used by Orange Niger in its *Labaroun Kassoua* project. In addition, farmers can call a helpline to speak directly with an agronomist. The service was officially launched on 25 July 2013. In setting up and managing this Agri VAS, Orange Mali closely cooperates with local NGOs.

The positive impact of mobile phones on agricultural economic development has become clearly evident. Telecom operators must also take their corporate social responsibilities and offer their expertise in setting up mobile networks in remote rural areas in Africa. In doing so, telecom operators have to work with local NGOs and other local partners who know these rural areas and the development challenges of the farmers who live there. Only by openly collaborating with local partners will they be able to contribute effectively to sustainable development in Africa. The biggest challenge for telecom operators such as Orange is bringing mobile networks and Agri VAS to the level that these services can be financially self-sufficient and operate without government or donor support. ◄

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What is USSD?

USSD (Unstructured Service Supplementary Data) is a protocol used for communicating with the computers of value-added service (VAS) providers via mobile telephone networks. The protocol supports high-speed real-time information exchange between VAS and their subscribers. Unlike SMS (Short Message Service) messages, USSD messages create a real-time connection, allowing a two-way exchange of data. Originally, USSD was designed for supplementary services of mobile network providers, such as call forwarding. Today a wide range of mobile network services make use of this protocol, including mobile-money and agricultural information services.

CARICOM's e-agriculture strategies

The Caribbean Community is transforming its agricultural sector into a competitive and sustainable system of agricultural production and services in which ICTs will play a vital role.

e-agriculture strategies

Agriculture is a priority sector for the 20 member and associate member states of the Caribbean Community (CARICOM). Their vision for the agricultural sector entails a complete transformation towards a market-oriented and environmentally sound system of agricultural production and services – one that provides improved food and nutrition security, especially for vulnerable groups. ICTs and their many applications can play a vital role in realising this ambitious vision.

This vision has been set down in a number of policy documents, such as the Community Agriculture Policy, the Regional Food and Nutrition Security Policy and several supporting strategic policy frameworks, such as the Agribusiness Strategic Plan. One of the key imperatives of these policies is the adoption of modern knowledge and information systems to improve decision making and encourage interaction among all players in the value chain. These systems should also link R&D and extension efforts at the national, regional and international levels, and attempt to increase their impact on the entire agricultural sector in terms of adaptation of ICTs and other technology advances.

Bridging information gaps

A key challenge faced by farmers and agribusinesses is a lack of knowledge about markets, sources of technology and business support. ICTs could be used to fill these information gaps. For example, cellular networks and value-added services that can be accessed through these networks, have spread throughout the entire world. The speed of this diffusion and the variety of uses to which these networks have been put is indicative of the pent-up demand for more rapid and effective communication, even in the smallest and poorest communities.

Market information gaps exist even within internal markets in the Caribbean region. The building of market information systems is therefore critical to ensuring that farmers and agribusiness persons are able to make

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the right decisions, plan ahead and link up with the necessary markets. Linking producers to regional and external markets means setting up robust market information and intelligence systems, which must be funded largely by the public sector.

Crucial to this issue is the need for ICTs to gather, store and analyse, and subsequently disseminate information. Traditional extension services depend very much on there being a sufficient number of trained technicians to service a manageable number of

information and intelligence system, and work has started to develop the necessary capacity for such a system, at both regional and national levels.

National initiatives include Trinidad & Tobago's National Agricultural Marketing and Development Corporation (NAMDEVCO), which has a mandate to improve marketing and investment in the country's agro-industrial sector. NAMDEVCO has developed a National Agricultural Market Information System (NAMIS), which provides reliable and real-time

all scales of operation) have an interest – up-to-date information, statistics, trade and investment opportunities and policy issues. Caribbean Agribusiness is also meant to fill the information gap that currently exists in terms of all sorts of agricultural information but is not meant to replace or supersede any existing information service.

Leadership

The importance of embracing ICTs by the CARICOM's agricultural sector cannot be overstated. Both public sector institutions and the private sector have to show leadership if the mandates to increase production and promote trade and food security are to be met. We have to explicitly recognise the role that ICTs play in the practical lives of producers and consumers alike and build on best practices within and outside of the region, and we must mainstream ICT-related activities into the various institutions' ongoing programmes.

Since every business, country and region depends on the flow of knowledge – from production processes through to marketing techniques and the sale and purchase of goods via the internet – investing, or the lack of it – in ICTs can have a 'make or break' effect on the ability of CARICOM to remain a viable, sought-after partner in the global agriculture arena. ◀

Traditional agricultural extension services will become a thing of the past. There is now a critical need to build up digital databanks and translate technical information into user-friendly advice

farmers, and that those workers have the required budgets to do their work properly, even in remote villages. These extension services, if they ever existed, will probably become a thing of the past. There now is a critical need to build up digital databanks and translate technical information into user-friendly advice that can be accessed by farmers and agribusiness persons.

The CARICOM region's limited progress in the field is probably best illustrated by the sporadic presence of governments, regional institutions, NGOs and even established businesses on the web. These websites consist mostly of static web pages and are often short of relevant information and often lack the essential tools for communicating, doing business and engaging in national and regional dialogues.

Innovative ICT initiatives

Notwithstanding the many challenges, there are some encouraging innovative developments specific to ICTs in the Caribbean. For instance, at the policy level, the CARICOM member states recently approved a Regional Digital Development Strategy, which is a modern strategy seeking to capitalise on existing national initiatives and amplify them for regional benefit. Additionally, funding has been acquired from the EU-funded Intra-ACP Agricultural Policy Programme to reinvigorate the development of a regional agricultural marketing

information to farmers, processors, retailers and institutional buyers. Among the many innovations introduced by NAMIS is the use of hand-held devices for capturing data, which reduces the errors normally associated with data collection.

Another national initiative is the government-operated Jamaica Agricultural Marketing Information System (JAMIS), which provides regular updates on over 50 agricultural products. JAMIS provides weekly updates on prices, availability and quality of agricultural produce on its website, where visitors can subscribe to a service that sends these reports to them by email.

Various other innovative mobile applications are emerging in the academic world and through the work of private developers. These applications range from providing safety and weather information, to linking fishermen at sea with buyers for their catches. Others provide 'real-time' key information for specific fruit trees throughout the year.

Meanwhile, the CARICOM Secretariat has created a Caribbean Agribusiness website with an ambitious agenda. This website is meant, eventually, to be a major internet portal integrating existing initiatives and relevant institutions, such as ministries of agriculture, producer organisations, agribusiness associations and inter-governmental organisations, to name a few, and serving as the hub for all matters in which business persons (at

The Caribbean Community is using ICTs to improve food and nutrition security for future generations

JEFF GREENBERG/ALAMY

ICT-triggered knowledge revolution in India

Agricultural digital networks help to break down the barriers that stand between localised rural economies and globalised markets.

e-agriculture strategies

India is one of the world's fastest-growing economies and the prospect of over a billion people connected to the internet has staggering implications for its government and citizens. Of course, that point has not been reached yet. Many farmers in rural India, where 70% of its population lives, still lack internet access. However, there are many ICT-led e-governance initiatives underway to develop effective and inexpensive ICT penetration. Indeed, India's e-agricultural strategy is targeting the country's 125 million farm households, 80% of which are marginalised. It is hoped that a strategy of agricultural digital networks will lead to an ICT-triggered rural knowledge revolution and help to break down the barriers between localised rural economies and the globalised market.

Agricultural networks

The Digital Network for Farmers is an ICT-led initiative run by the National Informatics Centre (NIC) and the Ministry of Agriculture. It began at a national conference in India on ICTs and agriculture in 1995. It was then and there that a blueprint was developed for

A farmer receives an explanation of agricultural networks

ALAMY/PHOTOSINDIA.COM LLC

e-governance in the agricultural sector and a recommendation formulated to allocate 3% to 6% of the national budget for agriculture to the development of digital networks and information services. Today, this initiative has developed 15 digital networks linked to agriculture and related topics, including digital information services on seed, fertilizer, plant protection, fisheries and natural disaster management .

The first e-governance project, AGMARKNET, was launched in 2000 to strengthen India's agricultural marketing system. AGMARKNET has now emerged as a key national portal. It has local language interfaces to reach the broadest possible audience. Its databases publish daily market information, such as minimum, maximum and modal prices for about 300 commodities and their over 2,000 varieties. AGMARKNET has also strengthened decision making at various levels and paved the way for the globalisation of Indian agriculture. Apart from domestic visitors, this portal has also received a tremendous number of visitors from outside India.

Another agricultural e-governance initiative has been developed by the Plant Protection Informatics Network (PPIN) to register pesticides digitally. It is a government-to-business project called CROP (Computerised Registration of Pesticides), which makes it easier to file and process online applications for pesticide registration. This same network has introduced ICT tools for plant quarantine stations, making them more efficient and effective. For instance, traders can now file import applications online. PPIN's initiative has already networked 35 plant quarantine stations and 125 phyto-sanitary certification offices.

Mobile phones

One of NIC's new exciting initiatives is the development of mobile information services. Mobile phones are already a success story when it comes to bridging the urban-rural digital divide, and their increased use has created tangible economic benefits in the agricultural sector. NIC is now planning to take the

use of mobile phones an important step further by promoting m-government services. Information retrieval systems with automatic speech recognition techniques are now being deployed on AGMARKNET in Hindi, Tamil, Marathi, Bengali, Telugu and English.

The list of mobile information services is long and ambitious and includes: agricultural news (on new cultivation products and machinery), agricultural policy (on laws and regulations), funding opportunities (to buy equipment), weather forecasts and alerts (for extreme weather conditions and disease outbreaks), market forecasts (for prices, supply and demand), expert consulting (for cultivation techniques, new production standards), notifications (for renewal of certificates and licences, new cultivation products or techniques), tele-diagnosis (for plant and animal diseases), messages to public agencies (for reporting agricultural accident, queries, complaints) and many more.

The potential impact of such a comprehensive number of mobile information services for farmers and all others connected to the agricultural sector are enormous, especially if one considers the fact that every 10% increase in mobile penetration rates potentially results in 1.2% more economic growth. Mobile phones and mobile-enabled services can bridge important information gaps, and because information is spread more quickly and widely, they can also help to accelerate the adoption of other ICTs in the agricultural sector.

Way forward

The ICT-triggered rural knowledge revolution is helping to break down the barriers that stand between localised rural economies and globalised markets. Moreover, in India, information services that remove language barriers are essential for good governance, peace and prosperity at the grassroots level. To facilitate this, India requires a National Rural Informatics Policy. Indeed, that is the need of the hour and a step towards enabling rural India to 'smile, shine and roar'. ◀

Madaswamy Moni (moni@nic.in) is the former director general of the National Informatics Centre, which is a principal Indian government institute for e-governance and informatics development, and former vice-president of the Asian Federation of Information Technology in Agriculture. He has been instrumental in conceiving many of the ICT initiatives mentioned in this article.

User-centred mobile app development

The success of a mobile app – its high adoption rate and actual use – largely depends on the degree of involvement of the end user during the development stage. Mark Kamau, Kenyan web solution expert at the iHub UX Lab in Nairobi, believes a user-centric approach to mobile app development is critical to building a sustainable ICT-based solution.

e-agriculture strategies

Two programmers who developed mFarm, an app for farmers at the innovation hub for the technology community (iHub) in Nairobi, Kenya

UX stands for user experience, a concept that dates back to the mid-1990s, when human-computer interactions were first discussed and conceptualised. According to Kamau, too often developers focus on the technology, the hardware and software their apps will use rather than the people they are developed for. Their focus on technology has resulted in many advanced, sophisticated mobile apps winning top places in competitions, but actually failing to attract real-world users.

For instance, in Africa mobile agricultural information services that can be accessed with cell phones are mushrooming. Most of these services return requested information in the form of an SMS, even though many farmers, the intended users of these services, cannot read. What farmers need are voice-based rather than text-based mobile information services. Another problem is that sophisticated online payment gateways are often cumbersome in their use and repeatedly require the initial input of a verification code of a complicated string of 15 or more digits, which the users will receive after a wait of 20 minutes or even longer.

The failure rate of mobile apps is high and many development man-hours are wasted when user experiences are not taken into account right from the start of the development process. That is why people like Kamau and initiatives such as the UX Lab seek to convince developers to include the users in the earliest possible stage of the design process to better understand their needs and wants, and how, when and where they would use the new mobile app.

Functional illiteracy

Focusing on technology alone carries the risk of turning away users in the target group that suffer from functional illiteracy, i.e. the lack of technological know-how, or those that simply cannot read. The development of appropriate technology relies on research conducted at the level of the user and on feedback loops linking the designer and the users at every critical step of the development process.

A user-centred approach to designing solutions ensures the mobile app is contextualised, serving the needs of the intended users. At the UX Lab, app designers meet with their target audience, often in rural areas, sit together and talk about the actual problem to better define it. At this stage, the users' needs are expressed and the intended use is discussed. In the field, designers also get a good idea of the surrounding natural environment (hazards, challenges, infrastructure and facilities, for example) in which the technology will be broadcast.

Using data about user experience, developers at the lab will prepare a prototype of the app. The prototype app is low fidelity (see Kamau at minute 3:20 in the video in the first 'related link'): not many resources go into its programming because each function is tested first by users. Each iteration of the consultation process produces new information to guide the next step of the development process. And so on.

Kamau sees this process as a lean and agile method of making sure that in the end apps answer the needs of users. By talking first to them, not only can the developers assess the degree of functional illiteracy of the target population and choose technology accordingly – between voice-based or touch-enabled commands, for example – they also get a first-hand feel of the problems they need to tackle. This is a source of creativity that pushes for innovation.

Cognitive load

Developers have started to make their work easier by putting the users' needs first, and by understanding their expectations and limitations before choosing a particular technology. In fact, when users take part in the process, developers share what Kamau calls the 'cognitive load'. In other words, user-centred design will unburden developers from the difficult task of having to pull the best solution to a particular need out of their hats.

At the moment, coming up with the best solution for problems intended users may face is something developers tend to do on their own. The thoughts, the models and the prototypes are all produced by the developers themselves: and it is a lot of work. Their time would be spent better developing appropriate solutions when developers share the cognitive load with the users during the conceptual phase that defines the problem. ◄

Related links

iHubUXlab, East Africa's first UX, design, testing and training lab
➜ www.ihub.co.ke/uxlab/

Can better UX reboot Kenya's app economy? By Jessica McKenzie
➜ http://goo.gl/ZQNd7y

Resources

e-agriculture strategies

Documents

Mobile use at the Base of the Pyramid in South Africa and Kenya

Today, mobile telephones reach most corners of the African continent. Two new infoDev-led studies, focusing on South Africa and Kenya, provide insights on how useful mobile phones are for economic and social empowerment of people living on less than US$2.50 a day. These studies investigate the actual use of mobile services, products and applications at the Base of the Pyramid (BoP), and assesses their potential for economic and social empowerment. It identifies scalable examples of services, products and applications and aims to develop tools and instruments to map viable operation models and to identify user needs.
➜ http://goo.gl/EOGiH3

Success stories on ICT/ICM in AR4D in Asia–Pacific Region, 2013

This publication highlights four ICT/ICM success stories in India, Malaysia and the Philippines. These success stories, compiled by APAARI, present different approaches, models, institutional collaboration, partnerships, community participation, and development of need-based information services to promote openness in sharing agricultural information and knowledge, and placing it in the public domain.
➜ http://goo.gl/YxA0Yk

Trends in Telecommunication Reform 2013

The theme of the 2013 Trends report is 'Transnational aspects of regulation in a networked society'. The report contains eight chapters that explore the legal and regulatory issues that are emerging as advanced networks spread throughout the world, and new services and applications increasingly cross borders: regulatory trends, traffic management, roaming, cloud computing, cost cutting technologies.
➜ http://goo.gl/OoFbFB

Web resources

Research ICT Africa Network

The Research ICT Africa Network conducts research on ICT policy and regulation that facilitates evidence-based and informed policy making for improved access, use and application of ICT for social development and economic growth.

The network consists of researchers in 20 African countries. The network will contribute to the gathering of up-to-date ICT data and the creation of a repository of information for furthering research and policy formulation.
➜ www.researchictafrica.net/publications.php

AgLinks.net

AgLinks provides agriculturalists with ideas, value chain analysis tools, contacts, videos and success stories from the Pacific that show how adding value to crops, produce and agricultural supplies – such as by processing vegetables into packaged goods – can increase profits.
➜ http://goo.gl/olt2mR

Online Climate Risk Management Tool for the Caribbean

The Caribbean Community Climate Change Centre (CCCCC) has launched the Caribbean Climate Online Risk and Adaptation TooL (CCORAL), a web-based tool designed to help decision makers in the Caribbean integrate climate resilience into their decision making and planning processes.

CCORAL outlines a step-by-step process to identify whether an activity, such as a project, programme, strategy, plan, policy or legislation, is influenced by, or vulnerable to, climate change. CCORAL then creates pathways for the identification and implementation of adaptation and mitigation options. CCORAL was developed with support from the Climate and Development Knowledge Network and the UK Department for International Development.
➜ http://goo.gl/hwpM5d

Projects

MojaCast

MojaCast is an interactive voice messaging product that allows users to send customized, pre-recorded voice messages in bulk, with question-and-answer response capabilities. Used in a pilot project in Ghana, MojaCast allowed traders with hundreds and sometimes thousands of outgrowers in their networks a wide network to communicate more efficiently and effectively with farmers. Messages can include market prices, reminders of application times for agro-chemicals or other key production practices, or coordination information for delivery schedules. Traders can record messages (in any language) using either a handheld recorder or a computer installed with simple recording software. The message is then delivered for bulk delivery to MojaCast as an MP3, via email or cloud uploading, along with the list of recipient mobile phone numbers and time and date of delivery.
➜ http://goo.gl/tpVMTN

iMENTORS

iMENTORS is designed to enhance the coherence and effectiveness of international actors involved in e-infrastructures development projects and initiatives in sub-Saharan Africa. iMENTORS, launched in April 2012 by Stockholm University and Gov2u, is a web-based platform serving as a knowledge repository for sharing and aggregating data on e-infrastructure projects throughout sub-Saharan Africa.
➜ www.imentors.eu

Smart ICT-Africa

The Smart ICT-Africa project, funded by IFAD, develops tools that can monitor plot-specific weather, water and crop-related information from satellite measurements and deliver it on-demand to relevant end users in Africa through web platforms and SMS services.
➜ http://www.smartict-africa.com/en

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capacity will be vastly expanded. In preparation of this development, we are completing our ambitious *ICT-for-all policy* that aims to ensure the broad use of the many new opportunities the cable connection will offer. In fact, we want 97% of the people on Vanuatu to have broadband internet access by 2017! We are also doing our utmost to have the tourist industry and off-shore financial services optimally connected, and perhaps most importantly schools and vocational training centres as well.

information they request as SMS to the cellular phones.

Your government seems to be particularly concerned about cybercrime. What type of risks do you actually foresee?
➜ We expect the connection to international data communication infrastructures to generate an enormous surge of online services. This surge will inevitably come with spamming, phishing and pharming, identity theft and

Catapulted into the information society

e-agriculture strategies

To place this Q&A in context, could you tell us a little bit about your country?
➜ Vanuatu is an island nation in the South Pacific Ocean, an archipelago of some 83 islands, 1,750 kilometres east of Australia. Vanuatu's 250,000 inhabitants live off tourism, offshore financial services, agriculture, cattle raising and fishing, mainly for domestic consumption. The long distances to our main markets in Australia, Asia and North America seriously hamper our economic development prospects. On the other hand, despite being located on the 'Ring of Fire', with its earthquakes and tsunami risks, Vanuatu was recently proclaimed the most ecologically efficient country and happiest place on earth in a survey by the New Economics Foundation and the Friends of the Earth.

Does Vanuatu have a national e-strategy?
➜ An international submarine cable system linking Port Vila to Suva, Fiji is due to be completed in January 2014. It has 200 times more capacity than our current satellite connection and over the years this

The Vanuatu government wants these children to pull their parents into the information society

Why does your government put so much emphasis on connecting schools and training centres?
➜ Connecting our schools and training centres is for us a priority number one because we want to teach Vanuatu's youth in using ICTs. As agriculture, accounting and wood carving are parts of our lives, so are ICTs, and therefore we need to teach our students how to use this technology properly.

It is clear what the tourism and banking industry will gain from broadband access to the internet, but what do farmers and fishermen stand to benefit?
➜ Our farmers and fishermen need better and more accurate information on market prices and the quality standards they must meet to add value to their produce and timely warning about impending challenges, such as pests or imminent tsunamis. They can already obtain this information from our government offices. But our government will take this information much closer to them, to information hubs in their schools in their own communities.

How will you actually connect farmers and fishermen?
➜ We intend to pool the information services of all government ministries and to make our schools community information hubs where people can access them. We want to make our students change agents who can help their parents and show them how they can access these information services. To implement this strategy we will learn from the success of a recent telecentre pilot project where we accomplished just that. And in the future we will also introduce mobile based applications and send updated

subsequent fraudulent access to bank accounts and many other forms of cybercrime. Our government has therefore given high priority to policies that will ensure that adequate measures against cybercrime are implemented on time.
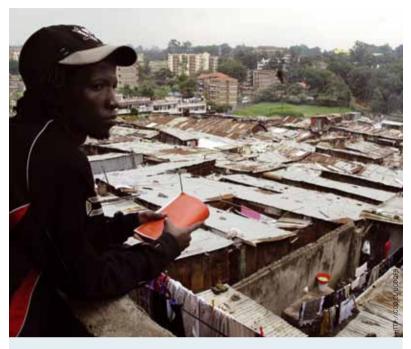
How do you intend to mitigate cybercrime?
➜ It's crucial that people are made aware of the risks of cybercrime and educated about how they can protect themselves. Our first priority is therefore to educate our students at schools to be mindful of the information sources they access and the spam they receive, and to report anything they see as suspicious. We have yet to put a comprehensive infrastructure and tools in place to combat cybercrime, but we are doing what we can to get the message across to our students, government officials and business people. Simultaneously we are developing a National Cybersecurity Policy that will put into place minimum mandatory security standards for operators of critical ICT infrastructures, strengthen the relevant legal frameworks and respond to the global nature of cybercrimes by strengthening Vanuatu's ability to participate in international efforts against such threats.

Could one say that Vanuatu is leapfrogging into the information society?
➜ Yes. Vanuatu is new to the ICT and telecommunications arena as our telecom market was only liberalised in 2008. Since then we have achieved a great deal in a very short time. Our success builds on strong government support and the fruitful relationship the government has with the regulator and the business community, which is unique and shows our commitment to provide safe access to the information society for our people throughout the islands. ◄

FLICKR/UNICEF SOUTH-EAST ASIA

Dispatches

HTTP://goo.gl/UdDqF9

Mapping an invisible slum in Kenya

If you were to search for the Mathare city slum in Nairobi on Google Maps, you would find little more than gray spaces between unmarked roads. But last year, activist cartographers in Nairobi who called themselves the Spatial Collective started walking around Mathare typing landmarks into hand-held GPS devices. In a slum with no addresses and no street names, they were creating a map of what it was like to live there, mapping informal schools, storefront churches and day-care centres, dark corners with no streetlights, illegal dumping grounds and broken manholes.

The slum-mapping movement started in India about a decade ago and more recently migrated to Africa. The idea is to make slums a reality for people who would never set foot in one.

Slum maps are not ordinary maps. They look more like a mad game of Tetris. Blocks of every shape are jammed in together with no space between, except narrow pathways following the trails of open sewers. They are maps of city neglect depicting life in a city slum where the idea of public space has no enforceable authority.

The Spatial Collective used their map of Mathare to get more street lights in dark and dangerous corners and more public toilets from the city authorities. Their map also helped city workers who came to lay pipes for drinking water and had to discuss with the slum dwellers where they could best lay their pipes. And last but not least, the map gave the slum-dwellers a growing sense that in seeing their slum on a map they are starting to take their city slum out of the shadows.
➜ http://goo.gl/NrnT1o

Mauritania ramps up broadband internet

A wave of reforms in the telecom and ICT sector in 1990s laid the foundation for the very high penetration rate of 110% of mobile phone services in Mauritania. By comparison, the current penetration rate of 3% for broadband internet services remains far below that of other West African countries. Mauritania recognised that there is a strong correlation between the dissemination of broadband internet in a country and economic growth, job creation and better living standards. Mauritania has therefore decided to implement a second wave of reforms in the telecom and ICT sector. For that purpose the country recently signed the WARCIP agreement (Mauritania Program for Regional Communications Infrastructure in West Africa), a programme financed by the World Bank that aims to connect all regions of the country to broadband internet by 2015. Mauritania has also adopted a national e-strategy for 2012–2016, to provide access to broadband internet for all citizens, adapt a regulatory legal framework for ICTs, provide sectoral technical support and develop improved e-government services.
➜ http://goo.gl/9TlE44

FLICKR/CYRUS FARIVAR

A single regional ICT space in the Caribbean?

At a recent held CARICOM heads of government meeting, Grenada's prime minister proposed that the Caribbean should create a single Caribbean ICT space that should complement CARICOM's Single Market and Economy programme. He suggested that the single regional ICT space could include single rules and regulations across the region, uniform mobile numbers and the removal of intra-regional roaming charges.

In ICTPulse, a blog on ICT issues from a Caribbean perspective, Michelle Marius discusses the prime minister's proposal and highlights a few examples that provide a precedent for such an initiative. She also discusses some challenges that could thwart the realisation of a single Caribbean ICT space, and what might be needed to put the region on the path to achieving it.
➜ Original article: http://goo.gl/0kK5ZF

Free weather information

WhereWeather is a free online platform that provides graphically displayed local weather information — both historical and forecasts — for South Asia and East, West and Southern Africa. The weather data comes from the Agricultural Weather Information Service in Auburn, Alabama in the United States, which aWhere then interpolates using surrounding weather stations to provide localised weather information in 9km-by-9km resolution. Within the next few months, they also plan to begin feeding in daily satellite-derived rainfall data for Africa (provided through NASA in conjunction with Colorado State University) to further strengthen the accuracy of the localised observed precipitation data. Currently, the platform provides three to five years of historical data, daily observed data, and forecasts on precipitation, minimum/maximum temperature, relative humidity, and wind speed, solar radiation, and accumulative growing degree days. This weather service is being funded by the Gates Foundation.
➜ www.awhere.com

Off-grid recharging mobile phones

With 500 to 650 million mobile phones off the power grid and people have to make long walks to charging stations in the nearest town that is connected to the grid. Buffalo Grid is changing the way mobile phones off the power grid will be charged. The company produces charging units of 60 watt solar panels connected to a battery and mounts these units to bicycles. Each unit has 10 charging sockets and can charge 30 to 50 mobile phones per day. Fully recharging a phone costs just €0.15. These mobile charging units can be pedaled to villages that are off the power grid and where mobile phones need charging. An interesting aspect of these charging units is how they release their power. A text message is sent to the unit and once an LED light glows above a socket, it is ready to recharge a phone. Each text message releases power to recharge a phone for 1.5 hours. These mobile charging units not only bring cheap power for phone owners in areas where electricity power is non-existent, they also bring jobs to these areas where they often are badly needed.
➜ http://goo.gl/2sEyir

ICTs and remote rural schools

Michael Trucano, Senior ICT & Education Specialist at the World Bank, recently presented a list of principles to consider when planning to introduce ICTs into schools in remote, marginalized areas of developing countries. The first six are:

1. *The best ICT is the one you know and can afford*
Parachuting in the 'latest and greatest' gadgets may have strong political appeal but ICTs already at hand always are a better bet. Look for quick gains from utilizing mobile phones, radios or TVs which already are around in even the remotest communities.

2. *Start down and out, and then move up and in*
Don't rely on ICTs that are piloted in relatively 'privileged' environments, they don't tend to work in marginalized areas. Start down and out before you move up and in. This approach may have more modest goals but is least you can be sure it works.

3. *Treat teachers like the problem*
Teachers may not like ICT devices when they see them as a potential threat to their position. Always begin with ICTs that support teachers in their work or save time in lesson preparation.

4. *It's the content, not the technology*
The future of education is in the content, not in technology. And, it's about more than just content, it's also about connecting students with students and teachers with teachers that technology can help enable and support as well.

5. *Technology may help you get into the wrong direction*
ICTs is just a tool and cannot compensate for bad educational practice. Much depends on educational practices and how ICTs are used to enhance them.

6. *Anticipate and mitigate*
While introducing ICT in schools, too often focus is on what is possible, while ignoring what is practical and predictable. Anticipate and take proactive steps to mitigate any potential problems.
➜ Original article: http://goo.gl/JFrJB

75 % of poor people in South Africa have mobiles; only 3% of them older than 15 have used mobile money in 2011. http://goo.gl/EOGiH3

11 % of poor people who possess a mobile phone have ever downloaded a mobile application. http://goo.gl/EOGiH3

10 million active subscribers on Mxit, making it the largest mobile social network in Africa. http://goo.gl/tnI4Sj

ICT tools for the uneducated

ICTs have generally been viewed as a tool that can bring about sustainable change in agricultural and rural development in Africa. The challenge has been how to teach a largely illiterate sector to read and write, two key skills needed to use ICT tools such as computers and mobile phones. It therefore was generally believed that farmers need intermediaries to effectively benefit from ICTs.

This solution brings with it its own extraordinary challenge: how to persuade farmers to once again rely on their educated community members – precisely those who had deceived them in the past because they could not read and write. It has been my belief that illiterate farmers could use ICT tools themselves, and in 2009 I set out to prove that this was possible.

I am an experienced ICT trainer and have trained many different people, including primary school children, high school and university students. I have even trained members of parliament how to use their laptops. I have never doubted my ability to deliver. All I needed was to prepare the relevant material and then go and deliver it.

I have always taught in English, and this has never been a problem. So I was eager to take up the challenge of teaching computer skills to illiterate farmers so they could access an online video and audio library without relying on other people's help. But how would I teach these people who had never seen the inside of a school to understand and use ICT tools? How would I use their vernacular to teach them a completely alien computer terminology? This represented a major

challenge that needed a lot of thinking – beyond my normal way of doing things.

Capacity building for the illiterate

As an ICT consultant, I was asked to train a group of illiterate farmers computer skills so they could access agricultural information. These were men and women between the ages of 40 to 50, most of whom had never seen a computer before.

For the project, we developed a web-based tool that streamed video and voice on demand stored in a database that had been set up in a community information centre. The videos and audios demonstrated various good agricultural practices such as composting, planting distances, pest control and many other topics. A computer with a user-friendly interface gave access to the database and the materials that had been stored in it. Users had to interact directly with the database and therefore needed a basic understanding of how to use computers and the interface to call up the video and audio material they want.

At first a lot of people were very sceptical about the venture. However, I thought it was possible and became determined to give it a try. I strongly believed that ICTs were not just for the educated and that the 'uneducated' too should have the opportunity to use computers and the database with educational videos and audios.

All they needed was some training. They should at least know what the computer and other ICT tools were used for and how they worked. We decided that they first needed some literacy lessons to enable them to identify letters and read and pronounce simple words, especially in their local language.

The ICT training

The ICT course itself was basically a hands-on computer training. We introduced our trainees to the various components of a computer, after which we took them through an extensive training in using the computer. The most interesting part of this training was that these adult learners devised their own methods for mastering skills like 'clicking' and 'double-clicking'.

Using the keyboard was a major challenge, however. They had difficulty typing their usernames and passwords. But

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after two weeks of training, all trainees had mastered sufficient skills to use computers effectively, and two months later they were able to fully use computers to access the videos and other materials in the database.

The training boosted the trainees' confidence in using ICT tools and they are now using a mix of ICT tools to access information that could enhance their livelihoods. They now listen to agricultural radio programmes and use their cell phones to interact with the radio presenters, asking them questions and contributing to discussions. They also use their cell phones to obtain market information such as commodity prices from the major markets in the country. On the basis of that information they can now decide which market to bring their produce to, and they have more leverage to negotiate for better prices.

At the moment, the use of ICTs is predominantly the preserve of the educated. However, many uneducated people could use them too if they only were less shy. Our project has demonstrated that if they are properly trained they can use them effectively. The number of web applications that could help to enhance agricultural development in Africa is rapidly growing. If we limit the use of these apps to just the educated, we can wait a long time before there is any growth in agricultural productivity in Africa, because the majority of farmers in our countries are uneducated. That's why it is important to continue training illiterate farmers to effectively use computers, cell phones and other ICT devices so they can improve their livelihoods. ◀