**Food and Agriculture Organization
of the United Nations**

e-agriculture
10 year Review Report

**Implementation of the World Summit
on the Information Society (WSIS)
Action Line C7.ICT Applications: e-agriculture**

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Action Line C7. ICT Applications: e-agriculture

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Foreword

E-agriculture, ICTs and their applications in agriculture and rural development can offer enormous support to combating hunger and malnutrition, building resilience and reducing food waste and losses.

Since the 2005 World Summit on the Information Society (WSIS) in Tunis, when FAO took up the facilitation role of the Action Line on e-agriculture, solid progress has been made in making ICTs available to farmers, rural communities, fisher folk and fishing communities, providing them with up-to-date and reliable information to improve their livelihoods. In areas where Internet connectivity remains challenging, mobile devices have enabled rural stakeholders to leverage these technologies to their advantage. They have changed the rural landscape of agricultural advisory services, market information, value chains and financial services.

The e-Agriculture Action Line 10 year review report is a joint effort of FAO and partner organizations in the agricultural sector. This report enables us to look back, reflect of what has been done, learn lessons, identify challenges and upcoming trends, and plan the use of ICTs in our future work in more effective, sustainable and innovative ways.

Data will play an important role in the achievement of the post-2015 Development Agenda. Modern ICTs can be critical for bridging information gaps for the vast number of people living on less than USD2 per day. The information needs of farmers increase as they have to make more complex decisions on land use, crop selection, choice of markets and other areas that impact the livelihoods of their families and communities. Having access to the right information at the right time and in the right form is no longer a luxury; it is a necessity for making informed decisions on critical issues. Indeed, agriculture is becoming increasingly knowledge intensive. This is most important for resource-poor farmers, foresters and fisher folk who live in rural areas. In addition, ICTs need to be more effective in bringing about more inclusive societies, reaching out to those typically excluded from development interventions, such as women.

FAO will continue to promote the use of ICTs to reinforce the resilience capacity of states, communities and individuals. With the support of our partners, FAO will continue to foster collaboration and knowledge sharing, including through the e-Agriculture Community of Practice.

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Acronyms

AARINENA	Association of Agricultural Research Institutions in Near East and North Africa
ACP	African, Caribbean, and Pacific Group of States
ADRM	Agriculture Disaster Risk Management
AFITA	Asian Federation for Information Technology in Agriculture
AFRACA	African Rural and Agricultural Credit Association
AgLR-TF	Agricultural Learning Repositories Task Force
AGORA	Access to Global Online Research in Agriculture
AGRIS	International Information System for the Agricultural Sciences and Technology
AIBDA	Inter-American Association of Librarians and Specialists in Agricultural Information
AIS	Agricultural Information System/Network
ANADER	National Agency for rural development (Agence nationale d'appui au développement rural)
ANASEMCI	National Organization of seed multiplier in Ivory Coast (Association nationale des semenciers de Côte d'Ivoire)
ANPE	Asociacion Nacional de Productores Ecologicos del Peru
AOAD	Arab Organization for Agricultural Development
AOPP	Association des organisations professionnelles paysannes
APC	Association for Progressive Communications
APC	Association for Progressive Communications
APIMONDIA	International Federation of Beekeepers' Associations
ARDYIS	Agriculture Rural Development and Youth in the Information Society
ATAAS	Uganda Agricultural Technology and Agribusiness Advisory
BIID	Bangladesh Institute of ICT in Development
BMZ	Federal Ministry for Economic Cooperation and Development (Germany)
BRDD	Bridging the Rural Digital Divide
CABI	Centre for Agricultural Bioscience International
CCAFS	CGIAR Research Programme on Climate Change, Agriculture and Food Security
CEPES	Peruvian Centre for Social Studies (Centro Peruano de Estudios Sociales)
CGIAR	Consultative Group on International Agricultural Research
CIARD	Coherence in Information for Agricultural Research for Development
CKW	Community Knowledge Worker
CLCOP	Local Councils of Farmer Organizations (Cadres Locaux de Concertation des OP)
CNOP	National Coordination of Farmer Organizations (Coordination nationale des organisations paysannes)
CRCR	Regional Council for Rural Organizations (Cadre Regional de Concertation des Ruraux)
CRS	Catholic Relief Services
CSDMS	Centre for Science, Development and Media Studies
CTA	Technical Centre for Agricultural and Rural Cooperation
DFID	United Kingdom Department for International Development
EAFF	East African Farmers' Federation
EAWG	E-Agriculture Working Group
FACET	Fostering Agriculture Competitiveness Employing Information Communication Technologies
FAO	Food and Agriculture Organization of the United Nations

FIRCA	Inter-professional fund for agricultural research and advice (Fonds interprofessionel de la recherche et de conseil agricoles)
GAID	Global Alliance for ICT and Development
GAINS	Ghana Agricultural Information Network System
GCARD	Global Conference on Agricultural Research for Development
GenARDIS	Gender, Agriculture, and Rural Development in the Information Society
GFAR	Global Forum on Agricultural Research
GFIA	Global Forum for Innovations in Agriculture
GIS	Geographical information systems
GIZ	German Agency for Technical Cooperation
HPAI	Highly Pathogenic Avian Influenza
IAA	Institute for an Agrarian Alternative (Instituto para una Alternativa Agraia)
IAALD	International Association of Agricultural Information Specialists
IADB	Inter-American Development Bank
ICARDA	International Centre for Agricultural Research in Dry Areas
ICT4Ag	Information and Communication Technologies for Agriculture
ICT4D	Information and Communication Technologies for Development
ICT-KM	Information and Communication Technologies – Knowledge Management
ICTs	Information and Communication Technologies
IFAD	International Fund for Agricultural Development
IICA	Inter-American Institute for Cooperation on Agriculture
IICD	International Institute for Communication and Development
IITA	International Institute of Tropical Agriculture
IMARK	Information Management Resource Kit
ISSD	Unstructured Supplementary Service Data
ITC	International Trade Centre
ITU	International Telecommunication Union
IVR	Interactive Voice Response
K4D	Knowledge for Development
KAINET	Kenya Agricultural Information Network
KM	Knowledge Management
KM4Dev	Knowledge Management for Development
MAFNET	Ministry of Agriculture and Fisheries Network
MEAS	Modernizing Extension and Advisory Services
NAIS	National Agricultural Information System
NAKEMS	National Agricultural Knowledge Exchange Management Systems
NARIMS	National Agricultural Research Information Management Systems
NECTEC	National Electronics and Computer Technology Center
NEPAD	New Partnership for Africa's Development
NGO	Non-governmental organization
ODI	Overseas Development Institute
OIE	World Organisation for Animal Health
OLPC	One Laptop Per Child
PPP	Public-private partnership
RADCON	Rural Agricultural Development Communication Network
RAP	FAO Regional Office for Asia and the Pacific
REM	Weather Stations Network (Red de Estaciones Meteorológicas)
RITS	Information Network for the Third Sector (Red de Información para el Tercer Sector)
ROPPA	Netwerk of Farmer and Producer Organizations in West Africa (Réseau des Organisations Paysannes et de Producteurs de l'Afrique de l'Ouest)
SADC	Southern African Development Community
SMS	Short Message Service

SRII	Service Research and Innovation Institute
TECA	Technologies and Practices for Small Agricultural Producers
UBC	University of British Columbia
UCAD	Cheikh Anta Diop University
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNECA	United Nations Economic Commission for Africa
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
UPOU	University of the Philippines Open University
USAID	U.S. Agency for International Development
VERCON	Virtual Extension Research Communication Network
WCCA	World Congress on Computers in Agriculture
WFP	World Food Programme
WHO	World Health Organization
WIPO	World Intellectual Property Organization
WSIS	World Summit on the Information Society
YPARD	Young Professionals for Agricultural Development

Summary

Following the World Summit on the Information Society (WSIS), which was held in Geneva (2003) and Tunis (2005), the Food and Agriculture Organization of the United Nations (FAO) was assigned responsibility for facilitation of the e-agriculture Action Line. This report gives an overview of the work done, the progress which has been made, and the lessons which have been learned through facilitating the Action Line for the past decade. It also starts to map out some of the key trends, opportunities and challenges which lay ahead.

According to *The State of Food Insecurity in the World 2014* (FAO, IFAD and WFP), about 805 million people, or one in nine, suffer from not getting enough food on a regular basis to allow them to conduct an active life. We live in a world where efforts to ensure global food security face an ever-expanding list of challenges, including climate change, reduced biodiversity, increasingly frequent natural disasters, food price volatility and inefficient supply chains. In this context, the agriculture and rural development sector urgently needs solutions, and modern information and communication technologies (ICTs) offer enormous potential benefits.

The key to the role of ICTs in the agricultural context is in bridging information gaps. Information is vital for rural people to be able to make informed decisions on the critical issues they face. There are a number of key areas where this information is needed – related to specific agricultural value chains, increasing resilience by managing the risk of crop and animal diseases and pests, and those which help farmers to maximise their income, both by improving production through technical advisory services, and by increasing income through market price information, access to financial services and improved market linkages.

In the past decade, the e-agriculture Action Line has documented many successful and inspirational projects which have used ICTs to improve farmers' access to accurate and timely information. The projects are diverse – both in focus, in scale and organization. From large scale regional efforts initiated by development organizations and governments to small scale initiatives led by individual entrepreneurs. A successful example of a small-scale project was M-Farm, led by three female entrepreneurs from Kenya. This mobile application took advantage of the enabling environment provided by M-PESA mobile banking to connect farmers directly with buyers and facilitate their transactions.

The types of technology tools used also varies – from projects such as FAO's eLocust Information Service, that uses satellites to transfer real time data on locust infestations, recorded by field officers on handheld devices, to projects which uses simple SMS and mobile phones to gather data direct from farmers, such as Uganda's Rapid Response Initiative on Banana Bacterial Wilt.

Many of the most successful projects involve partnerships – whether between public and private sectors, between organizations with different specializations and networks, or between rural people themselves. For example, the Sènèkèla pilot was a successful market price and agricultural information service created in partnership by International Institute for Communication and Development (IICD) and the telecom operator Orange Mali. In the Rural Knowledge Network Pilot for East Africa farmers

across Kenya, Tanzania and Uganda were connected so they could directly share knowledge and information and learn from each other.

In 2007, FAO and a group of founding partners launched the e-Agriculture Community of Practice, an online space to facilitate an exchange of knowledge and experiences of projects where ICTs are used for agriculture and rural development. By December 2014, the community had grown to more than 12 000 registered members and more than 35 000 followers through social media channels. The community has documented case studies and good practices, gathered resources and hosted interactive fora around important topics.

What is clear in this stocktaking of the past decade is that ICTs are increasingly recognised as vital for agricultural and rural development, and a positive trend is the growing interest in governments to integrate ICTs into their national agriculture strategies. The sector is highly innovative, and changes in technology availability such as widespread mobile ownership and increasingly affordable smartphones and tablets continue to open up new possibilities.

Yet there is still much scope for improvement. The digital divide in agriculture is not only concerned with technological infrastructure and connectivity, but is characterised by ineffective knowledge exchange and management of information content, limited individual and institutional capacities and the lack of favourable enabling environments, as well as inadequate sensitivity to gender and the diverse needs of different groups.

Scaling up is challenging, and plans for doing it need to be integrated in the formulation and implementation of initiatives. The sustainability of pilot initiatives is an issue; whether economic, social or environmental. Too often after the pilot phase, projects cease because of financial, human and other constraints. Costs of ICTs need to be reduced, and the use of ICTs needs to be financially sustainable, a goal in which public-private partnerships (PPPs) will play an important role. Development actors need to better address the availability of appropriate and adapted content; the affordability of access, the development of farmers' capacity to use ICTs and available information, and the inclusion in ICT initiatives of women, youth, older people and those lacking literacy and educational skills. Finally, solid information is needed regarding the impact of previous initiatives, including lessons learned, in order to inform the design and approach of future efforts.

Clearly there is still much to be done, and the need for the e-agriculture Action Line continues beyond 2015. Ensuring that farmers, foresters and fisherfolks have access to the right information at the right time in the right form is no longer a luxury; it is a necessity essential for making informed decisions on critical issues.

The e-Agriculture Community of Practice intends to continue playing a role in monitoring new developments, validating models and methodologies, examining emerging trends and further evolving the role of ICTs in creating scaled, sustainable information-service models for agricultural and rural development.

1. Introduction

There has been significant progress in improving communication and decision-making in rural areas through the application of new technologies. At The World Summit on the Information Society (WSIS), Geneva 2003 and Tunis 2005, the Plan of Action[1] included e-agriculture as an area of application of information and communication technologies (ICTs) under Action Line 7. The term e-agriculture refers to the application of ICTs and their applications in the domain of agriculture and rural development.

The Food and Agriculture Organization of the United Nations (FAO) was assigned the responsibility of organizing activities related to e-agriculture. Even prior to WSIS 2003, FAO actively promoted the use of ICTs for agriculture and food security, with a focus on rural communities and vulnerable people. In 2006, FAO brought together a group of founding partners who officially launched the e-Agriculture Community of Practice in 2007 at www.e-agriculture.org (see Annex 8.1: List of the founding partners in 2006).

The use of ICTs, such as mobile phones and the Internet, has increased significantly since the creation of the e-Agriculture Community. It is estimated that there are almost 6.8 billion mobile connections among a world population of a little over 7 billion[2]. The most recent 1 billion connections have been predominantly activated by the largest, but poorest, socio-economic group – people living on less than USD2 a day.

People involved in agriculture and allied fields form the majority of these rural poor, and the increased availability of mobile connections provides a phenomenal opportunity to deliver information services to them. Having access to the right information at the right time has an enormous bearing on the livelihoods of resource-poor smallholder farmers by allowing them to make informed decisions. Multi-stakeholder partnerships have been formed, and time and money have been invested in this effort. It is essential to reflect on those experiences and to strategize for the future.

In this report, "e-agriculture" refers to the Action Line or any associated initiative in the sector, while "the e-Agriculture Community" (Agriculture with a capital letter) – also abbreviated as "the Community" or "e-Agriculture"– refers to the Community of Practice on e-agriculture.

2. Review

2.1   Action line objectives

The e-agriculture Action Line objectives defined in the WSIS Plan of Action are the following:

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[1]   World Summit on the Information Society, Geneva 2003-Tunis 2005, Plan of Action. Paragraph 21. www.itu.int/dms_pub/itu-s/md/03/wsis/doc/S03-WSIS-DOC-0005!!PDF-E.pdf

[2]   *The World in 2013: ICT Facts and Figures,* International Telecommunication Union, available at www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2013-e.pdf

(a)   Ensure the systematic dissemination of information using ICTs on agriculture, animal, fisheries, forestry and food, in order to provide ready access to comprehensive, up-to-date and detailed knowledge and information, particularly in rural areas.

(b)   Public-private partnerships (PPPs) should seek to maximize the use of ICTs as an instrument to improve production (quantity and quality).

In 2006, FAO conducted an extensive survey[3] on the subject of the Action Line, and in 2007, it launched the e-Agriculture Community of Practice with 13 founding partners. The e-Agriculture Community is a global initiative to enhance sustainable agricultural development and food security by increasing the use of ICTs in the sector. Facilitated by FAO, the e-Agriculture Community acts as a catalyst for networking and knowledge-sharing on the role of ICTs in sustainable agriculture and rural development. It provides an international framework to facilitate the processes of capturing, managing and disseminating the lessons learned, as well as the results and implications of multilateral processes related to the use of ICTs in agriculture and rural development. The overall aim of the Community is to enable members to exchange knowledge related to e-agriculture, and to ensure that the knowledge created is effectively shared and used worldwide. The Community plays an active role in WSIS follow-up and WSIS stocktaking.

Additional outputs of the e-Agriculture Community include:

the development and strengthening of innovative mechanisms and processes for information exchange and communication, including normative guidelines and tools which are being formulated, tested and disseminated;

•   the empowerment of networks to exchange new mechanisms and processes among key stakeholders;

•   the development, filtering, mobilization and exchange of relevant content in digital format; and

•   other activities based on partnerships and collaborative learning.

The mandate for the e-agriculture Action Line was extended in the *WSIS+10 Vision*. Building on work to date, it encouraged the development and implementation of national e-agriculture strategies focused on integrating ICTs in rural development to foster food security. It also encouraged the creation and adaptation of content in local languages and for local contexts, support for digital literacy, and the use of ICTs to reinforce the resilience of communities faced with natural and man-made disasters and environmental change.[4]

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[3]   See **Report on 2006 analysis of e-agriculture survey** at www.e-agriculture.org/content/report-2006-analysis-e-agriculture-survey. The analysis report is also available as a published article in Agricultural Information Worldwide, Vol 1, No, 1 (2008), at www.itu.int/wsis/c7/e-agriculture/docs/survey-analysis-2007.pdf

[4]   *WSIS+10 Outcome documents*, June 2014 www.itu.int/wsis/implementation/2014/forum/inc/doc/outcome/362828V2E.pdf

WSIS+10 Vision for WSIS Beyond 2015

C7 ICT applications: benefits in all aspects of life - e-agriculture

a. As part of national ICT strategies, foster the development and implementation of national e-agriculture strategies focusing on providing reliable and affordable connectivity and integrating ICTs in rural development to support food security and hunger eradication.

b. Foster collaboration and knowledge sharing in agriculture via electronic communities of practice, including the e-Agriculture Community, in order to showcase and promote models, methodologies, good practices and the adoption of Open Access and interoperability standards, for effective and equitable use of ICTs for sustainable agriculture and rural development.

c. Promote the creation and adaptation of content including in local languages and contexts from reliable and trusted sources, including, to ensure equitable and timely access to agricultural knowledge by resource-poor men and women farmers, foresters and fisher folk in rural areas.

d. Foster digital literacy of institutions and communities in rural and remote areas taking into consideration local needs and constraints by providing appropriate learning opportunities for all which will enhance individual and collective decision making skills.

e. Promote the use of ICTs to reinforce the resilience capacity of states, communities and individuals to mitigate and adapt to natural and man-made disasters, food chain challenges, socio-economic and other crises, conflicts and transboundary threats, diseases, and environmental damages.

f. Promote Public-private partnerships in cooperation with relevant CSOs/NGOs, cooperatives, farmer organizations, academia, research institutions in the agricultural sector (which also includes forestry and fishery) for inclusive, efficient, affordable and sustainable ICT services and initiatives in agriculture and rural development which will promote the wide scale use of ICT and foster sustainable agri-business models.

2.2   Most important achievements of the e-Agriculture Community

Since 2007, the e-Agriculture Community has demonstrated steady growth, and in 2014, it reached 12 000 registered members from over 170 countries (see Table 1). Members are distributed globally, with the majority being based in Asia (29 percent), Africa (25 percent) and Latin America and the Caribbean (23 percent) (see Table 2). Widely represented sectors are universities (23 percent), non-governmental/civil society organizations (21 percent) and the United Nations (16 percent) (see Table 3).

Table 1: Growth of the e-Agriculture Community over the years (registered members by end of year/period)

	2008	2009	2010	2011	2012	2013	2014
Members	3 640	4 887	6 033	7 658	9 483	11 166	12 131
Countries	150	150	150	170	170	170	170
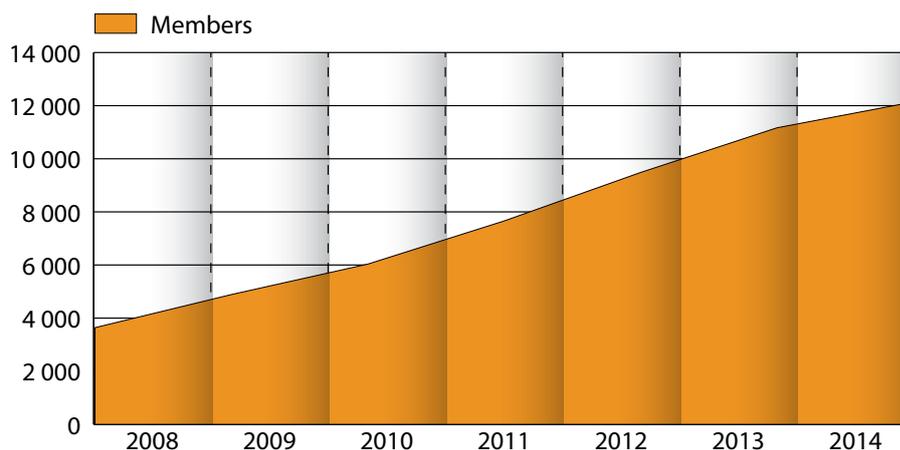
Table 2: Geographical distribution of the e-Agriculture Community in 2014

Southwest Pacific 2%

North America 7%

Africa 25%

Near East 3%

Asia 29%

Latin America Caribbean 23%

Europe 13%
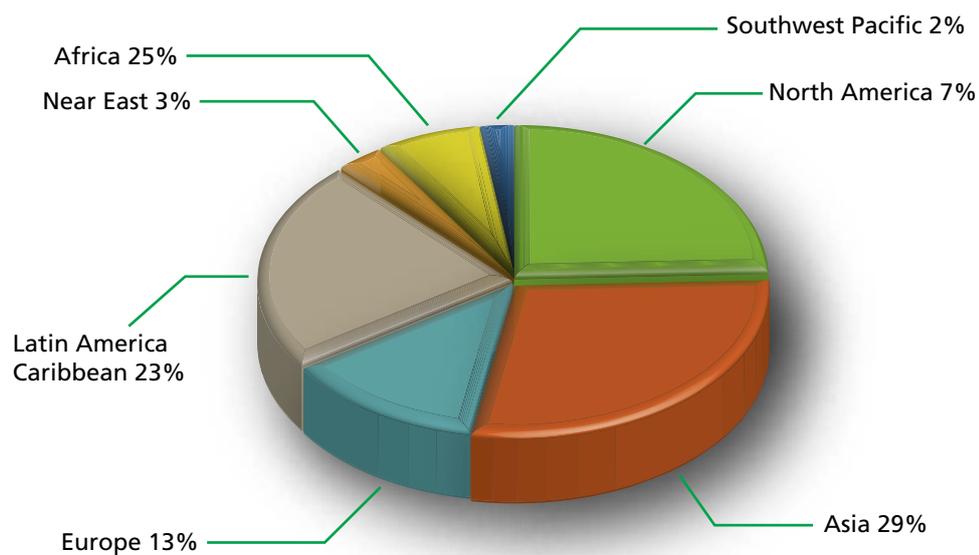
Table 3: Sectoral distribution of the e-Agriculture Community in 2014

Media 3%
Government 11%
University 23%
Private sector 15%
Research 11%
NGO/CSO 21%
United Nations 16%
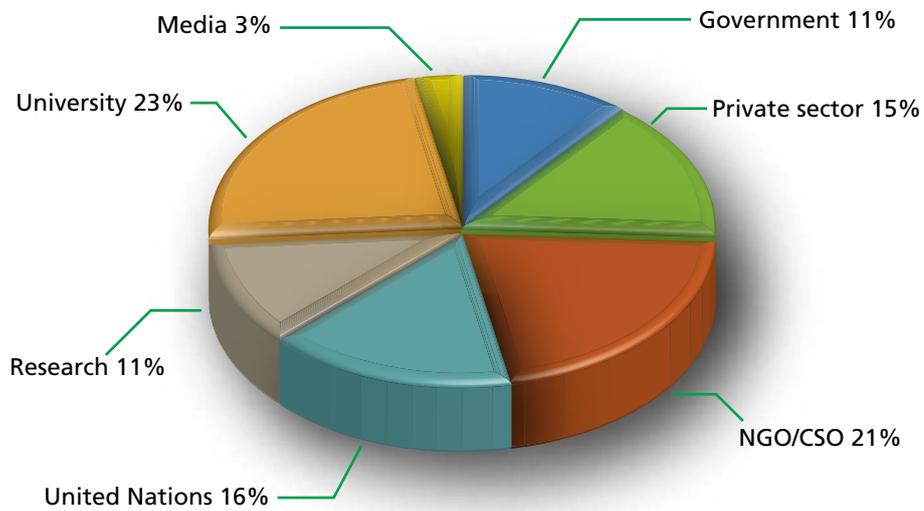
Table 4: Social media accounts related to e-Agriculture

Social media	Year of creation	Account	# of followers (September 2014)
Twitter	2008	@e_Agriculture	22 000 followers
Facebook	2010	e-Agriculture.org	4 447 likes
LinkedIn	2010	e-Agriculture	5 177 members

FB   LinkedIn   e-Agriculture Registered Members   Twitter Followers

25 000
20 000
15 000
10 000
5 000
0

2007 2008 2009 2010 2011 2012 2013 2014
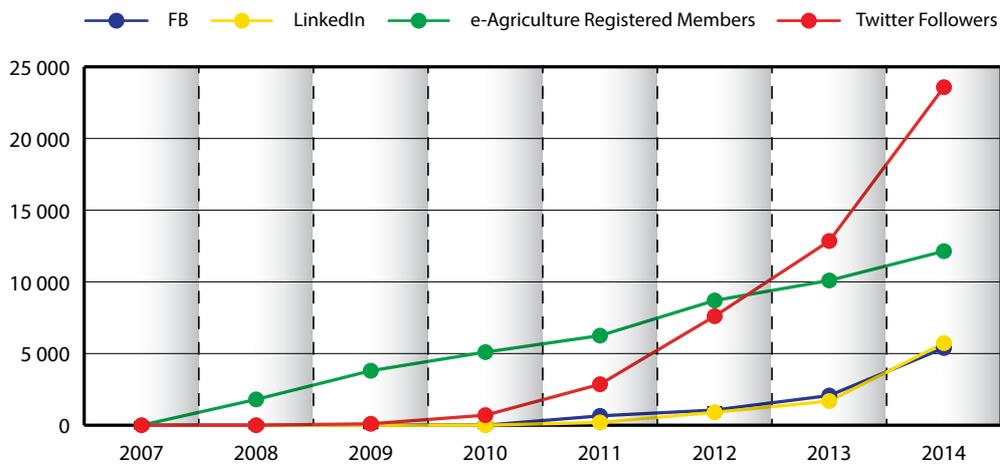
Over the years, members have shared 830 information resources and 2 900 news items and events, as well as expressed their point of view or personal experiences through blogs.[5] Since the launch of e-Agriculture in 2007, 24 online fora on topics identified by the Community have generated about 4 000 discussion posts, producing trilingual policy briefs (see Annex 8.2: List of e-Agriculture fora and related policy briefs).

Face-to-face events complement online activities, which reach tens of thousands of individuals through social media (see Table 4).

Global partnerships are an important part of the WSIS mandate and many contributed greatly to the success of the online fora (see Annex 8.3: List of e-agriculture forum partners). Partnerships and collaborative arrangements are in place with both private sector and development organizations.

In addition, other organizations have contributed to the success of the e-Agriculture Community through the years in online and face-to-face activities and exchanges (see Annex 8.4: List of other contributing organizations from 2006 to 2013).

Over the years, the e-Agriculture Community has examined the evolving role of ICTs in support of rural and agricultural development, and the challenges in reaching scaled, sustainable information service models. Many topics prioritized during the years are issues identified in the *ICT in Agriculture Sourcebook* (www.ictinagriculture.org) developed by the World Bank with contributions from FAO (see Annex 8.5: ICT in Agriculture Sourcebook – partnership with World Bank). Critical issues are addressed in publications (see Annex 8.6: List of publications) as well as through discussion fora, policy briefs and case studies available online at www.e-agriculture.org.

The Web-based collaboration component of the Community's activities (www.e-agriculture.org) is the most popular and effective tool to engage with Community members. The site relies solely on volunteer efforts to lead discussions and assist in providing content, which contributes towards the development of policies and good practices. For this, the Community is grateful to the individuals and organizations that have willingly taken on leading roles in the Community's activities over the years.

The contact details of the e-Agriculture Community are available in annex 8.10.

2.3   Year reviews

WSIS Geneva and Tunis – setting the scene in 2003 and 2005

WSIS was held in two phases: the first in 2003 (Geneva), and the second in 2005 (Tunis). The Action Line *C.7 ICT applications – E-agriculture* was identified in Geneva, while the follow-up was assigned to FAO in Tunis. The WSIS *Tunis Agenda for the Information Society,* published on 18 November 2005, emphasized the lead facilitating roles that United Nations UN agencies need to play in implementing the Geneva Plan of Action. Key responsibilities of these agencies include organizing meetings, moderators and facilitators for specific Action Lines as stated in the Tunis Agenda.

The FAO programme on *Bridging the rural digital divide* (BRDD) was launched in 2003 and provided a platform for FAO's participation in WSIS. BRDD focused on enhancing the role that ICTs play in support of agricultural development and food security. The

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[5]   Statistics as of September 2014

lead agencies were the United Nations Development Programme (UNDP), the United Nations Educational, Scientific and Cultural Organization (UNESCO), the United Nations Conference on Trade and Development (UNCTAD) and the International Telecommunication Union (ITU). When starting up the E-Agriculture Working Group (EAWG) in 2006, and then the e-Agriculture Community in 2007, FAO benefited significantly from the successful implementation of the BRDD and its related Web-based platform.[6]

In 2003, within the framework of the BRDD, FAO conducted a study[7] jointly with the United Kingdom Department for International Development (DFID) and the Overseas Development Institute (ODI) to determine the key issues that needed to be addressed to enhance the benefits of information and communication in rural development. The most important findings of the study were:

- **Creating locally-adapted content:** how to ensure that useful knowledge is repackaged and mobilized in the right format so that it meets the different information needs and preferences of a variety of groups; can be stored, retrieved, and exchanged with ease; and considers issues of ownership and copyright.

- **Building on existing systems:** how to capitalize on existing indigenous – and therefore highly trusted – information and communication networks rather than replacing them and losing their value.

- **Addressing diversity:** how to respond to the different information and communication requirements of women, men, youth and other marginalized groups.

- **Building capacity:** how to strengthen the capacities of institutions and people to provide information, as well as the capacities of the information users to access a wider range of information and ICTs.

- **Ensuring access and empowerment:** how to ensure that relevant information actually reaches and empowers poor people, especially women, and is not monopolized by wealthier or more powerful sections of the community.

- **Strengthening partnerships:** how to build the new horizontal and vertical inter-organizational, interdepartmental and intersectoral partnerships that are necessary to ensure information is available to all stakeholders.

- **Using realistic approaches for technologies to support information and communication:** how to build sustainable systems that enhance existing information and communication systems; are expandable and extendable; and leverage multiple and diverse communication tools and the full range of existing media.

- **Developing information costs, value and financial sustainability:** how to value and finance the establishment of appropriate information infrastructure and the provision of appropriate information content, particularly in remote areas.

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[6] The BRDD platform is no longer online. A summary of the information from the platform can be found on the e-Agriculture Web site through the following link: www.e-agriculture.org/bridging-rural-digital-divide-programme-overview

[7] ODI, DFID, FAO, 2003, Livelihoods approaches to Information and Communication in Support of Rural Poverty Elimination and Food Security, www.odi.org.uk/sites/odi.org.uk/files/odi-assets/publications-opinion-files/208.pdf

The key issues identified in the 2003 study remain valid today. Over the years, reviews of the sector and the use of ICTs for agriculture and rural development have reinforced similar conclusions.

2.3.1 Main achievements 2006

FAO accepted the role and responsibilities of facilitating activities related to the Action Line under *C.7 ICT applications - E-agriculture* at the WSIS follow-up meetings in February 2006 in Geneva. From the beginning, FAO's objective has been to ensure the creation of a multistakeholder, people-centred, cross-sectoral platform that brings together stakeholders representing relevant constituencies of e-agriculture. FAO serves as the facilitator for the Community, coordinating activities and programmes based on information exchange and collaboration with the Community at large. FAO also coordinates the development, creation, packaging and maintenance of the www.e-agriculture.org Web site, coordinates participation in face-to-face events and drafts policy documents.

FAO hosted the first e-agriculture workshop in June 2006, bringing together representatives of leading development organizations involved in agriculture. The meeting served to initiate development of an effective process to engage a wide range of stakeholders involved in e-agriculture, and resulted in the formation of the EAWG. The EAWG was at that time composed of FAO, the Technical Centre for Agricultural and Rural Cooperation (CTA), the Consultative Group on International Agricultural Research (CGIAR), the German Federal Enterprise for International Cooperation (*Deutsche Gesellschaft für Internationale Zusammmernarbeit* – GIZ), the International Association of Agricultural Information Specialists (IAALD), the International Fund for Agricultural Development (IFAD), the Inter-American Institute for Cooperation on Agriculture (IICA), the International Institute for Communication and Development (IICD), the United Nations Department of Economic and Social Affairs (UNDESA), ITU and the World Bank.

The EAWG initiated a scoping process for e-agriculture in order to formulate a definition and identify relevant areas of application. Starting from WSIS' emphasis on how ICT applications could support sustainable development, the EAWG defined the following e-agriculture objectives:

- to demonstrate the role of information and knowledge exchange as priority areas in achieving agricultural development and food security;
- to facilitate access to the world's knowledge on agriculture and food security, especially locally derived content;
- to monitor, alert and react to information relating to food supply and demand in all countries by compiling and analysing agricultural information, especially during times of human-induced or natural disasters, through improved communications systems and knowledge exchange;
- to develop new approaches and technologies for early warning, and make these available to national and regional early-warning systems;
- to support the development and adoption of global standards and norms to compile, effectively store and exchange valuable agricultural information;
- to provide technical support to enhance information management for all stakeholders involved in agriculture;
- to foster capacity development among countries, organizations, local communities and individuals to help promote best practices in information management related to agriculture, including e-learning and other training activities; and

- to promote the formation of partnerships and other collaborative efforts between governments, non-governmental organizations (NGOs), UN agencies, other international organizations and local partners with the common goal of building institutional capacity at national and local levels to manage and share agricultural information more effectively.

The EAWG members also decided that the definition of e-agriculture contained in the WSIS document was inadequate and required revision. On that basis, the first major activity of the EAWG was to engage stakeholders through an open survey on the subject of the Action Line. Over 3 400 stakeholders from 135 countries participated in the survey from 15-30 September 2006. Stakeholders were asked questions about e-agriculture, including their familiarity with and definitions for terms; benefits and challenges of e-agriculture; and priorities to be addressed in an international forum. Respondents clearly indicated the range of important technical subjects to be addressed – including farming techniques and practices, market/food chains and research – and more than 1 100 respondents contributed success stories.

The survey results guided efforts in addressing stakeholders' concerns and bringing their views to the attention of the international community. E-agriculture was seen by the participants as a contributing factor in the achievement of broader development goals and much more than just new ways of using technology.

As an outcome, e-agriculture was defined as follows:

> E-Agriculture is a relatively new term and its scope is expected to change and evolve as understanding of the area grows. For now, e-Agriculture is seen as an emerging field focusing on the enhancement of agricultural and rural development through improved information and communication processes. More specifically, e-Agriculture involves the conceptualization, design, development, evaluation and application of innovative ways to use ICT in the rural domain, with a primary focus on agriculture. Standards, norms, methodologies, tools, development of individual and institutional capacities, and policy support are all key components of e-Agriculture. [8]

Analysis of survey results led to the following conclusions:

- the survey respondents represented a wide range of organization types from all parts of the world;
- only 41 percent of respondents were familiar with the term "e-agriculture" in English, and French and Spanish versions of the term were even less well-known;
- perceptions of the scope of e-agriculture were immensely variable;
- e-agriculture was perceived to comprise primarily information and communication processes, and secondarily technologies and tools;
- the principal subjects associated with e-agriculture were: (1) farming techniques and practices; (2) market/food chains; and (3) training, statistics/data and science/research. A wide variety of other subjects were identified by small numbers of people;
- key stakeholder groups associated with e-agriculture were seen to be farmers/producers, rural service providers (including traders/buyers, science and education) and policy- makers;

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[8]   www.fao.org/fileadmin/user_upload/kce/Doc_for_Technical_Consult/E-AGRICULTURE_-_English.pdf

- benefits to be derived from e-agriculture were: (1) enhanced processes in information access/exchange and communication for the key stakeholder groups; and (2) greater access to markets, improved household finances and more sustainable livelihoods;
- e-agriculture was widely regarded to be a contributing factor in the achievement of broader development goals, such as more secure livelihoods, enhanced poverty reduction, food security, agricultural and environmental sustainability, trade, conservation, etc.;
- priorities in the proposed e-Agriculture Community were information exchange and communication processes in the following areas:
  - developing virtual communities/networks among rural stakeholders to exchange information and knowledge and to empower them through participation;
  - building capacity of rural stakeholders in the use and application of ICTs;
  - enhancing farmers' and producers' access to markets and information on farming techniques and practices;
  - improving dissemination of and access to scientific and technical information;
  - enhancing access to statistics and other types of information for policy- and decision-making.

The full report of the survey analysis can be found online on www.e-agriculture.org.[9]

2.3.2 Main achievements 2007

In February 2007, another meeting of the EAWG was held in Rome. Organizations represented in that meeting were FAO, IFAD, IAALD, the Global Forum on Agricultural Research (GFAR), CGIAR and UNDESA. Attendees discussed the outcomes of the initial survey as well as the business proposal for the e-Agriculture Community of Practice and the e-Agriculture Web site (www.e-agriculture.org). Other points of attention during the meeting were the Global Alliance for ICT and Development (GAID) Strategic Council Meeting and the Infodev-funded project implemented by the ODI on *Enhancing the livelihoods of the rural poor: the role of information and communication technologies*. The EAWG also started planning the e-agriculture week that would take place later in the year.

In May 2007, a pilot version of www.e-agriculture.org was launched, and in September 2007, the e-Agriculture Community officially began.

In September, e-Agriculture week was held in Rome and focused on the use of information, communication and associated technologies in sustainable agricultural development and food security. The following organizations were actively involved in the organization and activities of e-Agriculture week: Association for Progressive Communications (APC), the African, Caribbean and Pacific Group of States (ACP) Secretariat, CGIAR, CTA, Euforic, FAO, the German Agency for Technical Cooperation (*Deutsche Gesellschaft für Technische Zusammenarbeit* – GTZ), IFAD, IICD, University of British Columbia (UBC), Cheikh Anta Diop University (*Université Cheikh Anta Diop* – UCAD), Global Knowledge Partnership (GKP), IAALD, CTA and GFAR.

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[9]   See Report on 2006 analysis of e-agriculture survey at www.e-agriculture.org/content/report-2006-analysis-e-agriculture-survey. The analysis report is also available as a published article in Agricultural Information Worldwide, Vol 1, No, 1 (2008), at www.itu.int/wsis/c7/e-agriculture/docs/survey-analysis-2007.pdf

The e-Agriculture week had three objectives:

- **Review technologies:** to discuss and agree on common approaches to methodologies and tools;

- **Consider policy:** to discuss policy issues associated with e-agriculture; and

- **Share expertise:** to allow stakeholders to describe their experiences while learning from others.

During the e-Agriculture week, the first Web2forDev International Conference[10] was held at FAO. The term refers to participatory Web 2.0 for development, a way of employing Web services to improve information-sharing and collaborative production of content in the context of development. The event was organized by CTA in collaboration with APC, the ACP Secretariat, CGIAR, Euforic, FAO, GTZ, IFAD, IICD, UBC and UCAD.

Also, during e-Agriculture week, the EAWG held another official meeting. At that time, it was composed of the following organizations: IAALD, FAO, IBM India, IICD, APC, World Food Programme (WFP), GFAR, CTA, Inter-American Development Bank (IADB), IFAD, CGIAR, Development Gateway Foundation, IICA and the U.S. Agency for International Development (USAID). During the meeting, the objectives of e-agriculture were revised and the members again recognized that a global Community underpinning the implementation of the Action Line would have to focus its activities on three main areas:

- development and facilitation of a Web-based collaboration space;
- organization of face-to-face sharing/learning events, such as the e-Agriculture week; and
- in-country interventions.

Three online fora were organized in 2007. The first, held in September, was entitled *Responding to demand - The focus of e-agriculture*. The second forum, in October, was entitled *Opening access to CGIAR research and knowledge: From data, information and collaboration to food* with the ICT-KM (Information and communication technologies – knowledge management) programme of CGIAR as forum partner. In November, the third forum, *Using ICT in fisheries and aquaculture programmes*, was organized with WorldFish, CGIAR and the Fisheries and Aquaculture Department of FAO.

In December 2007, FAO organized the e-agriculture track at Global Knowledge III (GK3), a major Information and Communication Technologies for Development (ICT4D) event. The event focussed on the interplay, interface and interweaving of issues related to Knowledge for Development (K4D) and ICT4D within the context of evolving societies, economies and technologies worldwide. GK3 sought to explore issues of emerging people, markets, technologies and solutions.

2.3.3   Main achievements 2008

In March 2008, an online forum on *The development of e-Agriculture through public-private partnerships in Asia* was organized in collaboration with Katalyst

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10   See Web2forDev website at www.web2fordev.net

Bangladesh. In November, the forum on *Mobile telephony in the rural world* was a strategic follow-up to the special e-Agriculture panel discussion held at the IAALD-Asian Federation for Information Technology in Agriculture (AFITA)- World Congress on Computers in Agriculture (WCCA) World Congress in August 2008, where a group of experts discussed the future of mobile telephones in rural development. Both fora were in English.

The Community participated in four face-to-face events in 2008: a Facilitation Meeting of WSIS in Switzerland in May; the e-India conference in India in July; the first Lango Forum on e-Agriculture in Uganda in July; and the IAALD Congress in Japan in August.

At the 2008 WSIS Forum, a panel discussion focussed on *What role could the USD100 laptop play outside the educational sphere for which it was originally intended – specifically related to agriculture and rural development?: From one laptop per child to one laptop per farmer*. The session investigated the role of low-cost computing in agricultural development and, in particular, looked at adaptation of technologies. Panellists included representatives from CTA, FAO, Katalyst, One Laptop Per Child (OLPC) and Microsoft.

The Community also participated in the Expert Group Meeting on the WSIS+5 and emerging issues in Asia and the Pacific in Bangkok, Thailand in November 2008, hosted by the Economic and Social Commission for Asia and the Pacific.

In December 2008, the *Networking in support of development online course for Asia* training initiative received applications from over 150 e-Agriculture Community members in Asia and the Pacific. The course covered how different ICTs in a country fit together at the local, national and international levels to provide a workable means of communication, and addressed the issues that affect each level. This free two-week facilitated online e-learning course had been offered in a condensed format to members in Africa in May 2008. The e-Agriculture Community was also active in training and uptake of ICTs, using the resources developed through the collaborative Information Management Resource Kit (IMARK) e-learning initiative.

Also in 2008, the Community expanded its social media activities with the establishment of a Twitter account (@e_Agriculture).

2.3.4   Main achievements 2009

By the end of 2009, the e-Agriculture Community had grown to around 5 000 registered members from about 150 countries. Members from around the world participated in activities such as online discussions, international and regional meetings and free online capacity-development opportunities through the IMARK partnership.

Two online fora were organized on the following topics: *Mobile telephony in rural areas* in Spanish with IICA (April 2009) and *The role of ICT in agricultural value chains* in English (December 2009).

Community members participated in many face-to-face events such as the Knowledge Share Fair organized by Bioversity International, CGIAR, FAO, IFAD and WFP in Rome; the WSIS Forum 2009 in Geneva; the IAALD Africa Chapter Conference in Accra, Ghana; the e-India Conference in Hyderabad, India; and the XVth Meeting of the Inter-American Association of Librarians and Specialists in Agricultural Information (AIBDA) in Lima, Peru.

The Knowledge Share Fair in Rome covered various agricultural development and food security issues through several information sessions that focused on the knowledge-sharing aspects of the initiatives. Over 900 participants had the opportunity to showcase, re-create and invent ways to share knowledge and improve access to it. Two sessions were relevant to the e-agriculture agenda: *Mobile telephony in rural areas*, organized by Bioversity International, the CGIAR ICT-KM Programme, FAO, IFAD and WFP in Rome; and *Leveraging connections among networks*.

At the WSIS Forum, an interactive session looked at the work and ideas of the e-Agriculture Community which, through virtual fora, face-to-face meetings, interviews, policy reports and other activities executed over the year, had provided a first-hand view of how people at all levels of intervention are using mobile telephony in rural areas, and how that impacts rural livelihoods. The session also looked at the role of international organizations and how their influence on national strategies can ensure that poverty-reduction programmes properly adopt ICTs.

E-Agriculture Community members were invited to participate in the free e-learning courses made available through IMARK (www.imarkgroup.org), which provided capacity and professional development opportunities to ICT practitioners in developing countries.

2.3.5   Main achievements 2010

By the end of 2010, the Community had grown to over 6 000 members from 150 countries. During the same year, the e-agriculture Web site was revamped and migrated to Drupal, an open source content management platform offering unique approaches to online communication and innovative support for knowledge exchange.

e-Agriculture Community members participated in a number of face-to-face events, such as the WSIS Forum 2010 in Geneva, Switzerland; the e-India conference in Hyderabad, India; the ICT2010 conference in Egham, United Kingdom; and the Conference on ICT for Rural Economic Development in Berlin, Germany.

At the 2010 WSIS Forum in Geneva, an interactive session on *ICT and rural enterprises* was organized by FAO, UNCTAD and the International Trade Centre (ITC) and combined the e-agriculture and e-business Action Lines. The debate focused on how ICTs can enable rural enterprises to become means of poverty reduction and sustainable rural development. It also addressed the roles of governments, international organizations, the private sector, civil society and NGOs in contributing to these ends. Panellists included representatives from the United Nations Office at Geneva, IICD, IFAD, Bangladesh Institute of ICT in Development (BIID), World Summit Award, and Brazil's Information Network for the Third Sector (RITS) (see *Annex 8.7: E-agriculture theme sessions at WSIS Forums 2010-2014* for details of panellists at Forum sessions).

Also during this year, in a unique collaborative effort including FAO, IICD, CTA, APC, the University of the Philippines Open University (UPOU), Gamos, IAALD and other members of the e-Agriculture Community, work progressed on a conceptual framework to enhance the impact of ICTs in rural development. This work attempted to build upon the many existing models and frameworks, expanding the understanding of the impact of ICTs in rural development and how to improve the design and positive impact of ICT interventions.

During the same year, four online fora were held on the following topics: *Gender, ICTs and rural livelihoods* with Gender, Agriculture and Rural Development in the Information Society (GenARDIS) (July); *The role of ICTs in agricultural value chains*, with IICA (August, in Spanish); *Learning repositories in agriculture, food and environment* with the Agricultural Learning Repositories Task Force (AgLR-TF) (October); and *ICT for rural economic development*, organized by GTZ on behalf of the Federal Ministry for Economic Cooperation and Development (BMZ) and partners (November).

The e-Agriculture Community, in collaboration with the Centre for Science, Development and Media Studies (CSDMS), produced a special issue of i4d magazine on e-agriculture[11] in April 2010. The issue contained unique content that showcased recent advances in agricultural and rural development from around the world through the innovative use of ICTs. Key topics included mobile telephony; rural farmers' information networks; and ICTs and development communities.

In 2010, CTA initiated Agriculture Rural Development and Youth in the Information Society (ARDYIS),[12] – a framework for actions with the purpose of raising youth awareness and capacity on agricultural and rural development issues in ACP countries through ICTs.

Also in 2010, the Community expanded its social media activities with the establishment of a Facebook account (e-Agriculture.org), and a LinkedIn account (e-Agriculture Community of Practice).

2.3.6   Main achievements 2011

By the end of 2011, the e-Agriculture Community had grown to about 7 700 registered members from more than 170 countries. Efforts continued to support collaboration with French- and Spanish-speaking members. Among Community members, 35 percent indicated that Spanish was their preferred language and 25 percent indicated French.

During 2011, five online fora were held, with the collective participation of thousands of people around the world. The first forum was *The CIARD framework for data and information sharing*, organized with Coherence in Information for Agricultural Research for Development (CIARD) (www.ciard.net) (April). The next forum in May was in French and focused on *Gender, ICTs and livelihoods in rural environments*, co-organized with CTA. The third forum, *Challenges and opportunities for capturing impact in ICT initiatives in agriculture,* was co-organized with Katalyst. In November, a forum on *Mobile information services* was organized with GSMA Fund (mFarmer initiative). Finally, in December, *Strengthening agricultural marketing with ICT* was organized with the World Bank.

At the 2011 WSIS Forum, the e-agriculture session theme was *The promise of mobile technology - what is the socio-economic impact on rural communities?*. Building on the latest experiences and looking forward, this session considered the broad potential benefits and impacts created by the use of mobile technology in rural areas. Expert researchers and practitioners reported on some of the trends involving mobile technology in development from both public- and private-sector perspectives. In

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[11]   See issuu.com/i4d_magazine/docs/i4d_jan-mar2010_eagriculture

[12]   See ardyis.cta.int

particular, the dichotomy of positive and negative impacts was addressed. UNCTAD, ITC and FAO collaborated again to create two interactive dialogues that allowed both onsite and remote participants to interact with leading thinkers and practitioners. Panellists included representatives from Open University of Catalonia, Sarvodaya-Fusion, CTA, IFAD and Royal Holloway University of London.

In 2011, blogging was added to the Community's range of knowledge-sharing functions. The newly established blog section showcased special contributions written by leaders in the Community. Through blogs, members shared information about their work and interests in e-agriculture. In 2011, guest bloggers contributed to a total of 55 blog posts in three languages, supporting interaction among Community members and attracting thousands of readers.

To mark the International Year of Youth, the e-Agriculture Community and Young Professionals for Agricultural Development (YPARD) organized a special blog series from July to August to give a voice to youth and bring their perspective to the issues surrounding the field of agriculture, young professionals and the use of ICTs. A total of 27 blogs in three languages were published, which were very popular with the Community.

2.3.7   Main achievements 2012

By the end of 2012, the e-Agriculture Community had grown to more than 9 400 registered members from around 170 countries. Highlights of the year included: discussions around the World Bank's *ICT in Agriculture Sourcebook*; inputs to Rio+20 and the Second Global Conference on Agricultural Research for Development (GCARD2); improvements in developing country access to agricultural information through the Access to Global Online Research in Agriculture (AGORA) programme and the CIARD movement; and identification of regional policy issues in an expert workshop on *Mobile telephony for food security, agriculture and rural development*, jointly organized by the FAO Regional Office for Asia and the Pacific (RAP) and the National Electronics and Computer Technology Center (NECTEC).

At the 2012 WSIS Forum, the e-agriculture session theme was *Strengthening the agricultural value chain with ICT*. Panellists included representatives from CTA, the Government of Ethiopia, World Bank and Katalyst. The discussion identified a growing body of experience that showed clear benefit of ICTs in facilitating information flows and social networks. A need for scale and time-tested sustainability of mobile agricultural information services was highlighted. Content remained a critical issue, with a need to identify and develop the roles and strengths of partners (especially government). The session report is published in the *WSIS Forum 2012 Outcome Document.*[13]

Also at the 2012 WSIS Forum the e-Agriculture Community received the prestigious WSIS Project Prize 2012. The award received wide media attention, and the e-Agriculture Community was featured in the ITU publication *WSIS Stocktaking: Success Stories 2012.*[14]

In 2012, the e-Agriculture Community continued to examine the evolving role of ICTs in support of rural and agricultural development, and the challenges faced in shaping

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[13]   See page 86 of Outcome Document at bit.ly/WSISForum2012Outcomes

[14]   See www.itu.int/wsis/stocktaking/docs/reports/S-POL-WSIS.SUCC_STORIES-2012-PDF-E.pdf

scaled, sustainable information service models. Many of the topics prioritized during the year were issues identified in the *ICT in Agriculture Sourcebook* (www.ictinagriculture.org), including the role of ICTs in areas such as agricultural marketing, "green growth", data collection and evaluation, agricultural innovation systems and producer organizations.

The World Bank and the e-Agriculture Community continued their collaboration in organizing online fora to raise awareness of, and to expand on resources in, the *ICT in Agriculture Sourcebook*. These discussion fora responded to the growing demand from the development community for knowledge on how to use ICTs to improve agricultural productivity and raise smallholder incomes. They were also a means to inform the World Bank of other programmes that Community members were executing and that complemented the World Bank's work. The discussions focused on: *ICT and agriculture in the context of green growth* (March 2012), *ICT for data collection, monitoring and evaluation* (June 2012), *Using ICT to enable agricultural innovation systems for smallholders* (September 2012), and *ICT and producer organizations* (November 2012).

The outputs on the forum on ICTs and "green growth" and "climate-smart" agriculture were presented at a Rio+20 side event, while the importance of using ICTs to enable agricultural innovation systems for smallholders was discussed at (GCARD2, 2012).

2.3.8   Main achievements 2013

By the end of 2013, the e-Agriculture Community had grown to slightly over 11 000 members from about 170 countries.

In 2013, the e-Agriculture Community continued to examine the critical role ICTs can play in communicating knowledge and information that is essential to agricultural development and food security. Priorities among the Community's technical interests were:

- content, its availability and accessibility, in the form of both public goods and value-added services;
- the role of public-sector policy in bridging ICTs and agriculture and bringing both topics to the forefront of a fast-moving area of commerce and development; and
- the role of mobile technology – which had the fastest growth rate of any ICTs in the developing world – and its ability to reach people in rural areas.

In early February 2013, FAO signed an agreement with CTA for the co-promotion of *ICTUpdate*[15] on www.e-agriculture.org by adding joint branding and incorporating *ICTUpdate* articles on the Web site (see *Annex 8.8: List of ICTUpdate issues on e-agriculture - Partnership with CTA*). *ICTUpdate* is a bimonthly printed bulletin, a Web magazine and an accompanying e-mail newsletter and mobile Web site. Each issue focuses on a specific theme relevant to ICTs for agricultural and rural development in ACP countries, and features a selection of commissioned articles. Joint promotion has attracted a new audience for the *ICTUpdate* articles and ensured a regular source of fresh content for the e-agriculture online audience. Since 2013, www.e-agriculture.org has brought over 900 new readers to the *ICTUpdate* Web site. In this time, *ICTUpdate* has published over 300 stories from practitioners, ICT developers and beneficiaries, thus adding new content to its collection of over 2 000 pages.

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[15]   See ictupdate.cta.int

In March 2013, the online forum *Strengthening e-agriculture strategies in ACP countries* was organized with CTA, FAO, the World Bank, the East African Farmers' Federation (EAFF), the Ministry of Agriculture and Animal Resources of Rwanda, the Ministry of Communication of Ghana, IICD, the New Partnership for Africa's Development (NEPAD) and the United Nations Economic Commission for Africa (UNECA). The online forum served as consultation in preparation for the ICT Observatory 2013 on *Strengthening e-agriculture strategies in ACP countries* that was held in Wageningen in April 2013. One key recommendation was that the issue of national e-agriculture strategies should transcend the boundaries of ACP countries, and that CTA should present the outcomes of the study and the stakeholder consultation at the WSIS forum.[16]

At the 2013 WSIS Forum, FAO and the CTA collaborated on the e-agriculture Action Line session *e-agriculture strategy*. The outputs of the ICT Observatory were presented by CTA as part of the Action Line session. Panellists included representatives from the Government of Ghana, CTA, eNovation4D and BIID.

In May 2013, CTA's project *Web 2.0 and social media learning opportunities* was proclaimed as winner of the WSIS Project Prizes 2013 contest in the category *C7. ICT Applications: e-agriculture.*[17]

During this year, the World Bank and the e-Agriculture Community continued their collaboration with online fora to raise awareness of, and expand on resources in, the *ICT in Agriculture Sourcebook* with the May 2013 forum on *ICT enabling rural financial services and microinsurance for smallholders*.

In addition, knowledge-sharing was extended through collaboration with USAID's project *Fostering agriculture competitiveness employing information communication technologies* (FACET) and Mercy Corps.

At the end of 2013, the Community organized a forum with Grameen Foundation entitled *Looking back and moving forward* to deepen the understanding of major achievements and challenges of using ICTs in agriculture in preparation for the WSIS+10 High-Level Event in 2014. Participants contributed their successes and failures and provided examples of possible models to emulate. Specific discussions focused on the challenges faced by women and youth and on measuring impact. In addition, FAO and Grameen Foundation are now collaborating to support poor small-scale agricultural producers, improve farming practices and innovation exchange, empower smallholder farmers and support better access to agricultural and rural financial services and competitive value chains through greater access to technology.

A highlight of the year was the Information and Communication Technologies for Agriculture (ICT4Ag) Conference (www.ict4ag.org), organized by CTA and the Government of Rwanda with the support of CGIAR, IICD, FAO, the e-Agriculture Community and many others. Held in November 2013, the ICT4Ag Conference brought together over 400 practitioners, donors and policy-makers in Kigali, Rwanda. The Conference was a key milestone in promoting the application of ICTs in the agricultural sector, and placed particular emphasis on value chains, advocacy and policy development. The main findings of the Conference can be summarized as follows:

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[16]   See ICT Observatory 2013 study and recommendations at ict-observatory.cta.int/index.php/en/

[17]   More about the Prize at www.web2fordev.net/en/about/award.html

- develop partnerships to ensure positive impact of ICT4Ag initiatives.
- support ICTs for extension and advisory services;
- support open and big data management for smallholders;
- ensure availability of reliable and quality ICT4Ag content;
- ensure grassroots' access to ICT solutions;
- strengthen youth's and women's involvement in ICT4Ag initiatives;
- support ICT4Ag entrepreneurship and promising business models;
- support sound strategies and high-level political buy-ins for ICT4Ag;
- promote adequate infrastructure and energy for ICTs in rural areas.

One key challenge that was brought up consistently at the ICT4Ag conference was the adoption and utilization of the ICT solutions (including mobile apps, Web-based apps, radio, video, IVR (Interactive Voice Response) technologies) by millions of smallholder farmers, pastoralists, fishers and forest dwellers. Therefore, a number of the recommendations aimed at achieving increased use and impact in addition to increased access.

Experiences that emerged during the 2013 ICT4Ag Conference revealed the huge potential of new technologies for agriculture. They also showed the breakneck speed at which applications are being developed, with various initiatives coming from developing countries to address information issues along the agricultural value chain. However, the Conference also revealed the huge diversity and little coherence in the development process of such ICT solutions, resulting in overlaps and gaps in the services being offered. Also, most of the solutions are still at the pilot stage. Only a few seem ready to scale and reach sustainability without support from donors. Scalability issues are often associated with poor business models adopted by service providers.

CTA has initiated a number of activities to address some of these issues:

- continuing with the capacity strengthening of institutions in Web2.0 and social media through new business models;
- developing new business models for Apps4Ag Learning Opportunities
- supporting young ICT innovators and ICT entrepreneurs developing agricultural services;
- supporting ICT capacity building and opportunities for young agropreneurs;
- identifying and collating ICT4Ag resources to enhance access;
- promoting enabling environments and sound e-agricultural strategies; and
- building viable delivery models for ICTs for agriculture.

For more information about the Conference, see *Annex 8.9: ICT4Ag Conference – partnership with CTA.*

2.3.9   Main achievements 2014

The Global Forum for Innovations in Agriculture (GFIA) 2014 was held in Abu Dhabi from 3-5 February 2014 under the theme *Driving innovation for an agricultural revolution*. The main theatre hosted a series of keynote addresses and panel debates including *The big investment debate*, *The e-Agriculture revolution* and *The NGO revolution*. The session on e-agriculture highlighted the changes that have occurred since the early 2000s in the use of ICTs for development, and presented the work of several organizations from different continents. Panellists included representatives from the Centre for Agricultural Bioscience International (CABI) (United Kingdom),

M-Farm (Kenya), Farm Apps (Australia), Dairymaster (Ireland) and Reuters Market Light Information Services (India). During the discussions, the panellists confirmed that the eight critical success factors for implementing ICTs in agriculture, which were identified by FAO in the early 2000s, are still valid today (see *2.3.1 WSIS Geneva and Tunis – setting the scene in 2003 and 2005*).

ICTs in agriculture was a thematic track at the Service Research and Innovation Institute (SRII) Global Conference in Silicon Valley, USA in April 2014. The main objective of this track was to initiate the development of an innovation agenda for ICTs in agriculture and an action plan for the future.

At the XIV Infopoverty World Conference in New York in April 2014, representatives from Rwanda and Tanzania described how ICTs are being used for a range of development activities in their respective countries, including for agricultural development. Both countries are working closely with the private sector in this context.

In preparation for the 2014 WSIS+10 High-Level Event, FAO, as facilitator of the Action Line on e-agriculture, contributed to two outcome documents, the "WSIS+10 Statement on Implementation of WSIS Outcomes" and the "*WSIS+10 Vision* for WSIS Beyond 2015".[18]

For the 2014 WSIS+10 High-Level Event, the e-agriculture Action Line facilitation meeting was entitled *Moving forward, building on ten years of lessons learned in e-Agriculture*. Four of the 14 founding partners participated in the session: CTA, IICD, FAO and the World Bank. Each partner contributed to the debate by highlighting lessons learned and future areas of action. Partners and participants expressed their agreement with the vision for implementing the e-agriculture Action Line beyond 2015 (see *6. Recommendations* below) and supported three key recommendations for the future of the Action Line: (1) bridging e-agriculture with the policy audience; (2) developing appropriate governance for e-agriculture; and (3) collaborating and cross-fertilizing across Action Lines.[19] These were also reported at the Action Line facilitators' meeting.[20]

In June 2014, the Club of Ossiach, a group of agriculturists, agribusiness managers, agriculture and forestry technologists, environmentalists and agricultural ICT specialists from around the world, organized the AgriFuture Days 2014 conference in Villach, Austria, sponsored by GFAR, among others.[21] The Conference participants discussed the future of agriculture in the context of how ICTs can contribute to improve family farming and make it more sustainable, resilient and profitable. It focussed on key issues in three areas in which application and use of ICTs and related technologies make a difference: (1) informing family farming communities; (2) improving family farm production, productivity and marketing efficiencies; and (3) contributing to the future of agriculture.

In July 2014, CTA and the African Rural and Agricultural Credit Association (AFRACA) co-hosted the Fin4Ag International Conference in Nairobi, Kenya, which aimed to

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18   See WSIS Outcome documents at www.itu.int/wsis/implementation/2014/forum/inc/doc/outcome/362828V2E.pdf

19   Session report available at www.itu.int/wsis/implementation/2014/forum/agenda/#?se=214

20   Session report available at www.itu.int/wsis/implementation/2014/forum/agenda/#?se=265

21   See conference Web site at www.progis.com/events/agrifuturedays2014/index.html

have "a catalytic effect on the use of innovative value chain financing tools in ACP countries". The Conference advocated for a paradigm shift in agricultural finance, so that policies, rules and regulations can be aligned to the real economy and innovated to realize the full potential of agricultural finance.[22]

In September 2014, the online forum *Towards concerted action on communication, community media and ICTs for family farming* focussed on the role and support that ICTs and community media can effectively provide to innovations in family farming.

In December 2014, BIID and mPower Bangladesh hosted the e-Ag Conference 2014, which took place in Dhaka. The event was organized with support from USAID, ModernizingExtension and Advisory Services (MEAS), Catholic Relief Services (CRS) and leading partners from the Government and public and private sector. The conference brought together leading international agencies involved in scaling up field-tested e-agriculture products, along with cutting-edge innovators engaged in adapting mobile technology for agricultural purposes.[23]

3. Achievements with a thematic and geographical focus

This chapter describes effective, replicable and sustainable examples of ICTs for agriculture as reported by the e-Agriculture Community partners. These examples aim to highlight areas of application and models of ICTs in agriculture, animal husbandry, fisheries, forestry and food security, where effective, sustainable and scalable initiatives have been implemented at national, regional or global levels. Potential good practices offer insight into the right mix of conditions, inputs and methodologies that are important for replicable and sustainable initiatives.

E-agriculture achievements at national, regional or global levels are documented in the annual *Reports on the WSIS Stocktaking,*[24] which outlines successful and promising examples of ICT solutions suitable for several agricultural sectors. In addition, a large collection of toolkits, briefing papers and profiles produced by USAID's FACET programme is available to a global audience on the e-Agriculture Web site.[25] The briefing papers cover areas such as supply chain management, mobile banking, market price information and weather information services. They provide an overview of the projects and their components; discuss applications for ICT interventions, and document lessons learned in the field, with a geographical focus on sub-Saharan Africa. Achievements and promising practices are reviewed and disseminated on an ongoing basis on www.e-agriculture.org.

3.1   Agricultural value chains

Examples of initiatives aimed to foster exchange of information related to agricultural value chains for smallholder farmers, experts and policy-makers include:

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22   See conference Web site at fin4ag.org
23   See conference website: e-agconference.net
24   Available from ITU at www.itu.int/pub/S-POL-WSIS
25   The collection of USAID FACET resources is available at www.e-agriculture.org/usaids-fostering-agriculture-competitiveness-employing-information-communication-technologies-facet

Red de Información y Comunicación del Sector Agropecuario de Colombia (AGRONET) (Colombia): A decentralized agricultural information and communication network aims to provide strategic, appropriate and concise information to smallholder farmers and policy-makers about new technologies for sustainable food security and crop diversity to improve productivity and market opportunities. The network is based on a technical platform that integrates several databases and provides data analysis and business intelligence tools.[26]

African Cashew Initiative (Ghana): Ghana is one of the five countries where the Initiative is promoting integration of cashew farmers in the value chain. Ghanaian cashew nut farmers are testing a smartphone app that improves efficiency in the supply chain.[27]

eAgri Transport GO Network (Ghana): Implemented by Foresight Generation Club, this network aims to provide viable transport and improved marketing channels for farmers to transport farm produce from farms to villages and selected marketing centres, based on a database of contacts and phone numbers of individual members, farming associations, transport owners and drivers.

SmartFish (Burundi, Central African Republic, Djibouti, Kenya, Rwanda, South Sudan, Sudan, Tanzania, Uganda): SmartFish Programme, led by the Indian Ocean Commission and co-implemented by FAO, aims to reduce post-harvest fish losses for improved food security. Assessment work was built on FAO's Post-Harvest Loss Assessment methodology, including a data collection and analysis tool based on mobile phones. The information collected via mobile devices shows where fish losses are occurring, how large the losses are and why they are occurring. All this information is important in planning where and how to reduce losses and therefore how best to make use of development resources.[28]

SIS Semences (Côte d'Ivoire): The SIS Semences project was established in line with the Côte d'Ivoire Government's national strategy for the production of rice focusing on quality seed. FAO, the Inter-professional fund for agricultural research and advice (*Fonds interprofessionel de la recherche et de conseil agricoles* – FIRCA), the National Agency for rural development (*Agence nationale d'appui au développement rural* – ANADER) and the National Organization of seed multiplier in Ivory Coast (*Association nationale des semenciers de Côte d'Ivoire* – ANASEMCI) have agreed to put in place a low-cost system for the production and commercialization of quality seeds. The partners agree about the necessity of building an information system on seed production and marketing based on a cheap and effective technology that would allow an increase in seed marketing as well as access by farmers to certified seeds. FAO has provided the know-how and trained local staff from different institutions to handle and manage the information system. The system uses mobile technology, in particular smartphones, to report on the quality of seed production and to facilitate access to markets.

Cadre Regional de Concertation des Ruraux (CRCR) (Mali): This initiative covers and represents approximately 400 farmer and producer organizations of the Sikasso province. IICD has helped CRCR to equip and train its local branches

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26   See www.agronet.gov.co/agronetweb1

27   See www.africancashewinitiative.org/

28   See commissionoceanindien.org/fileadmin/projets/smartfish/Fiche/FICHE17ENGLISH.pdf

(*Cadres Locaux de Concertation des OP* – CLCOP) in the seven district towns of Sikasso with ICTs. Using Internet, mobile phones and local radios, CRCR now fluently exchanges information from, to and among the CLCOPs; keeps a regularly updated database on farmer households in the province; and is able to systematically collect data on food security and share these with the local and regional authorities. The information system has inspired the national farmer associations Association des organisations professionnelles paysannes (AOPP) and Coordination nationale des organisations paysannes (CNOP), and the subregional Réseau des Organisations Paysannes et de Producteurs de l'Afrique de l'Ouest (ROPPA) to use the same model for its surveys.

CocoaLink (Ghana): CocoaLink is a mobile technology service that delivers timely farming, social and marketing information to cocoa farmers in 15 communities in Western Ghana, to improve incomes and livelihoods. Cocoa farmers who subscribe to CocoaLink receive and share practical information via SMS text and voice messages with industry experts and other farmers. CocoaLink is available to any Ghanaian with a cell phone[29].

Coffee Initiative (Ethiopia): The Coffee Initiative is implemented by TechnoService and provides an IVR and SMS mobile data collection system used by farmers to register in the initiative and also to record cherry collection volumes, operating costs and wet mill performance indicators[30].

iCow (Kenya): Cow farmers in Kenya are small-scale farmers and use rudimentary methods to manage their cows' estrus cycle and milk production. Smallholder farmers are estimated to sell an average of 3 to 5 litres per day. Calculations have shown that 15 litres per day is the required production to bring a family over the poverty line. Green Dreams TECH Ltd developed iCow, an SMS information system, with the main motivation being to enable small-scale farmers to maximize their returns by helping them to track analytics about their cows, ranging from gestation to immunization, and access information about diseases, find local veterinarians and optimize their animals' healthcare[31].

3.2   Risk management

These initiatives aim to enable farmers and national systems to manage the risk of natural disasters and prevent the losses caused by crop and animal disease outbreaks**:**

Agriculture Disaster Risk Management (ADRM) (Sixteen communities in Dominican Republic, Haiti and Jamaica): Communication for Development approaches and ICTs were used for documenting agriculture disaster risk management (ADRM) processes, good practices and support dialogue. In recent years, floods, landslides, droughts and hurricanes have crippled agricultural production in the Caribbean, where national economies are largely dependent on agriculture. To strengthen community preparedness and resilience to natural disasters in the region, an FAO project on Disaster Preparedness for Dominican Republic, Haiti and Jamaica was launched in 2011 and ended in April 2013. The whole process was documented through short videos and a series of

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29   See www.worldcocoafoundation.org/cocoalink/

30   See www.technoserve.org/files/downloads/coffee-initiative-lessons-learned.pdf

31   See icow.co.ke

photos. Good practices were also systematized on video and in community photo albums to share experiences among farmers and fishermen. Particularly in Dominican Republic, there was a fruitful experience that applied new ICTs to improve community-based early warning and to enhance knowledge exchange: short message service (SMS) through mobile phones was used to alert fishing communities on time,[32] and a Web-based platform was launched to exchange knowledge and practices among communities at the local level.[33] Both ICT tools are still functioning in the six communities of Dominican Republic that participated in the project.[34]

e-Krishok (Bangladesh): Launched in 2008 by the BIID, in collaboration with Katalyst (a multidonor development initiative) and Grameen Phone (a leading telecom operator), e-Krishok is an initiative for farmers that provides extension and market linkage services from which farmers may benefit, both in terms of farming activities and increased opportunities for selling their produce. Farmers with any problem, query or issue related to agriculture can go to nearby ICT-enabled information centres/telecentres and receive the information they are seeking. The service is also available via mobile phone.

Desert locust early warning system (Rome): The Locust Group at FAO Headquarters in Rome operates an early warning system to alert countries about the development of desert locust plagues. During calm periods, desert locust infestations are usually present somewhere within about 16 million square km of desert in 25 countries between West Africa and India. During plagues, the number of countries and the size of the area that can be affected doubles, representing about 20 percent of the Earth's land mass. The FAO Desert Locust Information Service, in collaboration with Novacom (France), developed a handheld device for field officers to enter and send geo-referenced data in real time. This device is called eLocust3. The field officer enters and saves the data into a rugged handheld device which automatically determines the coordinates of the location of the survey or control operation. The officer sends this data via satellite to the National Locust Centre, where it is received as an email attachment, downloaded, decoded and imported into a geographical information system (GIS). The GIS is used to manage and analyse the data.[35]

Event Mobile Application (EMA-i) (Uganda): A smartphone application (Event Mobile Application, or EMA-i), developed by FAO with the support of the Irish Government, was piloted in Uganda in 2013-2014 to support disease surveillance activities and national disease reporting. District veterinary officers are using the smartphone app to report disease outbreaks immediately through an online system. The user-friendly and efficient mobile application, developed using Android technology, improves timely reporting and has the capacity to report on a wide range of animal diseases. This system also allows district veterinary officers to access disease reports submitted by their colleagues, keeping them informed of events in neighbouring districts. The plan is to expand the use of EMA-i to all districts in Uganda in the next three years. FAO is encouraging other countries to test and use the app to improve disease reporting in the field.

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[32]   See taiguey.org/fao/Manual-SMS-GDRA.pdf

[33]   See buenaspracticas.socialgo.com/

[34]   See www.fao.org/emergencies/fao-in-action/stories/stories-detail/en/c/176703/ (English) or www.fao.org/emergencies/la-fao-en-accion/historias/historia-detalle/es/c/177091/ (Spanish)

[35]   See www.fao.org/ag/locusts/en/activ/DLIS/earlywarning/index.html

SMS Gateway for Avian Influenza Active Surveillance (Bangladesh):
Using the SMS Gateway system, disease information on high poultry mortalities (i.e. highly pathogenic avian influenza [HPAI]) was transmitted daily by community animal health workers in the field and received by the central server. Suspicious information was followed up for further investigation including sampling and dispatch for laboratory testing. By using this system, more than 86 percent of outbreaks in 2011 were reported by active surveillance using SMS Gateway ahead of the passive surveillance system; time between detection and response was reduced from 4.5 days to 1.5 days; and labour was saved for data entry at local and central levels. The project ended in 2013, but the concept has been incorporated into the HPAI Programme in Indonesia, and other countries (i.e. Egypt) have shown interest. It has also been rolled out in Lao People's Democratic Republic.

Animal Disease Surveillance Systems using Digital Pen Technology and Mobile Phones (Angola, Malawi, Mozambique, Namibia, Tanzania, Zambia, Uganda, Ethiopia, South Africa, Kenya): Digital pen technology was used to collect animal disease surveillance data at the case record level. The data elements were collected into animal disease information systems used by each country and sent to external organizations such as the Southern African Development Community (SADC) and World Organisation for Animal Health (OIE). A Web-based back-end server facilitated the data editing, validation and confirmation processes and reporting flows. A major benefit was the regional harmonization of the disease form and data collection methodology. A major enhancement involves using mobile phones through a Nokia Data Gathering client to collect zero reports (a search was conducted and no evidence of animal disease was found). Zero reports comprised approximately 75 percent of the total disease reports by field extension staff. In Uganda, a Nokia Data Gathering client is used to collect animal disease notifications, basically a disease suspicion report. The interesting development is the use of community animal health workers instead of extension staff. In Ethiopia, a pilot has started, learning from the experiences in Southern Africa and Kenya. Initial development includes an Open Data Kit mobile client to collect disease notification by vet assistants and digital pen technology for detailed investigation. A centralized back-end server will be the data hub with a Web-based data processing interface and a notification system for authorized users.

Regional Cassava Initiative (Burundi, Central Africa Republic, Democratic Republic of Congo, Gabon, Rwanda, Tanzania, Uganda): This initiative aimed to support smallholder farmers who cultivate cassava, an essential part of the diet of vulnerable communities across Africa, in preventing further spread of two virus diseases. The surveillance information system used digital pen technology to collect monitoring data covering post-planting, pre-harvest, quality management, beneficiary lists, post-distribution and output assessment. The quality management protocol was developed by the International Institute of Tropical Agriculture (IITA) and CRS, and FAO harmonized the post-planting and pre-harvest forms.

Rapid Response Initiative on Banana Bacterial Wilt (Uganda): The Uganda Agricultural Technology and Agribusiness Advisory (ATAAS) team reached out to the United Nations Children's Fund (UNICEF), which runs a 195 000+ member network in Uganda called UReport (www.ureport.org). Members of the network use mobile technology to report on various issues of interest to UNICEF and other

development partners. This initiative relied on UNICEF's UReport network to quickly map the spread of banana bacterial wilt disease in the country and raise awareness on control measures. By sending out SMS-based polls, the team was able to quickly gather data on the spread of the disease and disseminate basic information on control measures.

Global Forest Watch: This project by the World Resources Institute aims at enhancing forest management systems and increasing public awareness by providing reliable, timely and open-access information about the status of forests worldwide. From the Web site www.globalforestwatch.org, users have access to a real-time mapping application which is based on satellite technology, open data and crowdsourcing. In addition to the real-time world maps, users can download, analyse and share forest data (disaggregated by country and area).

Monitoring weather and climate data is a key component of risk management and adaptation strategies. The following initiatives aim to provide ways to collect information, analyse climate trends at the local level and inform decisions on natural resources management and crop planting planning:

Weather Stations Network (*Red de Estaciones Meteorológicas* – REM) (Argentina): The University of La Punta has created a network of automatic meteorological stations that provide weather data for San Luis in real time. These data facilitate improved forecasts and, at the same time, help build a database. They also produce information for research on models of soil moisture; development of wind energy resources; and climate change scenarios for the coming decades. Moreover, because of the certainty of the information in this network, data are used by the National Oceanic and Atmospheric Administration of the United States for its global precipitation maps.

CGIAR Research Programme on Climate Change, Agriculture and Food Security (CCAFS): This programme works on several aspects of climate change research, including managing the risk associated with climate variability as an integral part of strategies for adapting agriculture and food systems to a changing climate. In addition to several datasets and tools through which climate data are collected and analysed, the programme is active in bringing localized climate information services to smallholder farmers using a multifaceted approach: face-to-face communications; intermediaries in organizations and networks; integration of indigenous forecasting methods; and ICT-based methods such as mobile phones. Preliminary findings show that the most effective climate services include a variety of approaches (e.g. posting advisories in public places, announcements over loudspeakers, enlisting NGOs and extension services to help communicate, translating advisories into local languages). CCAFS is currently studying how best to balance media and ICT approaches with face-to-face interactions. An expansion of these approaches is under way in East Africa, where CCAFS and partners such as the International Research Institute for Climate and Society are working to bring climate services to farmers in Tanzania through a project under the Global Framework for Climate Services.[36]

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[36]   See ccafs.cgiar.org/climate-services-farmers

Additional examples of weather information services and their underlying models are discussed in the USAID FACET paper, *Using ICT to Provide Weather Information for Agriculture* (2013).[37]

3.3 Market and price information

The following are examples of initiatives to improve food production and security by improving market linkages and access to local and international markets for smallholder farmers' products. They rely on several levels of information generation and dissemination, including at the farmer and community levels:

Rural Knowledge Network Pilot Project for East Africa: This project encompasses market access networks in Kenya, Tanzania and Uganda, with actors at national, district and local levels who keep a constant and effective communication link (e.g. via e-mail, telephone, SMS, face-to-face meetings, Internet) for information-sharing and business-to-business learning. Initiated by FAO, the pilot project ran from 2007 to 2010; its most well-established and active offspring is **AgriNet Uganda.**[38]

Market Linkages Initiative Bridging Activity (Malawi): This USAID-funded project helped improve post-harvest handling, developed a transparent trading environment and increased access to accurate market information for smallholder farmers through a partnership with Esoko Networks and the Agricultural Commodity Exchange. Women groundnut producer farmers were trained in ICT skills for sourcing market information via an Esoko SMS-based subscription service, and consequently were able to sell their produce at a fairer price, organize transport in more cost-effective ways and quintuple their earnings.[39]

Krishi FM (Nepal): A rural radio relies on farmer-generated market information to inform its listeners. Farmers who roam or sell at local markets phone in to the local community radio to share information on current market prices.

SIM-Agri (Burkina Faso): IICD and its partners launched SIM-Agri, a platform giving 3 000 farmers access to vital market information via mobile phones and computers. Market price collectors around the country gather information at various farmers markets and then send information about prices and products at those markets to the SIM-Agri platform. For the price of a regular text message, the farmers can ascertain the prices of their crops in various markets and learn when and where they can earn the best price for their produce.[40]

TERRA (Ethiopia): Software service TERRA, implemented with the support of IICD and its local partners, relies on mobile technologies to collect price information of various commodities and their varieties from different markets and enables access for farmers and farmer unions. TERRA also enables farmer unions and cooperatives to collect, analyse, manage and utilize information on individual organizations and their members using a mix of mobile technologies and online interfaces. Additionally, TERRA assists suppliers in tracking the movement and

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37   See http://pdf.usaid.gov/pdf_docs/pa00j7px.pdf

38   See www.agrinetug.net

39   See www.acdivoca.org/site/ID/ICT-Helps-Woman-Farmer-Quintuple-Income-in-Malawi

40   See www.iicd.org/articles/market-information-system-test-kicks-off-in-burkina-faso

quality of inputs across the input distribution chain, to ensure that fertilizers and certified seeds reach farmers on time before the planting season. Finally, TERRA provides unions insight into the collection of commodities from farms at each of their individual cooperatives. Through this, unions will be able to better anticipate the levels of available commodities among their members, service the markets more efficiently, create and manage selling contracts and track how well they are servicing their commitments where external buyers are involved.

- **Labaroun Kassoua** (Niger): Labaroun Kassoua is a mobile phone-based market information system providing prices on livestock and crops from markets across the country. The system was developed by Orange; a mobile telephone service provider.[41]

Besides providing access to market information, ICTs can facilitate access to markets when farmers have the opportunity to acquire tools and knowledge and put them to use for their own objectives:

- **Coprokazan[42] (Mali) and the Songtaaba Yalgré Association (Burkina Faso):** These two women farmer cooperatives have organized producers of shea butter and helped their members earn better local crop prices and expand into international markets, by gradually acquiring Internet and other ICT skills and putting them to use for the benefit of the cooperative's members. In particular, they created visual learning materials for illiterate farmers, created a Web site as a marketing tool and trained their members in the use of global positioning system (GPS) devices so that farmers could provide traceability information to meet export certification standards.

- **Institute for an Agrarian Alternative (*Instituto para una Alternativa Agraria* – IAA) (Peru):** This project, supported by IICD, aims to directly benefit 45 125 farming families in eight regions by improving their guinea pig, dairy and crafts production volumes and stabilizing them to meet the demand. The overall goal is to improve the quality of producer families' supply and to increase their sales volumes. The project improves the producer families' sales by using ICTs (e.g. rural radio, Web TV and videos) to coordinate and promote production which is integrated with distance training to improve quality and production volumes.

- **EcoMarketPeru (*EcoMercadoPeru)* (Peru):** IICD supported a Web-based platform, which mobilizes consumers and entrepreneurs to create and meet the demand for agro-ecological organic products. By connecting 2 951 families of ecological producers from six regions of the country to alternative markets and offering information on organic household production, the online platform improves awareness of the availability of organic products, makes trade fairer, provides producers with market access and raises their income and thus ultimately their quality of life.[43]

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41   See www.orange.ne/labaroun.html

42   See www.iicd.org/articles/karite-producer-coprokazan-sets-example-in-mali?searchterm=coprokazan

43   See www.ecomercadoperu.com

3.4   Agricultural advisory services

Examples of agricultural advisory services supported by rural information and knowledge networks include:

Virtual Extension Research Communication Network (VERCON): Developed by FAO, this conceptual model uses ICTs to strengthen linkages among extension advisors, researchers, farmers and their organizations and other stakeholders involved in agricultural and rural development. It can be adapted to the context and needs of any country and aims to improve access to agricultural information and enhance communication, knowledge-sharing and lesson-learning among and within stakeholders of agricultural innovation systems. The extensive multistakeholder collaboration involved in planning, implementing, managing and evaluating practical processes and tools for VERCON results in improved communication linkages and information-sharing within the innovation system. Relevance is achieved by involving the farmers and their organizations in decision-making so that their needs and priorities are addressed.[44]. Creative and practical ways are developed to harness new ICTs which are most in use, particularly mobile phones and personal computers. There is no predetermined software package in VERCON as there is no one-size-fits-all solution for every developing country. VERCON-type developments have been carried out in Albania, Armenia, Bhutan, Colombia, Costa Rica, Egypt, Morocco, Nigeria and Uganda. Each development has been unique. VERCON-Egypt was successfully completed in 2002 and is still functioning and fully operational as an integral component in the **Rural Agricultural Development Communication Network Project (RADCON)**.[45] In 2013, Morocco started a pilot phase of the **ARNDA network** in the framework of the 'Plan Maroc Vert, Pilier II' (Green Morocco Plan, Pillar II) in support of smallholders. The ARDNA network will be up-scaled to a national level in 2015.

Grameen Foundation Community Knowledge Worker (CKW) Initiative (Uganda): Launched in 2009, today this project serves more than 176 000 farmers in remote developing-world communities through a network of more than 1 100 peer advisors. The initiative combines mobile technology and human networks to help smallholder farmers get accurate, timely information to improve their businesses and livelihoods. It has been replicated in Colombia. In Ghana, Grameen developed a Mobile Agriculture Education Application to provide smallholder farmers with weather updates and advice on caring for crops.

Technologies and Practices for Small Agricultural Producers (TECA): This programme ,[46] based on an interactive Web-based platform, is a global FAO initiative which aims to improve access to validated practical information in English, French and Spanish on agricultural practices for smallholders, extension and advisory services, development practitioners, producer organizations and producers. TECA is FAO's Web-based interactive knowledge repository of applied technologies and practices on different agricultural themes. It also contains online fora where registered users can exchange challenges, experiences and possible solutions. There are two different online fora: one with a thematic focus on various aspects of beekeeping, and a broader one on farmers' innovations.

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[44]   See km.fao.org/vercon
[45]   See www.radcon.sci.eg
[46]   See teca.fao.org/

TECA's most recent partners, who either share their practices on TECA, use TECA content for their outreach activities to farmers or moderate online fora, are the **International Federation of Beekeepers' Associations** (APIMONDIA), the World Agroforestry Centre, the Grameen Foundation, the International Potato Centre, GIZ and the South Asia Pro Poor Livestock Policy Programme. Uganda's communication knowledge workers use TECA to provide farmers with information on practices via mobile phones and a call centre.

Sènèkèla (Mali): IICD and telecom operator Orange Mali successfully piloted the implementation of a market price and agricultural information service. Sènèkèla includes an SMS/Unstructured Supplementary Service Data (USSD) information service providing farmers with market price information for locally grown crops, as well as a call centre staffed by agricultural experts who provide information on production techniques for farmers.[47]

3.5   E-agriculture policies

Although there are no specific ICT-for-agriculture policies in many countries, e-agriculture strategy initiatives have been or are being put in place in countries such as Côte d'Ivoire, Ghana, Mali and Rwanda, and in regions such as the Caribbean.[48] Moreover, with most ICT policies developed with the support of organizations such as UNECA, IICD, ITU and UNDP, there are provisions on sectoral strategies for agriculture. However, approaches differ in different regions and countries. In 2013, as a follow-up to the Connect Asia-Pacific Summit, a joint FAO-ITU proposal was submitted to develop an e-Agriculture Strategy Guide. This joint programme between ITU and FAO aims to provide assistance to countries in developing a comprehensive e-agriculture strategy, customized on a demand basis and in the form of a guiding policy document. This kind of assistance to governments is a first building block that facilitates increased development of local content and applications and aims at innovative and effective service delivery for agriculture and rural development. Bhutan and Sri Lanka are the two pilot countries for which the guide will be customized in 2015.

3.6   Capacity development

CTA, in partnership with national and international development agencies, organized a series of five-day training events (based on cost-sharing) in Africa, the Caribbean and the Pacific regions. These events are designed to raise awareness and stimulate the adoption of Web2.0 and social media learning opportunities in order to strengthen actors operating in the agricultural sectors.[49]

IICD's social innovation process is at the basis of an integrated capacity development approach aimed at strengthening farmer organizations' ability to use technology to increase, sustain and benefit from agricultural growth. In this context, ICT solutions are identified and mainstreamed in field activities in ways that promote inclusion of smallholder farmers in agricultural value chains. The key success factor is that diverse capacity-development activities are required for effective and sustainable

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47   See www.iicd.org/articles/orange-mali-launches-new-market-price-and-agricultural-information-service-in-mali

48   CTA. 2013. E-agriculture strategies. ICT Update, Issue no. 73, available online at ictupdate.cta.int/(issue)/73

49   See www.web2fordev.net

ICT use over time, especially at the organizational level. Capacity development is understood to be broader than training interventions. It also includes coaching and mentoring, analysing information and communication flows and providing support to local partners to formulate the objectives for implementing ICT solutions, sharing knowledge, building relationships and networking with local technical providers and resource persons. Capacity to design, develop, implement and maintain ICT solutions requires guidance and support through the business transformation processes that take place when ICT tools are adopted for agricultural purposes.[50]

For example, in Kenya, IICD and local private-sector partners train and coach farmers in using ICTs to receive and use market price information and short messages with production information on their mobile phones. IICD links farmer organizations and local service providers, ICT advisors and research institutes to provide accurate and timely information. As part of the Connect4Change programme, young people were trained to use ICTs to improve production and farm management. ICT skills were found to influence the motivation of young farmers to embrace farming as a profitable business. They were capable of increasing their income but also gained respected social status in their communities, which recognized them as successful entrepreneurs[51] and started approaching them for advice and increased participation.

E-Agriculture Community members were invited to participate in free e-learning courses made available via IMARK,[52] which provided capacity building and professional development opportunities for ICT practitioners in developing countries. IMARK is a partnership-based e-learning initiative that aims to enable development practitioners to acquire skills, competences, behaviours and attitudes in knowledge sharing and information management. The main objective of IMARK is to develop the capacities of individuals and support institutions worldwide in effective knowledge and information management. IMARK consists of a suite of free e-learning courses available online, on CD-ROM and as a downloadable package. The e-learning courses are being developed using the latest pedagogical models and methodologies, and provide an interactive environment for self-paced learning.

The e-Agriculture Community regularly informs its members about e-learning courses available on the **FAO e-learning portal**[53] for professionals working in food and nutrition security, social and economic development and sustainable management of natural resources.

3.7   Participatory communications

Effective examples of ICTs for agriculture and development use combinations of technologies, and the way they are used is often determined by the rural communities themselves. Traditionally, radio has long been used in combination with traditional forms of communication and media. With the massive availability of mobile phones – even in remote rural areas – as well as the Internet, radio continues to be an effective

50   IICD. 2014. ICT Solutions for Inclusive Agricultural Value Chains. The Hague (also available at www.iicd.org/about/publications/ict-solutions-for-inclusive-agricultural-value-chains/)

51   IICD. 2013. Youth, ICTs and Agriculture. The Hague (also available at www.iicd.org/about/publications/ict4d-effects-youth-icts-and-agriculture/)

52   IMARK. See www.imarkgroup.org

53   See FAO e-learning portal at www.fao.org/elearning/

technology in supporting community dialogue and information services, particularly when these are designed and provided by the community members.

ICTs such as mobile phones, Internet and audio/video devices (e.g. digital cameras) can enhance the process and outcomes of agricultural development initiatives if they are selected based on: (1) their suitability to meet the project objectives; (2) their adaptability to the socio-economic condition of local communities; and (3) the availability of the needed resources (local partners can play a key role in ensuring their availability). The following are some key examples:

Krishi FM (Bangladesh): This rural radio station, started by the Ministry of Agriculture with FAO's support, was designed with community participation in mind from the onset. Because of community ownership, the radio station is self-sustaining and continues to ensure that rural people have access to relevant information on agriculture and development, research and policies and that they develop local content and demand-driven communication services. Initially run by government agricultural officers, over time the radio station consolidated a team of community volunteers who currently perform daily production and broadcasting tasks. Krishi FM is an example of an effective combination of different technologies and media adapted to the local context: extension agents have been known to partner with local farmers to monitor local prices, and then re-post and disseminate that information using radio, phones and public bulletin boards.

Her Farm Radio: This initiative by Farm Radio International has developed seven projects so far in six African countries. The initiative combines community radio, mobile telephony, drama, listening groups, community forums and a "best farmer" competition to encourage dialogue and information-sharing among rural women and young farmers.[54]

FAO Dimitra (Burundi, the Democratic Republic of the Congo, Ghana, Niger, Mauritania and Senegal): This participatory communication and information project highlights the role of women in agriculture. It strengthens leadership by women and provides a platform for the most marginalized to improve their livelihoods and food security. The project is being carried out through participatory communication, more specifically community listeners' clubs. Mobile phones, rural radios and an online database are used to improve information exchanges and network creation.[55]

ANPE (Peru): This project, implemented by ANPE (Asociacion Nacional de Productores Ecologicos del Peru) in cooperation with IICD, seeks to strengthen associative marketing channels and to position the Eco-exhibition "Fruits of the earth" (*Ecoferias "Frutos de la tierra"*) in the Ancash, Cajamarca and Cusco regions with the use of ICTs. It aims to increase farmers' market access and to improve the economy of their family members. To achieve this, the youth of the farmer families associated with ANPE use ICTs for data management, communication strategies and marketing.[56]

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54   See Brief - Her Farm Radio July 2014 at www.farmradio.org/wp-content/uploads/Her-Farm-Radio-General-Brief-FINAL-July-7-2014.pdf

55   See www.fao.org/dimitra

56   See www.iicd.org/articles/young-people-in-peru-use-social-media-to-promote-agro-ecological-production

Appropriation of ICTs and media by local communities benefits the development of locally-relevant content, for example in the selection of topics and the use of local languages. It is also an opportunity to document and disseminate local knowledge, so that this becomes part of the local community's resources. Suitable information resources and trusted intermediaries are important for successful initiatives; quality content is more effective if it is delivered by actors who have the benefit of social standing and credibility within the communities. This again highlights the importance of introducing ICT solutions through farmer or producer organizations, community-based NGOs or other structures that have long-standing and trusted relationships with the intended user groups.

Farmer organizations can use ICTs to improve their organizational efficiency and better represent their members in areas such as negotiations on land, resources and infrastructure. Organizations can also facilitate the use of advanced ICTs, such as GPS-enabled devices, which are often not appropriate or affordable for individual farmers. Some farmer organizations also run ICT networks and community radio outlets and own telecentres, which appear to be more sustainable than outlets run by governments or civil society:[57]

- **Radio Pag-La-Yiri (Burkina Faso):** This radio station is run by a women farmer association and generates income through broadcasting announcements and providing computer training sessions to its members' children.[58]

- **Coopeumo (Chile):** This farmers' cooperative uses SMS for low-end mobile phones to reach its 400 members who do not pay directly for the service, since this is covered in their membership fees.

- **Huaral Valley Agrarian Information System (Peru):** This was initiated in 2000 by the Peruvian Centre for Social Studies (*Centro Peruano de Estudios Sociales -* CEPES) in partnership with the Chancay-Huaral River Basin Irrigation Board, a local community-based organization set up and owned by farmers. The irrigation board is responsible for maintaining irrigation infrastructure, and charges farmers for its services. The introduction of affordable Internet access and telecommunications services to district irrigator commissions and poor farming communities has benefited the communities by providing improved water management and an extended ICT infrastructure (e.g. wireless hot spots, computers and skills training), which enables farmers to create their own information.[59]

3.8 Information management and knowledge exchange for agricultural innovations systems

These initiatives aim to develop and strengthen institutional and human capacities in national agricultural research and extension systems. They fall into three broad categories:

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[57] FAO. 2014. *Farming for the Future: Rural Communication Services to Advance Family Farming*

[58] See paglayiri.org/

[59] See *The Huaral Valley Agrarian Information System*, Peru available at www.apc.org/en/system/files/ APCProPoorKit_CommunityModule_CaseStudy_HuaralValley_EN.pdf

- **Facilitating worldwide access to scientific literature in agriculture** that appears in peer-reviewed learned journals which, for the most part, are published commercially and thus sold at prices which are unaffordable in developing countries. Research4Life (www.research4life.org) is a Public Private Partership of the World Health Organization (WHO), FAO, United Nations Environment Programme (UNEP), World Intellectual Property Organization (WIPO), Cornell and Yale Universities and the International Association of Scientific, Technical & Medical Publishers. Working together with technology partner Microsoft, the partnership's goal is to help attain six of the UN's eight Millennium Development Goals by 2015, reducing the scientific knowledge gap between industrialized countries and the developing world. Research4Life is the collective name for the four programmes – HINARI, AGORA, OARE and ARDI[60]– that provide developing countries with free or low-cost access to academic and professional peer-reviewed content online.

- **Developing capacity for developing effective information management systems** based on stakeholders' needs to manage, disseminate and share relevant information and knowledge relating to agricultural development and food security policies. Examples include: **National Agricultural Research Information Management System (NARIMS)** in Egypt, **Ministry of Agriculture and Fisheries Network (MAFNET)** and N**ational Agricultural Knowledge Exchange Management System (NAKEMS)** in Oman and the **National Agricultural Information System (NAIS)** in Jordan, Sudan and Yemen. FAO has continued to provide technical support to a variety of operational projects in Egypt, Jordan and Oman (e.g. technical backstopping, developing technology systems and capacity, assisting with information and knowledge policy, strengthening national institutions), as well as advisory missions when requested. FAO has developed the Institution-based Agricultural Information System/Network (AIS) (Version 5.0 was released in 2014). It was distributed in collaboration with the Association of Agricultural Research Institutions in Near East and North Africa (AARINENA) and GFAR to the information focal units of Cyprus, Iran, Lebanon, Libya, Syria and Tunisia, and is available online to be downloaded free of charge.[61] With the **iMarine initiative**, FAO helps communities gain access to virtual research environments that rely on a well-managed and regularly updated set of software resources and enable collaborative scientific work. Users can focus on their own workflows rather than on maintaining and developing the software environment. Examples of applications of virtual research environments are generation of species distribution maps, harmonization of statistical datasets, semantic fact sheets and discovery and processing of geospatial data.[62]

- **Supporting agricultural science organizations to publish and disseminate the results** of their work. For example, the **International Information System for the Agricultural Sciences and Technology (AGRIS),** established in 1975, is a network of over 200 organizations worldwide that collaborate on improving access and information exchange in the field of agricultural science and technology.[63] Another institutional repository tool for capturing

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[60]   HINARI (Research in Health), AGORA (Research in Agriculture), OARE (Research in the Environment), ARDI (Research for Innovation)

[61]   See ais.faorne.net/

[62]   See www.i-marine.eu

[63]   See agris.fao.org/

and disseminating scientific and technical information is the Web Documents Information Management System, which can be downloaded free of charge.[64] An international group of partners in the CIARD global movement are supporting agricultural innovation by ensuring that the outputs of agricultural research are made more accessible, in part through open digital institution repositories. In many cases, these are part of national networks such as in Africa, where the **Kenya Agricultural Information Network (KAINET)** and the **Ghana Agricultural Information Network System (GAINS)** have adopted open technical standards and public domain ICT tools for interoperability of agricultural information systems. The CIARD movement (www.ciard.net) has developed a framework of policies and practices and a global registry of open content, which maps the knowledge resources of more than 350 organizations worldwide.

FAO has worked closely with partners such as AARINENA, the International Centre for Agricultural Research in Dry Areas (ICARDA), GFAR and the Arab Organization for Agricultural Development (AOAD) to establish and develop thematic networks of professional staff and collaborating centres for sustainable agriculture and food security. Examples include: **Near East and North Africa Rural and Agricultural Knowledge Information Network (NERAKIN);[65] Regional Agricultural Biotechnology Network (RABNENA);[66] Regional Aquaculture Information System (RAIS);[67] Near East and North Africa Regional Network for Agricultural Policies (NENARNAP);[68] and Near East and North Africa Plant Genetic Resources Knowledge and Innovation Network (NENAPGRN).[69]**

3.9   Knowledge sharing and good practices in online community management

In addition to the Community's primary goals of providing a platform for knowledge exchange and networking on ICTs for agriculture and addressing the WSIS Action Line, the e-Agriculture Community provides FAO and other organizations and individuals with valuable experience in using ICTs for knowledge management/sharing and in managing a global community of practice. Lessons learned and shared cover aspects of communication, community organization and technical management.

The e-Agriculture Community experience has resulted in sharing knowledge and good practices related to online community management and communication in the following ways:

*   documented processes and good practices through the experience of managing more than 20 asynchronous discussion forums;
*   strategies for engaging individual participation in the community, and separate strategies for engaging institutional partners in community activities;
*   significant experience in identifying, prioritizing and utilizing social media for outreach and networking;
*   experience managing content and discussions across multiple languages;

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64   See web-dims.com
65   See nerakin.net/
66   See www.rabnena.net/
67   See www.raisaquaculture.net/
68   See www.nenarnap.org/
69   See plantgenetic.com

- general community communication strategies for a global network;
- content management systems suitable for managing a community with characteristics and requirements similar to the e-Agriculture Community;
- technical management of social media tools; and
- online information management practices, including tagging and vocabularies.

FAO and the e-Agriculture team consider knowledge sharing an integral part of managing the Community. Knowledge sharing occurs through several channels. FAO engages interns in the team responsible for daily management of the Community; professionals in agriculture and ICTs collaborate with the Community; and team members participate in targeted knowledge-sharing activities. Such targeted activities include participating in KM4Dev (Knowledge Management for Development) community discussions and presenting/reporting about lessons, challenges and good practices in share fairs and at other events organized by the development community. Team members also capitalized on their experience contributing to the development of IMARK content, journal articles, technical reports and guides.

4. Recent developments and emerging trends

Since 2003, substantial progress has been made in making ICTs available and accessible to rural communities. ICTs have increasingly been deployed in rural development projects all over the world. At the same time, increasing attention has been devoted to creating the policy and regulatory frameworks required to enable affordable connectivity, often with specific provisions for agriculture in national ICT policies. Experiences have been diverse, both in scope and achievements. A broad range of examples has been and will continue to be submitted to the WSIS Stocktaking Database. Several recent examples were discussed by the e-Agriculture Community during the December 2013 online forum "*e-Agriculture: Looking back and moving forward*". These were included in the resulting policy brief and provided input to the analysis of emerging trends and challenges and the formulation of recommendations for e-agriculture after 2015, which are presented in this report. Additional analysis and consolidation of good practices will be carried out over 2014.

The wealth of reported experiences is proof of the increased availability and affordability of ICTs, which have been leveraged with varying levels of success. Although ICTs are not a silver bullet for improving agricultural productivity and raising farmers' incomes, they can make a remarkable difference in contexts where the delivered services closely match farmers' needs. They also create new opportunities for improving livelihoods, and help empower poor communities and marginalized people. All these aspects contribute to the rural development process.

The diverse experiences and the results achieved so far also prove that the pioneering phase of e-agriculture is drawing to an end and that the sector is gradually moving into a new phase, where experience capitalization and identification of common monitoring indicators will be top priorities. Strategies and technologies will be increasingly adapted to local contexts with sharper attention to the socio-economic dynamics ICTs can trigger in rural communities. This turning point in the evolution of e-agriculture also reinforces the need for a global community of practice to observe, report and monitor progress, while working together towards distilling lessons learned for more effective and sustainable ICT applications.

The following are the main recent developments and emerging trends:

Mobile telephony: The increase in mobile telephony penetration in the past ten years has led to an increase in mobile applications specifically designed for agricultural development. The number of mobile platforms developed and used in the market to bridge the digital divide with smallholder farmers has also increased tremendously, bringing a more diverse range of information sources for farmers (e.g. Internet, radio, TV, newspaper and extension agents) than some years ago. Mobile-based information delivery holds great promise and is either being considered or is in use as an important channel for agricultural advisory services, financial services and other essential information in rural communities, especially in enhancing access to markets, information on market prices and demand.

From mobile phones to smartphones: Years ago SMS dominated, and now there is SMS, interactive voice response (IVR), smartphone applications and integration with social media. Much of the drive in the development of mobile applications for agricultural development has been championed by young people. Applications alone may not cater to the needs of farmers, but they represent a huge step towards integrating agriculture and ICTs.

Mobile financial services: Four kinds of financial services that farmers need in order to achieve their economic goals have been identified and are becoming more widespread: credit; savings; transfer and payment facilities; and insurance. ICTs have created the potential to deliver more diverse financial products to greater numbers of rural clients than conventional financial service providers have been able to reach. ICTs contribute to economic efficiency and improved service delivery, as they lower business and transaction costs.

Use of ICTs in agriculture: ICT innovation plays a key role in improving agricultural production and the value chain. Food traceability systems using ICTs have become very important risk-management tools that allow food business operators or authorities to contain food safety problems and promote consumer confidence. ICT-enabled marketing and access to markets plays a major role, especially for information on market prices and demand. ICT-enhanced marketing and certification also strengthens the capacity of small-scale producers to increase revenue by improving their position on local and international markets. GIS and agrometeorological technologies have been introduced into programmes from the very beginning for various purposes including land-use planning, crop forecasting and early warning systems, among others. Space technology is also essential to monitor threats from the growing number of natural disasters. In addition, use of mobile phones has become more common for exchanging information such as for disease surveillance and pest tracking. There is also growing prevalence of ICT solutions for the later stages of the agricultural value chain (e.g. post-harvest, transport, storage).

e-Agriculture strategies in ICT policies: Even though in many countries there are no specific ICTs for agriculture strategies, e-agriculture strategy initiatives have been or are being put in place in a few countries such as Côte d'Ivoire, Ghana, Mali and Rwanda. Moreover, in most ICT policies developed with the support of organizations such as UNECA, IICD, ITU, and UNDP, there are provisions on sectoral strategies for agriculture. However, approaches differ in different regions and countries.

🔸 **Online learning:** Open online courses, and their combination with scientific and educational content which is more widely available (even on social media), enable an increased flow of new information and learning to smallholder farmers. Online learning also makes it possible to monitor the capacity of institutions and communities to use this information effectively.

🔸 **Growing use of big/open/real-time data collection and analysis**: This is leading to innovative applications for farm management and decision support, but also raising issues of intellectual asset management, particularly when data are collected at the farm level. Equally applicable to local adaptation of content is the approach based on content co-generation, which in turn raises issues of governance of data, information, skills and technology and the development of open standards and technologies.

5. Current and future challenges

While substantial progress has been made in making ICTs available and accessible for rural communities, challenges remain in respect to the following eight critical factors for success. (Recommendations for these areas are included in Chapter 6.):

1. **Content.** Adaptation of content to local needs, languages and contexts remains challenging. Appropriate information resources (i.e. content) and trusted intermediaries are necessary for the success of e-agriculture initiatives. Dissemination of information may be constrained if the nature of information does not match farmers' needs in terms of format and relevance. While ICTs can deliver large amounts of information, this does not imply effective use of it.

    Locally adapted content and existing relationships based on trust are not yet given sufficient attention and priority in development plans. Bringing ICTs and development planning closer together, with information innovations coming directly from the rural communities themselves, remains an often overlooked design consideration in meeting the demands of the poorest communities.

2. **Capacity development**. This is comprised of three dimensions: the enabling environment, the organizational capacity and individual's capacity. Capacities at the individual, organizational and institutional levels need to be strengthened. The focus on improving access to agricultural information without addressing the ability to effectively use the information has not yet yielded the desired reduction of the rural digital divide. Illiteracy, limited skills in using complex devices to search for information and cultural issues remain barriers to effectively receiving and using information delivered via ICTs. Models of capacity development need to be based on social characteristics, information needs and the function of technology in context. Scaling up pilot ICT projects to reach millions of smallholder farmers remains a challenge. Up-scaling and mainstreaming of projects is often not sufficiently supported by dialogues at organizational and national levels which could create a policy environment conducive to the effective use of ICTs in agriculture.

    The price of access to ICTs can be very high in some countries. Pricing of broadband or mobile services is an important barrier for most vulnerable groups, such as women, youth, older farmers and people living in most remote areas.

3. **Gender and diversity**. Access and opportunities are not distributed equitably among users, creating asymmetries that must be addressed with specific policies targeting the source of the inequalities. Access for women, youth, older farmers and people living in the most remote areas is hindered by the price of access to ICTs (e.g. broadband or mobile services) and by persistent inequalities. Gender inequalities remain a serious issue in the digital economy, as does the gap between urban and rural populations.

   The digital divide is not only concerned with technological infrastructure and connectivity; it is a multifaceted problem of ineffective knowledge exchange and management of information content; insufficient human resources and institutional capacity; and lack of sensitivity to gender and the diverse needs of different groups. For example, illiterate and older farmers often have less-developed digital skills, and so they are usually less likely to adopt ICTs. Many of the factors that constrain male farmers in adopting more sustainable and productive practices restrict women even more. Specific gender barriers further limit women farmers' capacity to innovate and become more productive.

   Youth's access and familiarity with technologies, as well as their role in the social dynamics of rural communities, are not yet sufficiently leveraged.

4. **Access and participation**. Access to ICTs is not yet equitable. As mentioned before, a gender-based digital divide persists, and is more frequent in rural than urban areas. The digital divide between men and women is increasing, despite the growing number of Internet users. Improved access to ICTs alone will not resolve the gender digital divide.

   As with the challenges reported in other key areas, proper design and implementation based on a bottom-up and participatory approach that involves the communities themselves can reduce the potential for information inequity that can be created when introducing new ICTs into a community.

5. **Partnerships**. Public-private partnerships are recognized as a critical factor in sustainable business models at the community level, but these do not always have to be with large corporate firms; small, local private companies, local producer organizations and community-based NGOs often have the social capital to provide trusted information and good quality services. Diverse advisory and extension services offered by different types of providers are more likely to meet the various needs of farmers, as there is no one type of advisory service that can fit all circumstances.

   With a broader variety of potential partners comes a new challenge: the formal recognition of information and service quality standards, and the partners' agreement to be held accountable for meeting them.

6. **Technologies**. Identifying the right mix of technologies that are suitable to local needs and contexts is often a challenge, in spite of – or because of – the rapid increase in mobile telephone penetration in rural areas. While this offers great potential for increasing access to information, challenges remain in the area of effective use of mobile telephony that are related to access and capacity as described above.

Technologies should be suited to local contexts and needs, and their selection should increasingly take into account the influence ICTs have on gender and social dynamics. The appropriation of ICTs by youth in support of farming activities is also creating shifts in the social dynamics between youth and older community members, or between rural and urban/peri-urban communities.

7. **Economic, social and environmental sustainability**. Scaling up pilot ICT projects to reach millions of smallholder farmers and identifying sustainable business models are still challenges. On the one hand, pricing is critical to sustainable agribusiness models at the community level. Investments are needed to cover the cost of creating content and collecting data. On the other hand, social sustainability can be hindered if clear roles and responsibilities have not been clarified among stakeholders. For example, the location of an ICT centre should be socially convenient for all users (including women and older people). Last but not least, technology waste is an issue and a polluting factor that should not be underestimated.

Measurements and data on the impact of mobile technologies on agriculture are scant and generally anecdotal. Solid information is needed regarding the impact of previous initiatives, including lessons learned, in order to inform the design and approach of future efforts. At the same time, these impacts are inherently difficult to measure because they may not be immediate, or may not be reported or recorded. Often, success of ICT interventions in agriculture is on a case-by-case basis. Sustainability of ICTs for agriculture initiatives may be at risk if development organizations, governments and the private sector do not succeed in defining indicators and data that validate investments in ICTs and the positive results these may have.

6.   Recommendations

Based on the current status of Action Line C7 and reflection on the findings and dialogue on www.e-agriculture.org, the following recommendations are suggested for the successful implementation of e-agriculture strategies:

1. **Content**

• Content should be created and adapted from reliable and trusted sources, including in local languages and taking into account local contexts, to ensure equitable and timely access to agricultural knowledge by resource-poor men and women farmers, foresters and fisher folk in rural areas.
• Useful information must be repackaged and mobilized in formats that meet the different information needs and preferences of different user groups and that can be stored, retrieved and exchanged with ease, taking into account issues of ownership and intellectual property.
• Information innovations coming directly from the rural communities themselves should be fostered and widely shared.

2. **Capacity development**

This is comprised of three dimensions: the enabling environment, the organizational capacity and individual's capacity.

- As part of national ICT strategies, the development and implementation of national e-agriculture strategies should seek to provide reliable and affordable connectivity and integrate ICTs in rural development to support food security and hunger eradication.
- Governments and the public sector should formulate clear policies that define the principles for their involvement in the development of e-agriculture strategies.
- Digital literacy in rural institutions and communities should be developed and enhanced, taking into consideration local needs and constraints by providing appropriate learning opportunities for men, women, youth and people with disabilities, which will enhance individual and collective decision-making skills.
- The use of ICTs should be promoted to reinforce the resilience capacity of states, communities and individuals to adapt to shocks and natural disasters, food chain emergencies, transboundary threats, socio-economic crises, violent conflicts and protracted crises.

3. Gender and diversity

- Gender, youth and diversity should be systematically addressed in the planning phase of project design and during the whole project cycle. Women's and youth's access to technology and equipment, as well as potential consequences for social dynamics within communities, should be assessed prior to project deployment in order to address ICT gaps and ensure sustainable adoption of solutions within communities.
- Gender-disaggregated data must be collected in projects and in national ICT-related statistics.
- Youth's access and familiarity with technologies, as well as their role in the social dynamics of rural communities, should be further leveraged in project design and capacity development.

4. Access and participation

- Digital inclusion policies with gender perspectives should be promoted to enable men and women to access and use ICTs equally.
- Collaboration and knowledge-sharing in agriculture should be fostered via communities of practice, including the e-Agriculture Community, in order to showcase and promote models, methodologies, good practices and the adoption of open access and interoperability standards to achieve effective and equitable use of ICTs for sustainable agriculture and rural development.

5. Partnerships

- PPPs with a wide range of non-state actors should be promoted for inclusive, efficient, affordable and sustainable ICT services and initiatives in agriculture and rural development, which will promote the wide-scale use of ICTs and foster sustainable agribusiness models.
- Partnership structures in which farmer or producer organizations and community-based NGOs are strengthened in their ability to adopt and integrate ICTs into their daily operations and service provision to their members (i.e. smallholder producers) should be encouraged.

6. Technologies

- Blended approaches, such as a combination of radio and telephone, and locally-relevant technologies selected on the basis of in-depth analysis of local needs

and existing information systems should be adopted to increase efficiency of e-agriculture initiatives and better serve different users and contexts.
• Mobile information services and voice-based services should be promoted as important tools in agricultural development and business.

7. Economic, social and environmental sustainability

• Access to mobile telephony, Internet and information in general should be possible and within the price range of the poor.
• During the pilot phase of ICT projects, a sustainable financial recovery mechanism should be identified in order to be able to continue activities later on.
• In order to ensure that use of ICTs is socially accepted, a participatory approach stressing inclusiveness of users should be employed.
• Open access policies and initiatives should be encouraged so as to make quality information available and accessible to a broader potential user base.
• Technology interventions should be designed to select appropriate and environmentally friendly technologies for collecting, storing, recycling, treating and finally disposing of e-waste.[70]

7. Conclusions

The exchanges within the e-Agriculture Community have provided valuable lessons about successful e-agriculture initiatives. Successful initiatives often complement existing infrastructure, are low-risk in terms of time and financial investment, are financially self-sustaining and are based on locally adapted content and context. They often also enable multidirectional discussions among peers and social groups who would otherwise be unable to connect. As a result, these initiatives lead to knowledge sharing as well as provide information to specific users.

However, there is much scope for improving the capacity of people and institutions. Equal access, resilience and empowerment need to be strengthened, as do partnerships and active participation of the beneficiaries. In addition, agriculture is becoming more knowledge-intensive as farmers require more information to make increasingly complex decisions on land use, crop selection, choice of markets and other areas that impact the livelihoods of their families and communities. Linking knowledge to innovation is crucial in addressing the information and knowledge gaps in the agricultural sector. Mobile phones are a true enabler – statistics show that there are almost 6.8 billion mobile connections for a world population of just over 7 billion – and these and other ICTs can play a crucial role in bridging information gaps.

While there are many valuable initiatives on the use of ICTs for agriculture, the sustainability of pilot initiatives is an issue. Too often after the pilot phase, projects cease because of many financial, human and other constraints. Scaling up should be integrated in the formulation and implementation of initiatives. Costs of ICTs need to be reduced, and the use of ICTs needs to be made financially sustainable, a goal in which PPPs will play an important role.

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[70]   see www.unep.org/gpwm/FocalAreas/E-WasteManagement/tabid/56458/ and www.unep.org/ietc/ Portals/136/Other%20documents/PolicyBriefs/13052013_E-Waste%20Policy%20brief.pdf

In summarizing developments for this report, FAO identified a number of positive trends, including mobile applications for agricultural information, mobile services and stronger integration of ICTs into agriculture and e-agriculture strategies; however, challenges may limit gains. The digital divide in agriculture is not only concerned with technological infrastructure and connectivity, but is also characterized by ineffective knowledge exchange and management of information content; limited human and institutional capacity; and inadequate sensitivity to gender and diverse needs of different groups. As a result, development actors need to better address the availability of appropriate and adapted content; the affordability of access; the development of farmers' capacity to use ICTs and available information; and the inclusion in ICT initiatives of women, youth, older farmers and those lacking literacy and educational skills.

E-Agriculture provides the basis for the global community to monitor development and validation of models and methodologies, and to package and disseminate them once tested. The e-Agriculture Community must continue to play a role in collecting and disseminating good practices on the use of ICTs in agriculture and rural development and in examining emerging trends, the evolving role of ICTs and the challenges faced in reaching scaled, sustainable information service models.

8. Annexes

8.1   List of the founding partners in 2006

CGIAR	Consultative Group on International Agricultural Research	www.cgiar.org/
CTA	Technical Centre for Agricultural and Rural Cooperation	www.cta.int/
FAO	Food and Agriculture Organization of the United Nations	www.fao.org
GAID	Global Alliance for ICT and Development	www.un-gaid.org
GFAR	Global Forum on Agricultural Research	www.egfar.org/
GKP	Global Knowledge Partnership	
giz	German Federal Enterprise for International Cooperation (Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH)	www.giz.de/
IAALD	International Association of Agricultural Information Specialists	www.iaald.org/
IICA	Inter-American Institute for Cooperation on Agriculture	www.iica.int/
IFAD	International Fund for Agricultural Development	www.ifad.org/

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	International Institute for Communication and Development	www.iicd.org/
	National Agricultural Library of the United States Department of Agriculture	www.nal.usda.gov/
	United Nations Department of Economic and Social Affairs	www.un.org/en/ development/desa/
	The World Bank	www.worldbank.org/

8.2   List of e-Agriculture fora and related policy briefs

Title	**Responding to demand - The focus of e-agriculture**
Date	21 to 28 September 2007
Partner(s)	No
Language	English
Number of topics	8
Number of posts	57
Policy brief	Yes (EN, FR, SP)
Link to the forum	www.e-agriculture.org/forums/forum-archive/forum-responding-demand-focus-e-agriculture-july-2007
Link to the policy brief	www.e-agriculture.org/content/policy-brief-emerging-issues-e-agriculture

Title	**Opening access to CGIAR research and knowledge: From data, information and collaboration to food**
Date	October 2007
Partner(s)	ICT-KM Programme of CGIAR
Language	English
Number of topics	28
Number of posts	106
Policy brief	No
Link to the forum	www.e-agriculture.org/forums/forum-archive/forum-%E2%80%9Copening-access-cgiar-research-and-knowledge-data-information-and

Title	**Using ICT in fisheries and aquaculture programmes**
Date	November 2007
Partner(s)	WorldFish Center; Fisheries and Aquaculture Department of FAO
Language	English
Number of topics	32
Number of posts	60
Policy brief	No
Link to the forum	www.e-agriculture.org/forums/forum-archive/forum-using-ict-fisheries-and-aquaculture-programmes-november-2007

Title	**The role of public-private partnerships (PPPs) in Asia**
Date	March 2008
Partner(s)	Katalyst (a project by Swisscontact, the Swiss Foundation for Technical Cooperation and co-implemented by GTZ-International Services)
Language	English
Number of topics	83
Number of posts	264
Policy brief	Yes (En, Fr, Sp)
Link to the forum	www.e-agriculture.org/forums/forum-archive/forum-%E2%80%9C-role-public-private-partnership-ppps-asia%E2%80%9D-march-2008
Link to the policy brief	www.e-agriculture.org/content/draft-lisa-ppp-en

Title	**Mobile telephony in rural areas**
Date	17 to 28 November 2008
Partner(s)	No
Language	English
Number of topics	137
Number of posts	550
Policy brief	Yes (En, Fr, Sp)
Link to the forum	www.e-agriculture.org/forums/forum-archive/forum-mobile-telephony-rural-areas-november-2008
Link to the policy brief	www.e-agriculture.org/content/policy-brief-mobile-telephony-rural-areas

Title	**Telefonía móvil en áreas rurales**
Date	April 2009
Partner(s)	IICA
Language	Spanish
Number of topics	77
Number of posts	268
Policy brief	Yes (En, Fr, Sp)
Link to the forum	www.e-agriculture.org/forums/forum-archive/foro-telefon%C3%ADa-m%C3%B3vil-en-%C3%A1reas-rurales-abril-2009
Link to the policy brief	www.e-agriculture.org/content/mobile-lac-draft

Title	**The role of ICTs in agricultural value chains**
Date	December 2009
Partner(s)	No
Language	English
Number of topics	37
Number of posts	260
Policy brief	No
Link to the forum	www.e-agriculture.org/forums/forum-archive/forum-role-information-and-communication-technologies-ict-agricultural-value

Title	**Tecnologías de información y comunicación (TIC) y las cadenas de valor agroalimentarias**
Date	August 2010
Partner(s)	IICA
Language	Spanish
Number of topics	15
Number of posts	189
Policy brief	Yes (En, Fr, Sp)
Link to the forum	www.e-agriculture.org/forums/forum-archive/foro-tecnolog%C3%ADas-de-informaci%C3%B3n-y-comunicaci%C3%B3n-tic-y-las-cadenas-de-valor
Link to the policy brief	www.e-agriculture.org/content/policy-brief-role-information-and-communication-technologies-icts-improvement-agricultural-v

Title	**Gender, information and communication technologies and rural livelihoods**
Date	July 2010
Partner(s)	GenARDIS
Language	English
Number of topics	33
Number of posts	157
Policy brief	Yes (En, Fr, Sp)
Link to the forum	www.e-agriculture.org/forums/forum-archive/forum-gender-information-and-communication-technologies-and-rural-livelihoods
Link to the policy brief	www.e-agriculture.org/content/policy-brief-gender-information-and-communication-technologies-icts-and-rural-livelihoods-0

Title	**Learning repositories in agriculture, food & environment**
Date	October 2010
Partner(s)	AgLR-Task Force
Language	English
Number of topics	13
Number of posts	79
Policy brief	No
Link to the forum	www.e-agriculture.org/forums/forum-archive/forum-learning-repositories-agriculture-food-environment-october-2010

Title	**ICT for rural economic development**
Date	November 2010
Partner(s)	GTZ (on behalf of the Federal Ministry for Economic Cooperation and Development (BMZ) and partners)
Language	English
Number of topics	4
Number of posts	96
Policy brief	No
Link to the forum	www.e-agriculture.org/forums/forum-archive/forum-ict-rural-economic-development-november-2010

Title	**Building the CIARD framework for data and information sharing**
Date	April 2011
Partner(s)	CIARD
Language	English
Number of topics	5
Number of posts	220
Policy brief	No
Link to the forum	www.e-agriculture.org/forums/forum-archive/forum-building-ciard-framework-data-and-information-sharing-april-2011

Title	**Genre, TIC et moyens de subsistance en milieu rural**
Date	May 2011
Partner(s)	CTA
Language	French
Number of topics	8
Number of posts	175
Policy brief	No
Link to the forum	www.e-agriculture.org/forums/forum-archive/forum-%C2%AB-genre-tic-et-moyens-de-subsistance-en-milieu-rural-%C2%BB-mai-2011

Title	**Challenges and opportunities for capturing impact in ICT initiatives in agriculture**
Date	September 2011
Partner(s)	Katalyst
Language	English
Number of topics	8
Number of posts	92
Policy brief	Yes (En, Fr, Sp)
Link to the forum	www.e-agriculture.org/forums/forum-archive/forum-challenges-and-opportunities-capturing-impact-ict-initiatives-agriculture
Link to the policy brief	www.e-agriculture.org/content/policy-brief-challenges-and-opportunities-capturing-impact-ict-initiatives-agriculture-katal

Title	**Mobile information services**
Date	November 2011
Partner(s)	GSM Association (GSMA) Fund (mFarmer initiative)
Language	English
Number of topics	8
Number of posts	133
Policy brief	No
Link to the forum	www.e-agriculture.org/forums/forum-archive/forum-mobile-information-services-november-2011

Title	**Strengthening agricultural marketing with ICT [ICT in Agriculture e-Sourcebook series, No. 1]**
Date	December 2011
Partner(s)	The World Bank
Language	English
Number of topics	16
Number of posts	94
Policy brief	Yes (En)
Link to the forum	www.e-agriculture.org/forums/forum-archive/forum-strengthening-agricultural-marketing-ict-december-2011
Link to the policy brief	www.e-agriculture.org/content/new-policy-brief-strengthening-agriculture-marketing-ict

Title	**ICT and agriculture in the context of "green growth" [ICT in Agriculture e-Sourcebook series, No. 2]**
Date	March 2012
Partner(s)	The World Bank
Language	English
Number of topics	6
Number of posts	30
Policy brief	Yes (En)
Link to the forum	www.e-agriculture.org/forums/forum-archive/forum-ict-and-agriculture-context-green-growth-march-2012
Link to the policy brief	www.e-agriculture.org/content/policy-brief-ict-and-agriculture-context-green-growth-ict-agriculture-sourcebook-forum-1

Title	ICT for data collection, monitoring and evaluation [ICT in Agriculture e-Sourcebook series, No. 3]
Date	June 2012
Partner(s)	The World Bank
Language	English
Number of topics	6
Number of posts	82
Policy brief	Yes (En, Fr, Sp)
Link to the forum	www.e-agriculture.org/forums/forum-archive/forum-ict-data-collection-monitoring-and-evaluation-june-2012
Link to the policy brief	www.e-agriculture.org/content/policy-brief-ict-data-collection-and-monitoring-and-evaluation-ict-agriculture-sourcebook-fo

Title	**Using ICT to enable agricultural innovation systems for smallholders [ICT in Agriculture e-Sourcebook series, No. 4]**
Date	September 2012
Partner(s)	The World Bank
Language	English
Number of topics	5
Number of posts	207
Policy brief	Yes (En)
Link to the forum	www.e-agriculture.org/forums/forum-archive/forum-using-ict-enable-agricultural-innovation-systems-smallholders-september
Link to the policy brief	www.e-agriculture.org/content/policy-brief-using-ict-enable-agricultural-innovation-systems-smallholders-ict-agriculture-s

Title	**ICT and producer organizations [ICT in Agriculture e-Sourcebook series, No. 5]**
Date	November 2012
Partner(s)	The World Bank
Language	English
Number of topics	5
Number of posts	475
Policy brief	No
Link to the forum	www.e-agriculture.org/forums/forum-archive/forum-ict-and-producer-organizations-november-2012

Title	**Strengthening e-Agriculture strategies in ACP countries**
Date	March 2013
Partner(s)	CTA in collaboration with FAO, the World Bank, the East African Farmers' Federation, the Ministry of Agriculture and Animal Resources (Rwanda), the Ministry of Communication (Ghana), IICD, the NEPAD Agency and UNECA/ISTD (ICTs, Science & Technology Division)
Language	English
Number of topics	9
Number of posts	204
Policy brief	No
Link to the forum	www.e-agriculture.org/forums/forum-archive/forum-2013-cta-ict-observatory-%E2%80%9Cstrengthening-e-agriculture-strategies-acp

Title	**ICT enabling rural financial services and micro-insurance for smallholders [ICT in Agriculture e-Sourcebook series, No. 6]**
Date	May 2013
Partner(s)	The World Bank
Language	English
Number of topics	6
Number of posts	69
Policy brief	Yes (En)
Link to the forum	www.e-agriculture.org/forums/forum-archive/forum-ict-enabling-rural-financial-services-and-micro-insurance-smallholders
Link to the policy brief	www.e-agriculture.org/content/policy-brief-ict-enabling-rural-financial-services-and-micro-insurance-smallholders

Title	**E-Agriculture: looking back and moving forward [in preparation of WSIS+10]**
Date	December 2013
Partner(s)	Grameen Foundation
Language	English
Number of topics	4
Number of posts	126
Policy brief	Yes (En)
Link to the forum	www.e-agriculture.org/forums/forum-archive/e-agriculture-looking-back-and-moving-forward
Link to the policy brief	www.e-agriculture.org/content/policy-brief-e-agriculture-and-wsis10-looking-back-and-moving-forward

Title	**Towards concerted action on communication, community media and ICTs for family farming**
Date	September 2014
Partner(s)	FAO, AMARC (Association mondiale des radiodiffuseurs communautaires)
Language	English
Number of topics	5
Number of posts	165
Policy brief	In progress at time of publication
Link to the forum	www.e-agriculture.org/forums/communication-development-community-media-and-icts-family-farming-and-rural-development
Link to the policy brief	www.e-agriculture.org/content/policy-brief-communication-development-community-media-and-icts-family-farming-and-rural

8.3   List of e-Agriculture forum partners

Name	Acronym	Official Web site
United Nations Economic Commission for Africa (UNECA/ISTD)	UNECA	www.uneca.org
AgLR-Task Force	AgLR-TF	aglr.aua.gr
Technical Centre for Agricultural and Rural Cooperation	CTA	www.cta.int
CIARD	CIARD	www.ciard.net
German Federal Enterprise for International Cooperation (Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH)	GIZ	www.giz.de
East African Farmers' Federation	EAFF	www.eaffu.org
Food and Agriculture Organization of the United Nations	FAO	www.fao.org
Gender, Agriculture and Rural Development in the Information Society	GenARDIS	genardis.apcwomen.org
Grameen Foundation		www.grameenfoundation.org
GSM Association Fund (mFarmer initiative)		www.gsma.com/ mobilefordevelopment/ programmes/magri/mfarmer-initiative
ICT-KM Programme of the Consultative Group on International Agricultural Research	CGIAR	www.ictkm.cgiar.org
International Institute for Communication and Development	IICD	www.iicd.org
Ministry of Agriculture and Animal Resources (Rwanda)		www.minagri.gov.rw
Project by Swisscontact, the Swiss Foundation for Technical Cooperation and co-implemented by GTZ-International Services	Katalyst	www.katalyst.com.bd
The Ministry of Communication (Ghana)		www.moc.gov.gh
The World Bank		www.worldbank.org
WorldFish Center		www.worldfishcenter.org
Fisheries and Aquaculture Department of the Food and Agriculture Organization of the United Nations	FAO	www.fao.org/fishery

8.4 List of other contributing organizations from 2006 to 2013

Name	Acronym	Official Web site
African Rural and Agricultural Credit Association	AFRACA	www.afraca.org
AgriNet Uganda Ltd		www.agrinetug.net
Asia-Pacific Rural and Agricultural Credit Association	APRACA	www.apraca.org
Association for Progressive Communications	APC	www.apc.org
AZMJ - Global Consulting Services	AZMJ	www.azmj.org
Bangladesh Institute of ICT in Development	BIID	www.biid.org.bd
CABI	CABI	www.cabi.org
Catholic Relief Services		www.crs.org
Consultative Group to Assist the Poor	CGAP	www.cgap.org
Donor Committee for Enterprise Development	DCED	www.enterprise-development.org
East African Farmers' Federation	EAFF	www.eaffu.org
Esoko		www.esoko.com
Federal Ministry for Economic Cooperation and Development, Germany	BMZ	www.bmz.de
Frontline SMS		www.frontlinesms.com
Gender, Agriculture and Rural Development in the Information Society	GenARDIS	http://genardis.apcwomen.org/en
Global Forum for Rural Advisory Service	GFRAS	www.g-fras.org
Global Forum on Agricultural Research	GFAR	www.egfar.org
Grameen Foundation		www.grameenfoundation.org
GSMA mAgri team Fund – GSM Association	GSMA	www.gsma.com
International Business Machines Corporation	IBM	www.ibm.com
Katalyst Bangladesh		www.katalyst.com.bd
KIVA Agro Supplies Ltd.		www.kivasl.com
Mercy Corps		www.mercycorps.org
Microensure		www.microensure.com
Microsoft		www.microsoft.com
Ministry of Agriculture and Animal Resources, Rwanda	MINAGRI	www.minagri.gov.rw
Ministry of Communications, Ghana		www.moc.gov.gh
National Electronics and Computer Technology Center	NECTEC	www.nectec.or.th
Nokia		www.nokia.com
One World South Asia		southasia.oneworld.net
SBC4D – SB Consulting	SBC4D	www.sbc4d.com
Secretariat of the Pacific Community	SPC	www.spc.int
Swedish University of Agricultural Sciences	SLU	www.slu.se

Name	Acronym	Official Web site
Swisscontact		www.swisscontact.org
Syngenta Foundation for Sustainable Agriculture		www.syngentafoundation.org
United Nations Conference on Trade and Development	UNCTAD	www.unctad.org
University of the Philippines Open University	UPOU	www2.upou.edu.ph
USAID Fostering Agriculture Competitiveness Employing Information Communication Technologies	FACET	www.kdid.org/projects/field-support/facet
VACID Africa		www.vacidafrica.or.ke
Zerion Software		https://www.iformbuilder.com/

8.5 ICT in Agriculture Sourcebook – partnership with World Bank

The *ICT in Agriculture Sourcebook* addresses mainstreaming ICTs into 14 subsectors of agriculture, including rural finance, markets, value chains, extension and more. The Sourcebook is freely available on www.ictinagriculture.org.

To disseminate this work and to get inputs from others in the field, the World Bank, in partnership with FAO and the e-agriculture Community, organized six high-level/ participative online fora on some of the modules in the Sourcebook. After each forum, a report was prepared that summarized the key issues, good practices and case studies identified during the discussion. The fora addressed the following topics:

1. Strengthening agricultural marketing with ICTs;
2. ICTs and agriculture in the context of "green growth";
3. ICTs for data collection, monitoring and evaluation;
4. Using ICTs to enable agricultural innovation systems for smallholders;
5. ICTs and producer organizations; and
6. ICTs enabling rural financial services and microinsurance for smallholders.

The table of contents from the *ICT in Agriculture Sourcebook* is shown below to provide an overview of the Sourcebook's scope:

SECTION 1: OVERVIEW OF ICT IN AGRICULTURE (Contains modules 1-4)

Module 1:	Introduction: ICT in Agricultural Development
Module 2:	Making ICT Infrastructure, Appliances and Services More Accessible and Affordable in Rural Areas
Module 3:	Anywhere, Anytime - Mobile Devices and Their Impact on Agriculture and Rural Development
Module 4:	Extending the Benefits: Gender Equitable ICT-enabled Agricultural Development

SECTION 2: ENHANCING PRODUCTIVITY ON THE FARM (Contains modules 5-8)

Module 5:	Increasing Crop, Livestock and Fishery Productivity through ICT
Module 6:	ICTs As Enablers of Agricultural Innovation Systems
Module 7:	Broadening Smallholders' Access to Financial Services Through ICTs
Module 8:	Farmer Organizations Work Better with ICT

SECTION 3: ACCESSING MARKETS AND VALUE CHAINS (Contains modules 9-12)

Module 9:	Strengthening Agricultural Marketing with ICT
Module 10:	ICT Applications for Smallholder Inclusion in Agribusiness Supply Chains
Module 11:	ICT Applications for Agricultural Risk Management
Module 12:	Global Markets, Global Challenges: Improving Food Safety and Traceability while Empowering Smallholders through ICT

SECTION 4: IMPROVING PUBLIC SERVICE PROVISION (Contains modules 13-15)

|	
Module 13:	Strengthening Rural Governance, Institutions and Citizen Participation through ICT
Module 14:	ICT for Land Administration and Management
Module 15:	Using ICT to Improve Forest Governance

8.6   List of publications
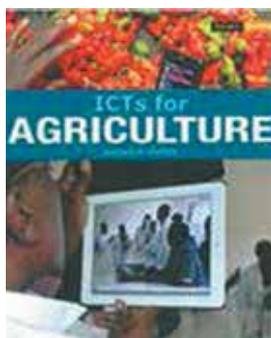
CTA. 2014. *ICTs for Agriculture: Making it happen.* Wageningen

(also available at publications.cta.int/en/publications/publication/1817/information-communication/)
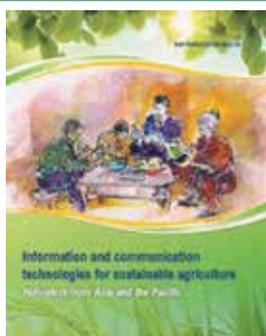
IICD. 2014. *ICT Solutions for Inclusive Agricultural Value Chains*. The Hague

(also available at www.iicd.org/about/publications/ict-solutions-for-inclusive-agricultural-value-chains/)
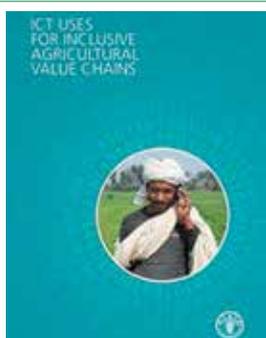
**FAO.** 2013. *ICT uses for inclusive agricultural value chains*. Rome

(also available at www.fao.org/docrep/017/aq078e/aq078e.pdf)

FAO. 2013. *Information and communication technologies for sustainable agriculture: Indicators from Asia and the Pacific*. Bangkok

(also available at www.fao.org/3/a-i3557e.pdf)

IICD. 2013. *Youth, ICTs and Agriculture*. The Hague

(also available at www.iicd.org/about/publications/ict4d-effects-youth-icts-and-agriculture/)
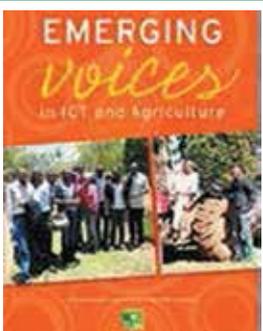
ARDYIS. 2012. *Emerging voices in ICT and agriculture: Shaping the future of ACP rural development using ICTs*. Wageningen: CTA

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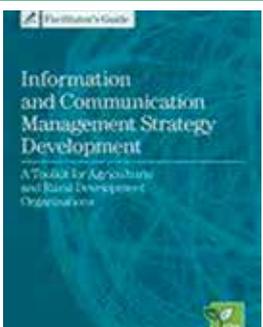
Walton, P., Kebede, G. 2012. *Information and communication management strategy development: A toolkit for agricultural and rural development organisations: Facilitator's guide*. Wageningen: CTA

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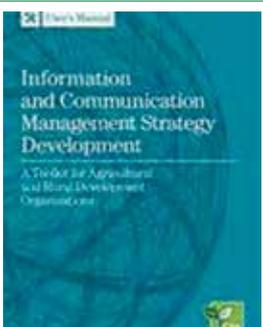
Gumbs, B. 2012. *Information and communication management strategy development: User's manual*. Wageningen: CTA

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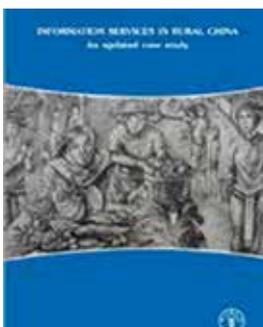
FAO. 2012. *Information Services in rural China: an updated case study*. Bangkok

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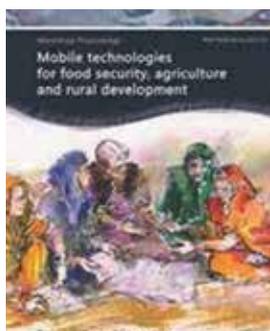
	FAO. 2012. *Mobile technologies for food security, agriculture and rural development*. Bangkok (also available at www.fao.org/3/a-i3074e.pdf)
	IICD. 2012. *ICT for rural economic development: five years of learning*. The Hague (also available at www.iicd.org/about/publications/ict-for-rural-economic-development-five-years-of-learning/)
	World Bank. 2012. *Agricultural innovation systems: an investment sourcebook*. Washington DC (also available at siteresources.worldbank.org/INTARD/Resources/335807-1330620492317/9780821386842.pdf) with contributions of FAO
	World Bank. 2012. *Information and Communications for Development 2012: Maximizing Mobile.* Washington, DC (also available at siteresources.worldbank.org/EXTINFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/Resources/IC4D-2012-Report.pdf)
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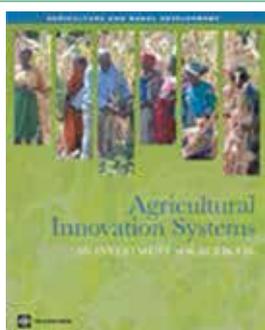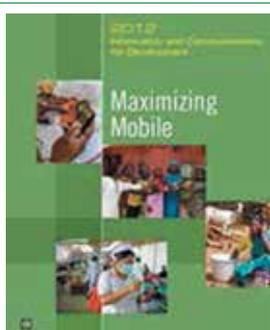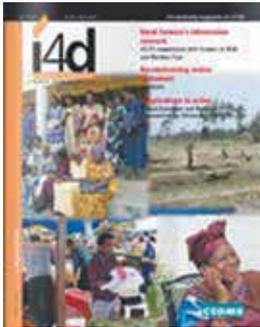
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(available at issuu.com/i4d_magazine/docs/i4d_jan-mar2010_eagriculture)

IMARK. 2010. *Digital libraries, repositories and documents*. Information Management Resource Kit

(available at http://www.imarkgroup.org/#/imark/en/course/H)

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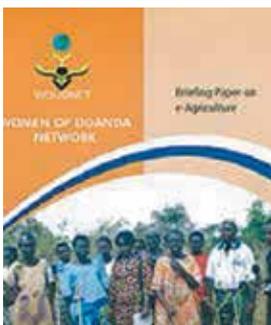
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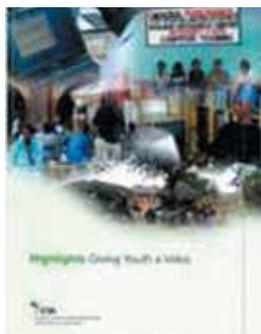
Minderhoud-Jones, M. 2006. *Giving youth a voice (highlights)*. Wageningen: CTA
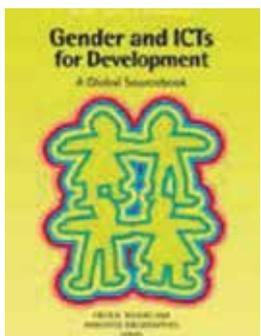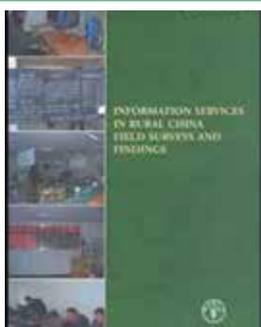
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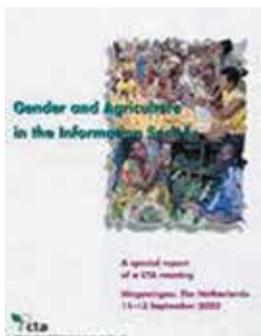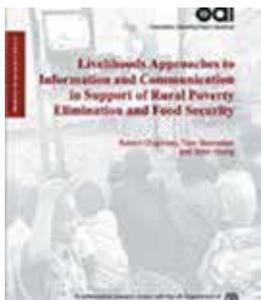
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ODI, DFID, FAO. 2003. *Livelihoods approaches to Information and Communication in Support of Rural Poverty Elimination and Food Security*. Rome

(available at www.odi.org.uk/sites/odi.org.uk/files/odi-assets/publications-opinion-files/208.pdf)

8.7   E-agriculture theme sessions at WSIS Forums 2010-2014

Title	**ICT and rural enterprises**
WSIS Forum	2010
Panellists	H.E. Iruthisham Adam, Permanent Representative, Permanent Mission of the Republic of Maldives to the United Nations Office at Geneva; Caroline Figuères, Managing Director, IICD; Roxanna Samii, Manager Web, Knowledge and Internal Communications, International Fund for Agriculture Development (IFAD); Md Shahid Uddin Akbar, CEO, Bangladesh Institute of ICT in Development; Peter A. Bruck, Chairman, World Summit Award; Carlos Afonso, Director, Brazil's Information Network for the Third Sector (RITS) and founder of the Association for Progressive Communications. Moderator: Allison Hornery, Cofounder, CivicTEC

Title	**The promise of mobile technology - What is the socio-economic impact on rural communities?**
WSIS Forum	2011
Panellists	Mireia Fernández-Ardèvol, Co-director, Research Program "Mobile Communication, Economy & Society", IN3 - Internet Interdisciplinary Institute, Open University of Catalonia; Harsha Liyanage, Managing Director, Sarvodaya-Fusion; Oumy Ndiaye, Head of Department at the Technical Centre for Agricultural and Rural Cooperation (Centre Technique de Cooperation Agricole et Rurale ACP-UE – CTA); Roxanna Samii, Web, Knowledge and Internal Communications Manager, IFAD; and Tim Unwin, Professor of Geography and UNESCO Chair in ICT4D, Royal Holloway University of London.

Title	**Strengthening the agricultural value chain with ICT**
WSIS Forum	2012
Panellists	Mr Chris Addison, Senior Program Coordinator Knowledge Management, CTA; Mr Leulseged Tadese Abebe, Counsellor, Permanent Mission of Ethiopia; Mr Tim Kelly, Lead ICT Policy Specialist, World Bank; Mr Md. Asad-Ur-Rahman Nile, Senior Business Consultant, Katalyst, Bangladesh.

Title	**E-Agriculture strategy**
WSIS Forum	2013
Panellists	Mr Edward Addo-Dankwa, Value Chain Development Expert, Policy, Planning Monitoring and Evaluation Directorate of the Ministry of Food and Agriculture, Ghana; Mr Ken Lohento, ICT4ARD Programme Coordinator, Technical Center for Agriculture and Rural Cooperation (CTA), Benin; Harsha Liyanage, Managing Director of Sarvodaya-Fusion, Principal Consultant of eNovation4D, Sri Lanka; Mr Shahid Uddin Akbar, CEO, Bangladesh Institute of ICT in Development (BIID), Bangladesh.

Title	**Moving forward, building on ten years of lessons learned in e-Agriculture**
WSIS Forum	2014
Panellists	Sophie Treinen, Coordinatrice du programme Gestion des connaissances et genre, FAO; Chris Addison and Ben Addom, CTA; Konrad Plechowski, IICD; Tina George and Samia Melhem, World Bank; Hon. Nonofo E. Molefhi, Minister of Transport and Communications, Government of Botswana; Donnie De Freitas, Office of the Regulator, Samoa

8.8 List of ICTUpdate issues on e-agriculture – Partnership with CTA

CTA. 2013. *Small islands and e-resilience*. ICT Update 71 English

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CTA. 2013. *Opening access and open data*. ICT Update 72 English

(available at http://publications.cta.int/en/publications/publication/ICT072E/)

CTA. 2013. *E-agriculture strategies*. ICT Update 73 English

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CTA. 2013. *ICT4Ag: Setting the scene*. ICT Update 74 English

(available at http://publications.cta.int/en/publications/publication/ICT074E/)

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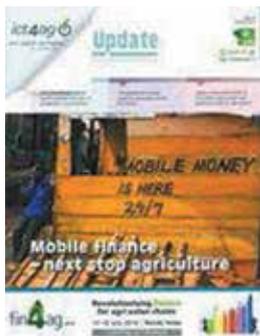
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8.9   ICT4Ag Conference – partnership with CTA

The e-Agriculture Community has a longstanding partnership with CTA, one of the founding partners of e-Agriculture. In November 2013, CTA and the Government of Rwanda organized the ICT4AG Conference in Kigali in partnership with FAO, among others.

Over 400 practitioners, donors and policy-makers were brought together during this Conference which placed particular emphasis on value chains, advocacy and policy development and was a key milestone in promoting the application of ICTs in the agricultural sector.

In 2012, CTA informed FAO that it would be organizing this event, and FAO accepted the opportunity to be a partner organization along with the e-Agriculture Community. Through 2013, FAO contributed to various planning committees and submitted a number of proposals to provide presenters and resource persons. The e-Agriculture Community solicited resource people and presentation submissions and promoted the event.

Sophie Treinen and Michael Riggs, e-Agriculture's focal points in 2013, coordinated, presented, chaired or facilitated the following sessions, based on their experience with the e-Agriculture Community:

1.   Meeting the content need of mobile-based agriculture services;
2.   Gender and ICTs in agriculture;
3.   Implementation of ICTs for development strategies in agriculture;
4.   ICTs for climate-smart agriculture and resilience to crises/threats;
5.   Experiences in implementing ICT solutions in farmer organizations; and
6.   Institutional experiences.

CTA dedicated three editions of ICT Update, now renamed ICT4Ag, to the Conference. The newsletters can be found through the following link: ictupdate.cta.int/en/

The main findings of the Conference are being compiled and can be summarized as follows:

Recommendation 1: Develop partnerships to ensure positive impact of ICT4Ag initiatives

•   Experiences suggest that the most successful e-agriculture programmes involve the public and private sectors, as well as local communities.
•   Without partnership/collaborations among the various actors, it is difficult to achieve any impact.
•   Provide platforms to encourage the convergence of ICT channels for agriculture.

Recommendation 2: Support ICTs for extension and advisory services

- ICTs are tools, and the tools should be developed with the intention of supporting extension and advisory services.
- Diversify tools and channels to meet beneficiaries' needs.
- Explore integration of the various ICT channels (e.g. radio, video, mobile, Web) for efficiency and effectiveness.

Recommendation 3: Support open and big data management for smallholders

- Make the smallholder benefit from "big data"; efforts must be made to make data available in a format that farmers can utilize.
- Emphasize the importance of data visualization.
- Create a public information platform to reduce data duplication.

Recommendation 4: Ensure the availability of reliable and quality ICT4Ag content

- Minimize the information overload on smallholders by filtering and making available trusted content for their use.
- Develop farmers' trust in ICT value-added service providers through delivery of reliable content.
- Promote accurate and reliable agricultural content on ICT platforms.

Recommendation 5: Ensure grassroots' access to ICT solutions

- Ensure access (in terms of cost/affordability, availability and usability) to ICTs in rural areas.
- Take local context into account when designing applications.
- Recognize the multidimensional needs of farmers and their families.

Recommendation 6: Strengthen youth's and women's involvement in ICT4Ag initiatives

- Strengthen the ICT capacity of youth (including young women) to be able to support other members of the smallholder farmers' families.
- Boost women's role in extension and advisory services through the use of ICTs.
- Support youth's ICT innovations that enhance agricultural and rural development.

Recommendation 7: Support ICT4Ag entrepreneurship and promising business models

- Ensure scale and sustainability of ICT4Ag initiatives by building into them exit strategies from the onset through sound business models.
- Scale not only ICTs but also processes.
- Support the adoption of innovative business models for ICT4Ag applications.

Recommendation 8: Support sound strategies and high-level political buy-ins for ICT4Ag

- Develop sound ICT4Ag strategies to inform the deployment of the applications.
- Secure high-level political buy-ins from ICT4Ag champions.
- Take advantage of the successes from other countries and build upon them.

Recommendation 9: Promote adequate infrastructure and energy for ICTs in rural areas

- Support network access (phone & Internet) and dependable energy/power sources in rural areas where agricultural production is dominant.
- Explore innovative models of funding and alternative low-cost gadgets/devices.
- Provide access to energy, devices and infrastructure.

8.10 Contacts of the e-Agriculture Community of Practice

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