10-Year WSIS Action Line Facilitator's Reports on the Implementation of WSIS Outcomes
WSIS Action Line – C7: E-agriculture
Lead Facilitator: FAO

Executive Summary

1. Introduction

E-agriculture is an area of application of Information and Communication Technologies (ICTs) under Action Line C7. ICT applications: benefits in all aspects of life, in the Geneva Plan of Action of WSIS;

a) Ensure the systematic dissemination of information using ICTs on agriculture, animal husbandry, 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 should seek to maximize the use of ICTs as an instrument to improve production (quantity and quality).

The Food and Agriculture Organization of the United Nations (FAO) was assigned the responsibility of organizing activities related to the e-agriculture Action Line. FAO conducted an extensive survey on this subject and launched the e-Agriculture Community of Practice in 2007 together with the founding partners. The e-Agriculture Community is a global initiative to enhance sustainable agricultural development and food security by enhancing the use of ICT in the sector. The Community plays an active role in WSIS follow-up and WSIS stocktaking.

2. Review

2.1. Action line objectives

The e-Agriculture Community of Practice, facilitated by FAO, acts as a catalyst for networking and knowledge sharing on the role of ICT 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 ICT 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.

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; empowering networks for exchange of new mechanisms and processes among key stakeholders; relevant content in digital format being developed, filtered, mobilized and exchanged; and other activities based on partnerships and collaborative lesson-learning.

2.2. Most important achievements

Activities relating to the e-agriculture component of Action Line C7 are underpinned by the global e-Agriculture Community with over 12 000 registered members from over 170 countries in 2014. Since its launch in 2007, 23 online forums on topics identified by the Community have produced some   4 000 discussion posts, resulting in trilingual policy briefs for each forum. Online activities, which reach tens of thousands of individuals, are complemented with face-to-face events. Partnerships and collaborations are in place with private sector and development organizations.

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. Critical issues continue to be addressed through discussion forums, policy briefs and case studies.

There has been significant progress in improving communication and decision-making in rural areas through the use of new technologies. The use of ICTs such as mobile phones and Internet has increased significantly since the creation of the e-Agriculture Community. It is estimated that there are almost 6.8 billion mobile connections for a world population of a little over 7 billion. It has been mentioned the latest 1 billion connections have been predominantly activated by the largest but poorest socio-economic group - people living on less than 2 USD a day. People involved in agriculture and allied fields form a majority of these rural poor. The opportunity that the increased availability of mobile connections provides in delivering information services to the people involved in agriculture is phenomenal. Access to the right information at the right time helps make informed decisions.

3. Recent developments and emerging trends

An important area for follow up is the recent developments and emerging trends in the sector of ICTs for agriculture and rural development. The main recent developments and emerging trends are the following:

- **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 a few 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:** Five years ago, Short Message Service (SMS) dominated, now there are SMS, IVR (Interactive Voice Response), smartphone apps, and integration with social media. The development of mobile applications (apps) for agricultural development has been driven partially by young people. Apps alone may not cater for the needs of farmers, but they are 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; money transfers and payment facilities; and insurance. ICTs have created the potential to deliver diverse financial products to a greater numbers of rural clients than conventional financial service providers have been able to reach so far. 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 strengthens the capacity of small-scale producers to increase revenue by improving their position on local and international markets. GIS and agro-meteorological technologies have been introduced into programmes for various purposes including land-use planning, crop forecasting and early warning systems. 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.

4. Current and future challenges

While substantial progress has been made in making ICTs available and accessible for rural communities, challenges remain in respect to seven critical factors of success:

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.

4.
   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.

5. **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.

6. **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.

7. **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.

8. **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.

5. Recommendations

Based on the current status of Action line C7 and the reflecting on the findings and dialogue of the platform 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 so that it 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. Women's and youth's access to technology and equipment, as well as potential consequences on social dynamics within communities should be assessed prior to project deployment so as 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, for effective and equitable use of ICTs for sustainable agriculture and rural development.

5. Partnerships
- Public-private partnerships 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 ICT and foster sustainable agri-business models.
- Partnership structures in which farmer or producer organizations, 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.

6. Conclusions

The exchanges within the e-Agriculture community of practice provided valuable lessons in regard to successful initiatives. These initiatives often complement existing infrastructure, are low-risk in terms of time and monetary investment, are financially self-sustaining, and enable multi-way communication between stakeholders. Locally adapted content and context are essential. Successful projects often also enable multi-way discussion among peers and social groups that would otherwise be unable to connect, thus leading to knowledge sharing, rather than simply providing specific information to an isolated user.

However, there is much scope for improvement concerning capacity development of people and institutions. Equal access, resilience and empowerment need to be strengthened as do as 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.

In summarizing developments for this report, FAO identified a number of positive trends, including mobile applications for agricultural information, mobile financial 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. E-Agriculture will continue to play a role in collecting good practices on the use of ICTs in agriculture and rural development and their dissemination. E-Agriculture continues to examine emerging trends and the evolving role of ICTs, and the challenges faced in reaching scaled, sustainable information service models.