Analysis of e-Agriculture Survey

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ABSTRACT: In late 2006, an online global survey to determine the scope and priorities for the WSIS Action line on e-Agriculture was conducted by an inter-agency Working Group. Most of the over 3400 respondents were unfamiliar with the term 'e-Agriculture,' but nearly all respondents had suggestions on potential definition and benefits, as well as on priority areas for action. Perceptions of e-Agriculture focused on information and communication processes more than on technologies and tools. Subject areas mentioned included farming practices, market information, training, statistics, and science/research. Stakeholder groups identified included producers, rural service providers, scientists, and policy-makers. Benefits included both generally enhanced information exchange and communication processes and specifically agriculture-related benefits such as market access and food security. e-Agriculture was also seen to contribute to broader development goals. Future priorities included developing virtual communities and networks, capacity building in the use and application of ICT, and defining and advocating e-Agriculture initiatives.

RESUMÉ: Fin 2006, une enquête mondiale en-ligne a été menée par un Groupe de travail inter-agence pour déterminer les objectifs et les priorités pour le Plan d'action du SMSI en cyberagriculture. La plupart des plus de 3400 répondants n'était pas familier avec le terme « cyberagriculture », mais presque tous les répondants avaient des suggestions pour la définition et les avantages potentielles, ainsi que pour les domaines prioritaires pour action. Les perceptions de la cyberagriculture sont focalisées sur les procédures de la communication et de l'information, plus que sur les technologies et les outils. Les domaines thématiques cités comprennent les méthodes de culture, l'information du marché, la formation, les statistiques et la science/recherche. Les groupes des parties prenantes identifiées incluent les producteurs, fournisseurs de services ruraux, scientifiques et décideurs. Les avantages incluent aussi bien l'améliora-

tion généralisée des échanges d'information que des procédures de communication, et spécialement les avantages liés à l'agriculture tels que accès aux marchés et sécurité alimentaire. La cyberagriculture est aussi vue comme contributeur aux objectifs plus larges du développement. Les priorités futures comprennent les communautés et réseaux virtuels, le développement des capacités dans l'utilisation et l'application des TICs, et la définition et le lobbying des initiatives cyberagricoles.

RESUMEN: A finales del 2006, se realizó una encuesta global en línea para determinar el alcance y las prioridades para la Línea de Acción de la Cumbre Mundial sobre la Sociedad de la Información (CMSI) sobre agricultura electrónica por un grupo de trabajo interinstitucional. La mayoría de los más de 3400 entrevistados estaban poco familiarizados con el término 'agricultura electrónica', pero casi todos los entrevistados tenían sugerencias acerca de una posible definición, beneficios potenciales y áreas prioritarias para acción. La agricultura electrónica se enfoca más hacia los procesos de información y comunicación que hacia tecnologías y herramientas. Las áreas temáticas escogidas incluyeron prácticas agrícolas, información de mercado, capacitación, estadística y ciencia/investigación. Los grupos de interesados directos identificados incluyeron productores, proveedores de servicios en zonas rurales, científicos y formuladores de políticas. Los beneficios incluyeron, en general, procesos mejorados de intercambio de información y de comunicación y, a nivel específico, beneficios relacionados con la agricultura como acceso a mercados y seguridad alimentaria. También se observó que la agricultura electrónica contribuye a metas de desarrollo más amplias. Las prioridades futuras incluyeron el desarrollo de comunidades y redes virtuales, el fortalecimiento de capacidades en el uso y aplicación de tecnologías de información y comunicación (TIC), y la definición y promoción de iniciativas de agricultura electrónica.

Introduction

Background – The Food and Agriculture Organization of the United Nations (FAO) accepted the role and responsibilities of facilitating activities related to the action line under *C.7 ICT Applications — e-Agriculture* at the World Summit on the Information Society (WSIS) follow-up meetings held in February 2006 in Geneva. 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 as wide a range of stakeholders involved in e-Agriculture as possible in the follow-up to WSIS, and resulted in the formation of an inter-agency e-Agriculture Working Group (EAWG).

Objective of the e-Agriculture Working Group (EAWG) – The objective of the EAWG is to create multi-stakeholder, people-centered, cross-sectoral platform(s) that will bring together stakeholders representing relevant constituencies of e-Agriculture.

The EAWG members decided that the definition of e-Agriculture contained in the WSIS documentation on Action Line *C.7 ICT Application — e-Agriculture* was inadequate and required revision. On that basis, the first major activity of the EAWG was to establish an initial engagement of stakeholders through an open survey on e-Agriculture.

Goal of the Survey – The goal of the survey was to:

- analyze stakeholders' familiarity with the term "e-Agriculture";
- identify activities stakeholders would include in a definition of e-Agriculture;
- identify examples of potential e-Agriculture activities already taking place;

- identify potential benefits of e-Agriculture as perceived by stakeholders, and identify the barriers that prevent them from receiving those benefits;
- identify stakeholders' priority activities to be included in an international forum on e-Agriculture; and
- identify stakeholders interested in participating in a virtual e-Agriculture knowledge forum.

Methods

Approach – The survey (Annex I) was designed by the EAWG members and comprised eight main questions and one optional question, and was offered in three languages (English, French and Spanish). More than 4,000 people from 135 countries visited the survey website. More than 3,400 responded to the survey, although many of those did not complete all of the questions. Participants were also invited to express interest in joining a virtual e-Agriculture Knowledge Forum, which secured over 2,100 positive responses.

The survey, which ran from October 1 through November 15, 2006, was extensively promoted through by EAWG members, their partners, and a variety of international development networks, such as those coordinated by the Development Gateway, the European Federation for Information Technology in Agriculture, Food and the Environment (EFITA), and Oneworld International.

Data Analysis—Open Questions – A team was formed at FAO (see Acknowledgements) to analyze the more than 3,000 responses to each of the three open questions (numbers 5, 6 and 7) in the survey across the three languages. Initially, frequencies of use of key words were calculated, taking into account plurals, tenses, and spelling mistakes. Then, broad categories of response were developed after reviewing the key word frequencies and examining the contexts of key word usage. Finally, individual responses were placed into these larger categories before calculating absolute frequencies. Data covering the three languages were analyzed together for those questions where patterns of response were found to be similar.

Results

Profile of Respondents – Respondents to the survey were asked to identify the categories of organization that best described the one in which they worked, as well as the region(s) in which they worked. Some respondents identified more than one type of organization and/or region. The two types of organization that respondents indicated most often across all regions were *"University/ Centre of Learning"* and *"Government"* (Table 1.1). However, significant proportions (9–12%) of respondents indicated *"Farmer Organization"*, *"NGO/CBO"*, *"International Organization"*, and *"Rural Service*

Provider". The remaining three categories were each selected by 3% or less of the respondents. In terms of respondents' regions of work, there were significant numbers of responses from all regions of the world, with the most heavily represented regions being Latin America and Africa (Table 1.2).

Familiarity with e-Agriculture – The survey responses showed that an overall majority (57%) were unaware of the term e-Agriculture (Table 2.1). There were also comments in the responses to other survey questions indicating that people had never encountered the term before. Latin America and the Caribbean and North America had the greatest number of respondents indicating that they were not familiar with e-Agriculture, at 63% and 61%, respectively. The Near East had the lowest proportion of negative answers at 46%, with Africa and Asia-Pacific both at 48%.

The French and Spanish translations of the term e-Agriculture in the survey were those used in WSIS, namely *cyberagriculture* and *cyberagricultura*, respectively. Analysis of the survey responses in the three languages (Figures 1.1–1.3) showed that the proportion who stated that they were not familiar with the term in their language was 44% for English, 66% for French, and 66% for Spanish.

Barriers to e-Agriculture – Respondents were asked to indicate which of seven suggested barriers affected their ability to benefit from e-Agriculture, or to describe any other barriers (Table 3.1). Half of all respondents were affected by the barrier of restricted access to digital

TABLE 1.1 – Respondents' organization affiliation

Type of organization	%
University/Centre of Learning	24
Government (National or Local)	20
Farmer Organization	12
NGO/CBO	11
International Organization	11
Rural Service Provider (public or private)	9
Youth Organization/ Student	3
Donor/Sponsor Organization	2
Media	2
Other	10

TABLE 1.2 – Respondents' regional involvement

Type of organization	Region					
	L. America & Carib.	Africa	Asia/ Pacific	Europe	North America	Near East
Total responses	2588	1176	792	576	505	269

TABLE 2.1 – Familiarity with the term "e-Agriculture"

Degree of familiarity	Region (%)						
	Global results	L. America & Carib.	Africa	Asia/Pacific	Europe	North America	Near East
Yes	31	26	36	37	32	29	40
No	57	63	48	48	56	61	46
I think so	9	7	10	12	9	8	12
I don't remember	5	4	7	5	3	2	2
Total responses	3196	1868	862	568	387	371	157

FIGURE 1 – Familiarity with the term "e-Agriculture" in three languages

Values expressed in %   ■ No   ■ Yes   □ I think so   □ I don't remember

1.1 – Familiarity with term "e-Agriculture" in English

1.2 – Familiarity with term "cyberagriculture" in French

1.3 – Familiarity with term "cyberagricultura" in Spanish
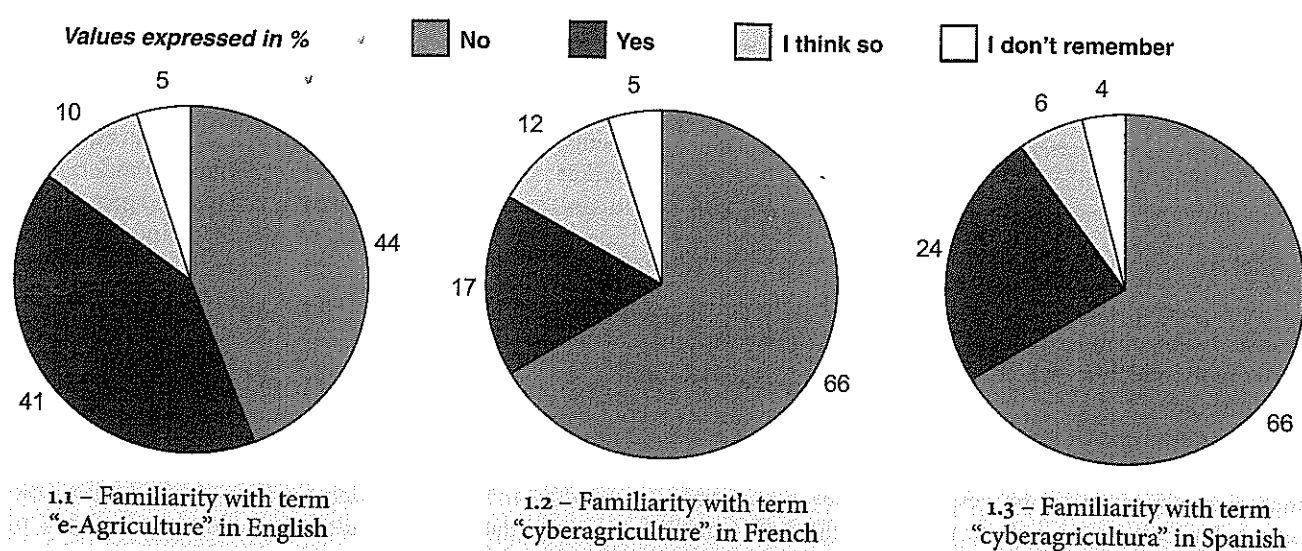
TABLE 3.1 – Barriers to uptake of e-Agriculture by region

Type of barrier	Region (%)						
	Global results	Africa	L. America & Carib.	Asia/Pacific	Europe	Near East	North America
Restricted access to digital technologies	50	52	52	47	40	37	37
High cost of access to ICT	44	55	39	44	39	32	35
Insufficient digital content in my language	39	30	42	36	36	30	31
Lack of ICT equipment	28	46	22	28	23	22	19
Lack of power, telephone, network	28	44	22	31	26	20	17
Unreliable digital technologies	19	21	20	17	16	14	16
Lack necessary skills/knowledge	17	23	13	21	17	17	14
Other	12	13	11	17	18	34	26
Total responses	2523	1856	3317	1037	670	243	610

media/technologies, but significant proportions (>25%) also selected high cost of access, insufficient content in the correct language, lack of equipment, and lack of power. These barriers were generally reported at the highest levels in Africa, although Latin America/Caribbean and Asia/Pacific also had relatively high incidences.

A Definition of e-Agriculture – Responses were extremely variable, and there were few clear trends. Analysis revealed that elements of responses could be placed into a small number of generic categories, which were:

(a) information-related process involved in e-Agriculture,

(b) information and communication technologies or tools,

(c) types of information,

(d) stakeholders who would benefit from e-Agriculture, and

(e) agricultural areas that could benefit from application of ICT.

In addition, some mentioned specific topics, specific ways in which processes could be improved, or development outcomes from the use of ICTs in agriculture. Many respondents included more than one of the above in their responses, both in terms of categories, and in terms of responses within a category. Therefore, responses were grouped according to which categories were mentioned, after which they were further analyzed for patterns.

Information and Communication Processes – Some 46% of respondents identified one or more information and/or communication processes that they associated with e-Agriculture, and these processes fell into eight generic categories (Table 4.1).

Information and Communication Technologies – Around one third (33%) of respondents mentioned types of technologies or tools. Of these, most did not mention a specific kind of technology, using terms like digital, ICT, or electronic. The tool mentioned most often was the Internet. Other tools mentioned were e-mail, personal computers, and mobile phones.

TABLE 4.1 – Types of information and communication process

% of responses	Type of process
46	information transfer/dissemination
28	learning
27	communication (sharing/exchanging)
16	trade/transaction/commerce
14	research on ICT
13	information service delivery
12	information systems
11	information management

TABLE 4.2 – Frequency of types of information

% of responses	Type of process
57	farming techniques and practices
33	agricultural markets
26	training
25	data/statistics
16	science and research

Agricultural Information – Some 21 % of respondents mentioned a type of information as being relevant to e-Agriculture, with five specific types of information being mentioned (Table 4.2).

Agricultural stakeholders – A total of 12% of respondents mentioned a specific stakeholder group they considered to be involved in e-Agriculture. The most frequently mentioned groups were those involved in the market chain, such as farmers, producers, traders, and buyers. The next most frequently mentioned group were those involved in science (researchers) and education (academics). Stakeholder groups occurring at lower frequencies were rural service providers (e.g. extension organizations and civil society organizations), and governments. Other stakeholders mentioned were women, youth, or rural communities.

Agricultural processes – One or more agriculture-related processes that could be enabled by ICT were mentioned by 20% of respondents, with 73% of such processes being related to agricultural production, and 35% to agricultural markets and marketing.

Other elements of e-Agriculture – A total of 8% of respondents identified the role of e-Agriculture in specific agricultural topics, though the range of topics was wide and none occurred frequently. Also, 5% of respondents mentioned ways in which information and communication processes in e-Agriculture could be enhanced, such as provision of more useful forms of information, more timely information, and wider dissemination or access. Finally, 9% mentioned development outcomes that they associated with e-Agriculture, such as increased capacities, new empowerment avenues, food security, and environmental protection.

Potential Benefits of e-Agriculture – Responses covered a wide range of topics across a wide scope of potential benefits, such as who benefits, the type of process improved, the way in which the process is improved, or access to a specific type of information or to a tool. Often respondents identified more than one type of benefit. Responses were analyzed and categorized according to a small number of broad categories, which were then examined in greater detail.

Five broad categories were identified, which then fell into two general groups. The two most frequently mentioned categories both referred to the potential of ICTs

to affect information and communication processes, which were applicable to any sector in which technology can play an enabling role, e.g. agriculture, health, education, governance, and so forth (Table 5.1). The other three main categories focused more specifically on the ways in which benefits could apply to agriculture and rural development.

Major benefits in information and communication – Some 36% of respondents mentioned one or more information and communication processes as benefits of e-Agriculture, which could be separated into principal categories related to access, sharing, dissemination, and communication (Table 5.2). Other processes mentioned less frequently included information management, technology transfer, e-commerce, and specific applications such as question and answer services, expert systems, and early warning systems.

Six principal types of improvement were identified by the 45% of respondents who mentioned ways in which processes could be improved by the use of ICTs (Table 5.3).

Agriculture/rural benefits – Approximately 16% of respondents mentioned specific stakeholder type(s) that they felt benefit from e-Agriculture. Of these, the most frequently mentioned group (81%) involved stakeholders in the market chain such as farmers, producers, traders, and buyers. The next most frequently mentioned (15%) group were those in science (researchers) and education (academics). Other stakeholder groups occurring at lower frequencies were rural service providers (e.g. extension and civil society organizations), and governments.

Some 18% of respondents mentioned benefits associated with a specific information type, and of those nearly one-half identified information on farming practices and techniques, with science and research and market information also mentioned frequently (Table 5.4).

The 15% of responses that identified broader benefits in which improved information and communication could play a role fell into two groups:

- increased capabilities, such as increased production, better decision-making ability, or more sustainable/improved rural livelihoods, and new empowerment avenues, such as awareness, participation, and policy input;

TABLE 5.1 – Categories of benefits

Broad category	Benefits	% of responses
I	Information and communication processes	81
	Types of improvement	45
	Types of process	36
II	Agriculture and rural development	41
	Stakeholder	16
	Broader development goals	15
	Types of information	10

TABLE 5.2 – Types of information and communication process

% of responses	Types of process
30	information access (user-oriented)
29	information sharing or exchange
15	information dissemination (supplier-oriented)
18	communication

TABLE 5.3 – Types of process improvement

% of responses	Types of improvement
37	faster availability of information or other processes
26	access to more timely information
12	wider access/dissemination
11	easier/more convenient information/knowledge processes
7	cheaper processes/access to information
6	more relevant information

- financial benefits, such as increased prices/revenue, improved market access and marketing capabilities, and reduced transaction costs.

Other secondary benefits that were mentioned significantly often were increased food security, environmental protection, and food safety.

Other benefits – Several other benefits were mentioned by less than 5% of respondents. These included improved access to various types of ICT (e.g. Internet, cell phone, computer), access to a wider variety of information

TABLE 5.4 – Information types

% of responses	Type of process
55	farming practices and techniques
19	science and research
18	market

THIS MARCH 2007 REPORT is a product of the e-Agriculture Working Group (EAWG), whose members include: Consultative Group on International Agricultural Research (CGIAR); Technical Centre for Agriculture and Rural Development (CTA); UN Department of Economic and Social Affairs (DESA); FAO; Gesellschaft fur Technische Zusammenarbeit (GTZ); Global Forum on Agricultural Research (GFAR); Inter-American Institute for Cooperation on Agriculture (IICA); International Association of Agricultural Information Specialists (IAALD); International Centre for Communication for Development (IICD); International Fund for Agricultural Development (IFAD); International Telecommunications Union (ITU); and World Bank. It is also available via the e-agriculture website: http://www.e-agriculture.org/

sources, and specific information topics (crops, pollution, inputs, pests). Finally, 2% of respondents said they had no idea what benefits e-Agriculture could have.

Priorities for an e-Agriculture Forum – Most respondents indicated more than one priority. Analysis showed that the responses could be grouped into five broad categories. Many respondents mentioned more than one category, and some mentioned more than one subject within the same category. Nearly one-half (46%) of the responses identified priorities related to information and communication processes (Table 6.1). A total of 23% of responses in two categories identified the need to enhance the role of ICT, in providing access to information and in facilitating agricultural processes. A significant proportion noted the need to define the term e-Agriculture and to advocate its use.

Information and communication processes – The information and communication processes could be separated into a few principal categories:

- information dissemination and sharing. i.e. one-way dissemination from providers to users including bulletins, news services and blogs, and two-way sharing of experiences or best practices, through activities such as extension and technology transfer;

- communication, participation, or community-building activities, such as the formation of networks, the creation of discussion forums, greater participation by

rural stakeholders in policy and decision-making, and the creation of linkages between different stakeholders;

- activities focused on making information more accessible to users, such as increasing the amount of information easily searchable by rural stakeholders, reducing the costs of access, the development and repackaging of relevant content, the creation of question and answer services, and increasing scientists' access to journals;

- capacity building activities, especially ICT skills training and ICT-based (e-)learning systems or courses; and

- activities related to the collection of rural information, such as research, data collection, and documentation.

Processes mentioned that did not fit into the above categories were creation of libraries, repositories, and databases, development of Global Information Systems, development of information management standards, and ICT-based monitoring and evaluation.

Stakeholder groups – Approximately 15% of responses mentioned a stakeholder group that they felt should be a priority in e-Agriculture. Of these, the most frequently mentioned group (more than 50%) involved stakeholders in the market chain such as farmers, producers, traders, and buyers. The next most frequently mentioned group were those involved in science (researchers) and education (academics). Other stakeholder groups occurring at lower frequencies were rural service providers (e.g. extension organizations and civil society organizations), and governments.

Information Types – When respondents mentioned priorities around enhancing the role of ICT in the provision of information, those that highlighted a specific type most often identified market information and descriptions of farming practices and techniques. Statistics and indigenous knowledge were also identified by some.

e-Agriculture as a concept – Respondents who felt definition of e-Agriculture as a concept should be a priority highlighted the need to develop a policy framework, and to identify stakeholders' needs properly. They noted the need to increase awareness and involvement of all stakeholders, as well as increase levels of funding/investment

TABLE 6.1 – Categories of priority

% of responses	Priorities
46	information and communication processes
15	stakeholder groups
14	role of ICT in facilitating agricultural processes
13	addressing ICT barriers
12	defining and advocating e-Agriculture
9	role of ICT in provision of specific information types

for e-Agriculture initiatives, and enhance linkages with other sectors. Lastly, some stressed the need to identify, develop, and scale up successful pilot projects.

Technological barriers – Respondents identified the principal barriers as being those impeding improvement of rural communications infrastructure, the creation of rural telecentres, the development of more accessible hardware and software, and the greater use of alternatives to Internet-based online services through media such as CD-ROM.

Agriculture-related processes – The most frequently mentioned priorities were felt to be enhancing the role of ICT in: market access; agribusiness; supply chain management; traceability of food; and environmental management.

Other Responses – There were a range of responses that did not fall into the above categories. Almost 20% of respondents mentioned specific topics related to agriculture, such as crops, livestock, pests/diseases, water, weather/climate, gender, nutrition, biotechnology, and organic agriculture. These occurred at low frequencies and no particular topics appeared significant. Some 12% of the respondents expressed the need for e-Agriculture to address broader development goals, such as enhanced poverty reduction, food security, agricultural and environmental sustainability, international trade, conservation, empowerment, biodiversity, and biosecurity bridging the divide between rich and poor. There were also small numbers of respondents who identified quite generic priorities such as greater availability or accessibility of information or technology, access to more up-to-date information, and simpler or cheaper access.

Conclusions

The conclusions of the analysis of the survey were:

- The survey sample covered a wide range of types of organization and with significant numbers of responses from all parts of the world.

- Only 41% 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 is perceived to comprise primarily information and communication processes, and secondarily technologies and tools.

- The principal subjects associated with e-Agriculture were firstly farming techniques and practices, secondly market/food chains, and then 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 policymakers.

- Benefits to be derived from e-Agriculture were principally in enhanced processes in information access/exchange and communication for the above stakeholder groups, and in terms of agriculture, more access to markets, improved household finances, and more sustainable livelihoods.

- e-Agriculture was widely seen to be a contributing factor to achievement of broader development goals, such as more secure livelihoods, enhanced poverty reduction, food security, agricultural and environmental sustainability, trade, conservation, etc.

- Priorities for consideration in the proposed e-Agriculture community were information exchange and communication processes in the following areas:

  - developing virtual communities/networks for information and knowledge exchange between rural stakeholders, as well as for their empowerment through participation;

  - capacity building of rural stakeholders in use and application of ICT;

  - enhancing farmer and producer 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.

Acknowledgements

Contact Information

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Annex I — e-Agriculture Survey Questions

1. Which region(s) does your work/research/activity focus on? Check all that apply.

☐ North America ☐ Africa

☐ Asia and the Pacific ☐ Europe

☐ Latin American and the Caribbean ☐ Near East

2. Please indicate the geographical scale of your work-related activities.

☐ Local ☐ National

☐ Regional ☐ International

3. Choose the category of organization that best describes the one in which you work:

☐ Farmer Organization

☐ University/Centre of Learning

☐ International Organization

☐ Service Provider (public or private)

☐ Media

☐ NGO/CBO

☐ Youth Organization/Student

☐ Government (National or Local)

☐ Donor/Sponsor Organization

☐ Other

4. Have you come across or used the term 'e-Agriculture' in your work?

☐ Yes   ☐ No

☐ I think so   ☐ I don't remember

5. What activities would you expect to be included in a definition of e-Agriculture? [Open]

6. Tell us the one most important potential benefit of e-Agriculture. [Open]

7. What two activities do you believe should be priorities for consideration by a new international forum on e-Agriculture? [Open]

8. What barriers do you face, if any, which prevent you from benefitting from e-Agriculture? Check all that apply:

☐ Access to digital media/technologies is too restricted

☐ Not enough content or resources available in digital form in my language

☐ The cost of access is too high

☐ The digital technologies available are unreliable

☐ I don't have the necessary skills/knowledge

☐ Lack of equipment, such as hardware

☐ Lack of power, lack of telephone lines/network coverage

☐ Other

9. Optional: Please share with us a story on a project/activity/practice that you think illustrates a potential e-Agriculture activity already taking place. If applicable, please share a URL or other contact details. [Optional]