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Submissions from entities in the United Nations system, international organizations and other stakeholders on the progress made in the implementation of the outcomes of the WSIS during the past 20 years

Submission by

Food and Agriculture Organization of the United Nations

This submission was prepared as an input to the report of the CSTD secretariat that will inform the substantive discussion at the CSTD on the progress made in the implementation of the outcomes of the WSIS during the past 20 years during its 28th annual session in April 2025, in response to the request by the Economic and Social Council, in its resolution E/RES/2023/3, to the CSTD to conduct such substantive discussions and to report thereon, through the Economic and Social Council, to the General Assembly.

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WSIS progress report in implementation of action lines C3 and C7 made by FAO

1. The evolution of e-agriculture: progress, challenges, and the role of human-centered approach in development-oriented future

The World Summit on the Information Society (WSIS) laid the groundwork for a future where information and communication technologies (ICTs) would revolutionize various sectors, including agriculture. Two decades later, the emergence of e-agriculture has significantly transformed the agricultural landscape, offering immense potential to address global food security challenges and empower rural communities.

As e-agriculture continues to evolve, newer and more complex technologies are emerging, such as artificial intelligence (AI). While AI has the potential to provide innovative solutions, it also presents new challenges, including capacity building, technology dependence, AI ethics, data governance, and job displacement. It is crucial to carefully consider these implications and develop strategies to mitigate potential negative impacts.

1.1 Progress

A. Progress achieved by information societies

- **Increased connectivity:** Internet penetration has surged globally, bringing more people online and enabling access to information and services. However, 2.6 billion people remain offline, that means that about one-third of the global population still lacks access to the internet.
- **Emergence of new technologies:** Advancements in technologies like geospatial technologies and GIS, AI, quantum computing, blockchain and immersive reality hold immense potential to transform various sectors, including agrifood systems.
- **Digital inclusion efforts:** Initiatives aimed at bridging the digital divide, such as subsidized smart devices and internet access, digital literacy programmes, and community networks, have empowered marginalized populations.
- **E-Government and digital services:** Governments have increasingly adopted digitalization to improve service delivery, enhance transparency, and engage citizens.

- **Innovation and entrepreneurship:** The Information Society has fostered an environment conducive to innovation and entrepreneurship, with digital platforms enabling new business models and economic opportunities.

B. Progress achieved in e-agriculture

- **Precision agriculture:** The adoption of advanced technologies like GPS, remote sensing, AI and IoT has enabled farmers to optimize resources, improve crop yields, and reduce environmental impact.
- **Digital extension services:** Online platforms and mobile applications have facilitated the dissemination of agricultural knowledge and best practices, reaching a wider audience of farmers. AI is expected to become a game changer for digital extension with the introduction of AI-enabled virtual advisers and AI chatbots
- **Market information systems:** Digital tools have empowered farmers by providing real-time market information on prices, supply and demands, enabling them to make informed decisions about production, logistics and pricing.
- **Financial inclusion:** Digital financial services have improved access to credit and insurance for rural farmers, enhancing their resilience to shocks and uncertainties.
- **Climate-smart agriculture:** E-agriculture tools have supported the adoption of climate-smart agricultural practices, helping farmers adapt to changing climatic conditions.

1.2 Challenges,

A. Persistent challenges at information society level

- **Content Accessibility:** Ensuring that content is adapted to the needs, languages, and contexts of local users remains a challenge.
- **Digital Divides:** Disparities in internet access, digital skills, and technological infrastructure persist, particularly in rural and underserved areas. The triple divide (digital, gender, rural) persists, and could widen due to the emergence of AI and continued connectivity gap.
- **Digital Literacy Gaps:** Many individuals still lack the necessary skills to fully participate in the Information Society.
- **Privacy and Security Concerns:** The proliferation of digital technologies raises concerns about privacy, data protection, cybersecurity, and digital exclusion.

- **Digital Rights and Governance:** Issues surrounding digital rights, freedom of expression, online restrictions, and the regulation of digital platforms continue to pose challenges.
- **Ethical Concerns:** The application of digital frontier technologies raises ethical questions about their impact on society.

B. Persistent challenges in e-agriculture

- **Digital divide:** Many rural farmers, especially in developing countries, still lack access to affordable, available and reliable internet connectivity and digital devices, limiting their ability to adopt and use digital technologies.
- **Digital literacy:** A significant portion of the agricultural workforce lacks the necessary digital skills, access to digital curricula and any kind of Vocational Education and Training (VET) on digital agriculture, to effectively use digital agriculture tools.
- **Data privacy and security:** Concerns about data privacy, ownership and cybersecurity can hinder the adoption of digital technologies in agrifood systems.
- **Infrastructure and connectivity:** Inadequate infrastructure, including power supply, ICT tools and reliable internet connectivity, remains a major barrier to e-agriculture.
- **Policy and regulatory environment:** A supportive policy, strategies and regulatory environment is crucial to foster innovation and investment in e-agriculture.
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1.3 A human-centered approach to e-agriculture

To fully realize the potential of e-agriculture, a human-centered approach is essential. By involving farmers and other stakeholders in the design and implementation of digital solutions, it is possible to create technologies that are relevant, accessible, and sustainable. However, affordability and local relevance remain a big concern.

Key considerations for a human-centered approach include:

- **User-centric design:** Developing e-agriculture tools that are intuitive and easy to use, tailored to the needs of diverse user groups.
- **Digital literacy capacity development programmes:** Investing in training and awareness raising programs to equip farmers with the necessary digital, and broader innovation skills.
- **Community-based approaches:** Leveraging community-based organizations to facilitate the adoption of e-agriculture technologies that respond to their concrete needs.

- **Digital public goods:** Championing affordable, and accessible digital public goods (open source, open data, open content, open AI models and open standards) to benefit all, especially smallholder farmers.
- **Public-Private Partnerships:** Fostering collaboration between public and private sector actors to accelerate e-agriculture development.
- **Ethical Considerations:** Ensuring that e-agriculture technologies are used responsibly and ethically, with a focus on social and environmental sustainability.

In conclusion, while significant progress has been made towards the vision of a people-centered, inclusive, and development-oriented Information Society, there is still much work to be done. By addressing the persistent challenges and embracing a human-centered approach, we can ensure that the digital revolution truly leaves no one behind. By addressing the challenges and embracing a human-centered approach, we can harness the power of e-agriculture to build more sustainable, inclusive, and resilient agrifood systems.

2. Implementing WSIS outcomes: advancing a human-centered, inclusive, and development-oriented Information Society in agrifood systems

The implementation of WSIS outcomes has played an important role in promoting the development of a "human-centered, inclusive and development-oriented information society". The WSIS outcomes emphasize that the application of information and communication technologies (ICTs) should be centered on human needs and development. This has contributed to the following advancements:

Access to agricultural information and knowledge: WSIS outcomes have facilitated the dissemination of agricultural information and knowledge to farmers, rural communities, and stakeholders in the agricultural sector. Through digital platforms and ICT tools, FAO and its partners have been able to provide access to critical information on agricultural best practices, weather forecasts and climate information, market prices, pest and disease management, and sustainable farming techniques, empowering farmers to make informed decisions and improve productivity. Increased information, including on science, technology and innovation about nutrients and sustainable diets have impacted both the research and development and promotion of more nutritious food in the Global South.

Value chain inclusion and transparency across the agrifood systems: WSIS outcomes have not only impacted the agrifood systems at production level but have significantly contributed to the inclusion of vulnerable rural population and producers to the markets via e-commerce platform and fintech solutions. Blockchains have contributed to fair trade and increased transparency in agrifood systems.

Capacity Development and Training: FAO has leveraged WSIS implementation efforts to provide capacity building and training programmes in digital literacy, ICT skills, and agricultural

extension services. These initiatives aim to enhance the capacity of farmers, extension workers, fisherfolks, and rural communities to effectively utilize ICTs for agricultural development, market access, and livelihood improvement.

E-agriculture initiatives: WSIS outcomes have supported the implementation of e-agriculture initiatives aimed at promoting the use of ICTs in agriculture and rural development. FAO has been involved in various e-agriculture projects and partnerships focused on leveraging mobile technologies, remote sensing, geographic information systems (GIS), use of drones, and other ICT tools to address agricultural challenges, increase agricultural productivity, and enhance food security.

Digital innovation and solutions: WSIS implementation has fostered digital innovation and the development of ICT-based solutions to address agricultural challenges and promote sustainable agrifood systems. FAO has been involved in initiatives promoting digital agriculture, such as mobile applications for farm management, blockchain technology for traceability in food supply chains, and digital platforms for agricultural market linkages, contributing to the modernization and transformation of agriculture.

Knowledge sharing and collaboration: WSIS outcomes have facilitated knowledge sharing, collaboration, and partnerships among stakeholders in the agricultural sector. FAO has engaged in multi-stakeholder dialogues, capacity development activities, and knowledge exchange platforms to promote collaboration, share best practices, and leverage ICTs for agricultural development and food security.

Policy support and advocacy: WSIS implementation has provided a platform for FAO to advocate for policies and strategies that promote the development of a people-centered, inclusive, and development-oriented Information Society in the agricultural sector. FAO has supported the formulation of national digital policies, digital agriculture strategies, and regulatory frameworks aimed at promoting digital inclusion, innovation, and sustainable development in agriculture.

In conclusion, the implementation of WSIS outcomes has been instrumental in advancing FAO's efforts to promote a human-centered, inclusive, and development-oriented Information Society in the agrifood systems, by enhancing access to agricultural information, inclusion into value chains and increased transparency across agrifood systems, developing capacity, fostering digital innovation, facilitating knowledge sharing, and advocating for supportive policies and partnerships.

3. Progress achieved by FAO in support of WSIS action line C3 "Access to information and knowledge"

Under this action line, where FAO is a contributor, FAO underscores its commitment to improving access to agricultural information and knowledge globally. Related activities under this action line included:

- **The Hand-in-Hand initiative (HIH)** – This is FAO’s evidence-based, country-led and country-owned initiative to accelerate agricultural transformation and sustainable rural development to eradicate poverty (SDG 1) and end hunger and all forms of malnutrition (SDG2). Since its launch in October 2019, HIH supports 72 countries. Under this initiative, FAO has developed the Hand-in-Hand Geospatial platform as Digital Public Good with the aim of turning data into actionable information for sustainable agriculture. More information [here](#)
- **FAO's 1,000 Digital Villages Initiative** – FAO initiative where a digital village is a rural community in which digital solutions are used to support socio-economic activities targeting farmers and value chain actors individually and collectively to empower them and to improve their livelihoods. The three pillars of a digital village are (i) amplify farmer productivity, (ii) provide market support services; and (iii) transform the villages holistically.
- **Technologies and practices for smallholder agricultural producers (TECA)** – the FAO platform gathers successful agricultural technologies and practices to facilitate knowledge exchange and help smallholder farmers in the field. TECA platform responds to the need for a systematic and user-friendly online archive of technologies, practices, and innovations, including success stories and case studies on family farming. More information [here](#).
- **TAPipedia** is an information sharing system, developed within the context of the G20 initiative Tropical Agriculture Platform, which Secretariat is hosted by FAO. It is designed to enhance knowledge exchange in support of Capacity Development for Agricultural Innovation Systems, including digital innovation. Offered in three UN languages, TAPipedia mainly targets researchers and practitioners in the field of development and cooperation and is a global information system for capacity development practices, innovation systems analysis, success stories, participatory and multi-stakeholder approaches, policy analysis and lesson learned in the context of agricultural innovation. More information [here](#)
- **Platforms** like the [FAO Digital Library](#), [FAOSTAT](#), [FAO Digital Services Portfolio](#), and the [FAO Knowledge Gateway](#) serve as repositories of agricultural publications, datasets, reports, and other knowledge products, making valuable information accessible to stakeholders worldwide.
- **Open Access Initiatives:** FAO has implemented open access initiatives to promote the sharing and dissemination of agricultural knowledge and information. Efforts such as the FAO Open Access Policy and the AGRIS database facilitate free and unrestricted access to agricultural research outputs, scholarly publications, and grey literature, contributing to the democratization of knowledge and fostering innovation in agriculture. For more information [here](#)
- **FAO Field Programme** – addresses the FAO members’ needs and demands for technical assistance and capacity building. During 2020-21, FAO field programme provided capacity

development and built skills in the stakeholders of more than 20 countries on different aspects of the application of digital agriculture and ICTs, such as climate change resilience and disaster risk reduction, digital extension, aquaculture, crop and livestock production on a variety of technologies, ranging from mobile phone applications, online systems, blockchains and geospatial technologies.

- **Partnerships and collaboration:** FAO has forged partnerships and collaboration with governments, international organizations, academia, civil society, and the private sector to enhance access to agricultural information and knowledge. Collaborative initiatives such as the **Global Open Data for Agriculture and Nutrition (GODAN)**, **Digital Public Good alliance**, and the **FAO e-Agriculture Community of Practice** facilitate knowledge sharing, capacity development, and innovation in agricultural information management and communication.

4. Progress, achieved by FAO in WSIS Action Line C7 “E-agriculture”

In the frame of this line, FAO has been made important progress through the following activities:

- **FAO continues to facilitate the yearly E-Agriculture Action Line C7 at WSIS 2021 Forum** - FAO facilitated the E-Agriculture Action Line C7 event in close collaboration with the International Telecommunication Union (ITU) and Zhejiang University. The event had 433 participants from all over the world and launched [The Digital Agriculture Report: Rural e-commerce development experience from China.](#)
- **Facilitation of the e-Agriculture Community of Practice** - FAO continues to facilitate the e-Agriculture CoP as a capacity development mechanism for its 19,300 members. Plans are in place to revamp the e-Agriculture Platform to allow for more functionalities such as members interaction, funding portal, collaboration features and open innovation. The global platform continues to offer news, events, capacity development activities, and to collect good and promising practices in digital agriculture. The mission of e-Agriculture is to facilitate discussion on the adoption and use of ICTs and digital innovations in agriculture, forestry, fisheries, natural resource management and rural development. <http://www.fao.org/e-agriculture>
- **FAO-ITU MOU and related activities in digital agriculture** – FAO and ITU have a cooperative agreement on digital agriculture activities. Through this framework the Niger Smart SDG Village Initiative, which has seen more than 20 villages earmarked for a roll-out in Niger. Two other countries are doing assessment studies in the Caribbean. FAO and ITU have also commissioned [The Status of Digital Agriculture in 47 Sub-Saharan Africa](#) countries as desk study, which informs investments in digital agriculture in the region.
- **FAO Digital Portfolio** – The FAO Digital Portfolio was released in May 2020 to scale digital technology adoption in the field to achieve greater digital impact. It originally comprised of 169 digital products that are used in support of FAO’s delivery at global, regional, and country levels. The FDP allows FAO to take stock of various digital products

- a combination of software, hardware and related services –that supports the digital IT in FAO global field delivery.

- **Support the development of national e-agriculture strategies** - In 2016, [FAO and ITU published an e-agriculture strategy guide, following which](#), FAO has continued to supported the development of national e-agriculture (or Digital Agriculture) Strategies in the following countries: Afghanistan, Albania, Armenia (finalized pending government sign-off), Benin (finalized pending government sign-off), Bhutan (completed), Bosnia and Herzegovina, Cambodia, Fiji, [Georgia](#), Indonesia, Kazakhstan, Kyrgyzstan, Madagascar (finalized pending government sign-off) Moldova, Mongolia, [Montenegro](#), Myanmar (on hold), Niger, Pakistan, Philippines, Papua New Guinea, Rwanda (completed), [Serbia](#), Sri Lanka, Tajikistan, Turkiye, [Ukraine](#), [UNMIK Kosovo](#), and [Uzbekistan](#). FAO is currently exploring the means to complement the guide with a new policy/strategy toolkit to support countries.
- **The FAO Programme Priority Area (PPA) on Digital Agriculture, as part of the FAO Strategic Framework 2022-31, including collaboration with DIAL on the Digital Impact Exchange.** The Digital Agriculture PPA, part of Better Production, is aiming to make digital technologies more accessible to enhance market opportunities, productivity and resilience integrated into agrifood systems policies and programmes, with particular focus on ensuring affordable and equitable access of poor and vulnerable rural communities.
- **FAO Membership of the Digital Public Goods Alliance since May 2022.** FAO is championing the use of Digital Public Goods outstanding among other UN agencies with 8 Digital Public Goods and contributing to the State of the Digital Public Goods Ecosystem Reports [2022](#) and [2023](#).
- **FAO Digital Villages Initiative.** The Digital Villages Initiative aims to promote the digital transformation of villages and small towns across the world, enabling farmers to use digital technologies. It contains 3 dimensions: 1) E-Agriculture, 2) Digital Farmer Services and 3) Rural Transformation. From the perspective of agricultural production, it refers to the “E-Agriculture” which focus on improving the productivity by using ICTs and relevant digital solutions, for example, climate smart agriculture, precision agriculture, intelligent facility agriculture. From the perspective of farmers lives, it refers to “Digital Farmer Services” which focus on how to enhance farmers accessibility to different kinds of social and economic services in terms of financial services, social protection, employment, for example, digital finance, Fintech, Digital-based agricultural insurance schemes, farm registries. From the perspective of the village, it refers to Digital Services to support rural transformation. Which focus on how to enhance the delivery of public services on health, education, jobs, welfare, tourism as eco-tourism, agri-tourism, etc.
- **The FAO Global Network of Digital Agriculture Innovation Hubs.** This network of in-country innovation hubs established by the FAO and country institutions, aiming to support farmers and value chain actors, especially youth and women, to increase their competitiveness by accelerating the development and uptake of digital innovations. The Network started as sub-programme in Dominica, Grenada, Ethiopia and Morocco, and each country is scoping its Digital Agriculture Innovation Hub taking into account its national

priorities, the country's digital maturity and the capacities of its partners (academia, NGOs or civil society).

A. E-Agriculture activities in Europe and Central Asia and the “Digital Excellence in Agriculture” contest for Europe and Central Asia

- Since 2014, FAO has been organising regular regional meetings on e-agriculture to discuss e-government aspects, inclusion of women and youth, strategies etc. In 2017 and 2018, regional fora combining discussions on thematic areas, exhibition, challenges and study visits have been organised. The insights received contributed to shaping strategic processes in the region.
- In April 2018, FAO initiated and conducted a joint forum with the European Commission, DG AGRI, the Bulgarian Presidency of the Council of Europe and the FAO Regional Office for Europe and Central Asia “2gether 4 strong digital agriculture” with a focus on the Western Balkans that gathered more than 500 participants, 3 ministers, several deputy ministers and 17 country delegations. The main key message was the need to create an enabling environment for the development of digital agriculture in the countries through digital agriculture strategies. After the event, Bulgaria, Hungary and Portugal have developed and adopted digital agriculture strategies. More information is available here: <https://www.fao.org/europe/news/detail/FAO-EU-see-prospects-for-a-strong-digital-agriculture/-en>.
- In May 2018, the 31st session of the FAO Regional Conference for Europe (ERC), the FAO regional governing body, has discussed the papers:
 - E-agriculture: the use of Information and Communication Technologies (ICTs) for the Development of Sustainable and Inclusive Food Systems and Trade Integration, that contains a section on climate change and digitalization.
 - Web Annex for document ERC/18/3: E-agriculture: the Use of Information and Communication Technologies (ICTs) for the Development of Sustainable and Inclusive Food Systems and Trade Integration, containing among others an index that estimates the preparedness and needs of a country in Europe and Central Asia to invest in digital strategy development.

The 31st session of ERC requested FAO to do the following (full report can be found [here](#)):

- i. Continues to assist countries in Europe and Central Asia in transforming their agricultural sectors and leveraging the livelihoods of farmers, both women and men, through e-agriculture and to foster its responsible use through the three Regional Initiatives;
- ii. collect and analyse good practices, tools and mechanisms in e-agriculture for knowledge sharing and provide policy advice and capacity development to maximize benefits and minimize risks;
- iii. develop, in collaboration with national, regional and international partners, an inclusive capacity-development framework and strategy in e-agriculture; and

iv. provide a neutral regional platform on which to share knowledge and support the implementation of national e-agriculture strategies for countries in Europe and Central Asia.

As a result of these initiatives, implementing the ERC recommendations,, and embracing the opportunities of newly created global FAO initiatives and strengthened emphasis on digital agriculture in the FAO strategic framework 2022-31, FAO had supported:

- Digital (e-agriculture) strategies in Albania, Armenia, Bosnia and Herzegovina, Georgia, Moldova, Montenegro, Kazakhstan, UNMIK Kosovo, Kyrgyzstan, Moldova, Serbia, Türkiye, Ukraine and Uzbekistan
- Digital villages in Albania, Azerbaijan, Bosnia and Herzegovina, Georgia, Kyrgyzstan, Tajikistan, Türkiye, and Uzbekistan
- AgriTech [Observatory](#): Navigate digital agriculture developments in Europe and Central Asia (2024)
- Status of Implementation of e-agriculture in Central and Eastern Europe and Central Asia (2018)
- Status of Digital Agriculture in 18 countries in Europe and Central Asia (2020)
- Digital excellence in agriculture in Europe and Central Asia.
- Good practices in the field of digital agriculture - Stocktaking report (2021). FAO and ITU launched the “[Digital Excellence in Agriculture in Europe and Central Asia](#)” contest to identify, highlight and celebrate good practices and innovative solutions that have proven successful in advancing the digital transformation of agrifood in the regions. The best practices contest attracted 200 submissions from 38 countries and FAO/ITU held a ceremony to award champions and recognize other best submissions.^[1](See the stocktaking report [here](#))

At country level, FAO supported capacity needs assessments on digital agriculture and the development of national digital agriculture policy framework in Albania, Armenia, Bosnia and Herzegovina, Georgia, Moldova, Montenegro, Kazakhstan, Kosovo, Kyrgyzstan, Moldova, Serbia, Turkey, Ukraine and Uzbekistan.

- B. **E-Agriculture activities in Africa** – The FAO Regional Office for Africa (RAF) has concluded a Digital Strategy for guiding investments in digital agriculture for the region. The strategy is guiding FAO offices in rolling out digitization projects. In 2022, FAO and ITU published the Status of Digital Agriculture in 47 Sub-Saharan African Countries <https://www.fao.org/documents/card/en/c/cb7943en>. FAO-RAF is implementing the [Digital Innovation Strategy for Agrifood Systems in Africa \(2021-2025\)](#), aiming to leverage digitalization for sustainable agrifood systems. At country level, FAO supported capacity needs assessment of digital skills and digital innovation capacity for youth and women, developed learning programmes to address the gaps identified and test it in

Rwanda. FAO also supported the development of the digital (e-agriculture) strategies in Benin, Ghana, Madagascar, Niger and Rwanda among other initiatives highlighted in the publication "[Digital Agriculture in FAO Projects in Sub-Saharan Africa](#)," created with Wageningen University and Research (WUR), with a roadmap for adopting impactful digital solutions. It highlights the role of digital tools in enhancing agriculture, the disparities in digital adoption, and the importance of digital literacy, infrastructure, and inclusivity to unlock the full potential of digital solutions for Africa.

- C. **E-Agriculture activities in Asia-Pacific and Small and Islands States (SIDS)** – FAO Asia and Pacific initiated the first pilot of the FAO's 1,000 Digital Villages Initiative (see 2.3 above). The FAO Asia-Pacific region continues to support countries in developing their national digital agriculture strategies (see 2.5 above). FAO recently launched the Small and Islands States (SIDS) Solution Platform to support the digitalization of these countries. The SIDS Solutions Platform aims to provide a space for SIDS to exchange knowledge, experiences, solutions and innovations that may be replicated or scaled up. These solutions may be local/homegrown or developed elsewhere in areas with similar conditions. The platform can be consulted [here](#).

In summary, FAO has been continuously working on actions in line with the WSIS actions, particularly the Action Line C7 ICT Applications. For example, the e-agriculture community of practice serves a crucial role in fostering the exchange of knowledge on best practices and initiatives within the platform. With over 20,000 members, it stands as the largest among FAO's Communities of Practice, facilitating dialogue and consensus among stakeholders on the transformative potential of digital technologies in agriculture. Through FAO's e-agriculture platform, the community collaborates to address challenges and harness opportunities in agricultural innovation. The FAO Office of Innovation (OIN) actively organizes webinars, events, and facilitates the WSIS Action Line 7 (e-agriculture), all aimed at promoting and sharing practices, knowledge, and innovations across the agricultural landscape." : E-Agriculture.

FAO continues with the implementation of programmes and services to accelerate progress towards its [strategic framework \(2022 –2031\) through the Four Betters](#)—better production, better nutrition, better environment, and a better life—aligned with the SDGs, including the [Digital Villages Initiative](#) to promote digital innovations to rural communities towards inclusive and sustainable rural development and agrifood transformation, the [Hand in Hand Initiative](#) which aims to accelerate agricultural transformation and sustainable rural development to eradicate poverty (SDG 1) and end hunger and all forms of malnutrition (SDG2); the [Hand in Hand Geospatial platform](#) which supports all stakeholders with rich, shareable data, respecting the proper protocols of data confidentiality; the [Global Network of Digital Agriculture Innovation Hubs](#) to foster innovation ecosystem and culture; and maintaining the operation on the [e-Agriculture Community of Practice](#).

5. Challenges faced during the implementation of C3 and C7

Despite considerable strides in making ICTs accessible for rural communities, several challenges persist across critical areas.

- Firstly, **adapting content to local needs, languages, and contexts** remains problematic, necessitating appropriate information resources and trusted intermediaries. The dissemination of information may be hindered if it fails to align with farmers' requirements in terms of format, and context and relevance. Furthermore, there's a lack of attention to locally adapted content and trust-based relationships in development plans, overshadowing the importance of integrating information innovations originating from rural communities.
- **Capacity development** presents a multifaceted challenge encompassing the enabling environment, organizational/institutional capacity, and individual skills. Strengthening capacities at various levels is imperative, as focusing solely on improving access to agricultural information hasn't bridged the rural digital divide. Illiteracy, limited digital skills, lack of digital agriculture curricula, Vocational Education and Training (VET) on digital agriculture, digital devices' access and affordability and cultural barriers persist, hindering effective use of ICT-delivered information. Scaling up pilot projects to reach millions of smallholder farmers faces hurdles, exacerbated by insufficient support for up-scaling and mainstreaming efforts, including test-bed facilities for experimentation of digital innovation.
- **Socio-cultural factors**, including language barriers, cultural norms, biases, and digital literacy levels, influence the adoption and utilization of ICTs. Addressing these factors requires tailored approaches and community engagement strategies.
- **Gender and diversity issues** underscore the unequal distribution of access and opportunities among users, necessitating specific policies to address underlying inequalities. Persistent gender disparities in access to ICTs and broader digital divides between urban and rural populations pose significant challenges. Illiterate and older farmers encounter barriers to adopting ICTs, with gender-specific obstacles further impeding women farmers' capacity to innovate and enhance productivity leveraging youth's technological familiarity and social roles remains underutilized.
- **Access and participation** continue to be marred by inequities, with gender-based digital divides persisting, particularly in rural areas. Improved access alone doesn't resolve gender disparities, highlighting the importance of bottom-up, participatory approaches in minimizing information inequities. Public-private partnerships are pivotal for sustainable business models, with recognition of quality standards and accountability among partners posing a new challenge.
- **Technological challenges** revolve around identifying suitable technologies aligned with local needs and contexts. Despite the potential of mobile telephony to increase information access, challenges in effective utilization persist, particularly concerning accessibility, affordability, and capacity issues. Technologies should be contextually appropriate and increasingly consider their impact on gender and social dynamics.

- **Sustainable scaling** of digital projects remains challenging, with pricing critical for community-level sustainability. Investments in content creation and data collection are essential, while social sustainability hinges on clarifying roles and responsibilities among stakeholders. Additionally, technology waste poses environmental concerns and warranting attention.
- Although qualitative data exists, a notable absence persists in the realm of **specific indicators designed to quantify the impact of digital innovations across agrifood systems and rural livelihoods**. The inherent challenges associated with measuring non-immediate and underreported impacts risk undermining the sustainability of ICT initiatives, as the lack of validated metrics and data may hinder the ability to support future investments.
- In order to move the SDGs forward, satisfying all segments of consumers and removing inequalities, advancements in policies and legislative barriers, open innovations and digital public goods, collaboration with private sector must be core of the strategy, once the fundamental infrastructure issues are solved (e.g. access to internet).
- **Policy and regulatory issues** also present significant challenges in the development of ICT for agriculture, stemming from the absence of coherent policies in many countries, which results in fragmented efforts and limited adoption of ICT solutions. Regulatory barriers related to data sharing, privacy, and intellectual property rights further impede progress, while the insufficient allocation of financial resources exacerbates these challenges, hindering the implementation of relevant policies and initiatives.
- **Several constraints hinder the uptake of digital public goods (DPGs) in rural areas.** Disparities in internet access and digital literacy are limiting factors for effective use of digital solutions, and DPGs face similar challenges. If DPGs are not designed with accessibility, affordability and inclusivity in mind, they will not benefit marginalized groups, and could exacerbating existing inequalities. The complex and diverse nature of rural contexts demands solutions that have the ability to easily pivot and adapt to local contexts. Additionally, the sustainability of these initiatives requires ongoing support and maintenance, which may be difficult to secure in resource-constrained environments.
- In terms of **interoperability and standards**, the lack thereof poses a significant hurdle, impeding data sharing and integration between different ICT platforms and systems. Developing common standards for data formats, protocols, and interfaces is crucial to enable interoperability and ensure compatibility among various ICT solutions
- **Lack of effective coordination and collaboration** among stakeholders, including governments, private sector entities, civil society organizations, and international bodies, is another factor that hampers successful implementation of WSIS outcomes. Achieving consensus and alignment of interests among diverse stakeholders can be challenging, however, it is imperative to consider the participation of all stakeholders for better achieving the common goals in digital agriculture.
- **Adequate financial resources** are necessary to support the implementation of WSIS goals and initiatives, including infrastructure development, capacity building, research and

development, and innovation. However, funding constraints, competing priorities, and uncertainties about return on investment may hinder investment in ICT projects, particularly in developing countries and underserved communities.

- **Stakeholder engagement:** while Internet penetration continues to increase, and the previous challenges mentioned above advance in fact in the correct direction, the digital divide still exists. Some regions, groups and individuals still have difficulty in enjoying the convenience and opportunities brought by information technology due to economic, cultural, educational, and other reasons. ICTs need to be more effective in bringing about more inclusive societies, reaching out to those typically excluded from development interventions. Numerous barriers stand in front of each group creating inequalities regarding accessibility, affordability and profit making of ICT based on very variable parameters: region of the world, rural and urban, age, purchasing power or gender among others. Statistics provided by the ITU's "Measuring digital development: facts and figure 2020" report show those inequalities:

- 91% of individuals in Europe are internet users, only 37% in Africa.
- 70% of males in the world are internet users, only 65% of women.
- 81% of the urban world individuals use internet, only 50% in the rural world
- Active mobile broadband subscriptions per 100 inhabitants are counted at 148 for high income groups and at 33 for low-income groups.

- **Background/professional technical knowledge, and limitation in time frame** add to the difficulty of knowledge absorbing for trainees.

6. Strategies used to mitigate or address implementation challenges

FAO's flagship programmes, such as, FAO's COVID-19 Response and Recovery Programme, the Hand-in-Hand Initiative and FAO's 1,000 Digital Villages Initiative, have been a beacon for addressing challenges in the digital agriculture transformation. The establishment of the Office of Innovation and the Chief Scientist have pitched science and technology, digital agriculture and ICTs high on the agenda. Several approaches on digital capabilities, digital solutions, tools and strategies have been taken and proven as valuable in addressing these challenges, such as:

- The **Global Network of Digital Agriculture Innovation Hubs** is a network of in-country innovation hubs established by Office of Innovation (OIN) in conjunction with country institutions to accelerate the development and uptake of digital innovations and support farmers and value chain actors, especially youth and women, to be more competitive. The programme seeks to support countries designing respective national digital agriculture innovation hub models meeting national agriculture, forestry, and fisheries priorities while involving local partners, including public-private partnerships. The sub-programme has implementations in Dominica, Ethiopia, Grenada and Morocco.

- FAO focused on supporting countries to develop **digital agriculture strategies and build regional capacities to assist member countries**. Several countries in Asia-Pacific (Indonesia, Sri Lanka, Cambodia and several Pacific Island countries), Sub-Saharan Africa (Benin, Ghana, Madagascar, Niger, Rwanda) and the Caribbean Region (Barbados, the Bahamas, Dominica, Grenada, St. Kitts and Nevis), are being supported to develop digital agriculture strategies, roadmaps, policies and/or action plans. FAO supported the production of a policy brief addressing the enabling ecosystem to inform national digital agriculture strategies. FAO supported the design and implementation of technological innovation and strategy on information technologies and reduction of digital divide in Mexico. In Europe and Central Asia, FAO developed policy frameworks and programmes of action for digitalization of agriculture in Moldova, Tajikistan and Uzbekistan. At global level FAO also conducted studies and developed policy guidance to promote digital inclusion for small-scale producers and vulnerable rural populations.
- In terms of **capacity building and skills development**, FAO conducts different events, trainings and capacity building sessions and based on the need and gap analysis, a digital agriculture and innovation skill learning program and tools for youth and women engaged in the agri-preneurship has been developed, tested and imbedded in the national digital ambassador's curriculum to increase the level of ICT adoption and accessibility to the rural communities.
- FAO has put much effort into **supporting digital rural transformation to strengthen digital infrastructure and boost the digitalization coverage** to address the challenges faced in agrifood systems. FAO launched the "1000 Digital Villages" Initiative (DVI) in 2020, which aims to use digital technologies to increase food production, improve agribusiness management, and enhance market-oriented agrifood services, and seeks to promote the transformation of agrifood systems and rural development through "digital agriculture", "digital farmer services" and "digital transformation", ultimately achieving the SDGs.

In 2023, in Europe and Central Asia, FAO successfully launched the implementation of DVI in seven programme countries (Albania, Azerbaijan, Bosnia and Herzegovina, Georgia, Tajikistan, Türkiye, and Uzbekistan). More than 30 villages across the region have been assessed for readiness to undergo a digital rural transformation and five have been selected as DVI target villages. Asia and Pacific Region also proceeded with pilot a village-level multi-actor survey to collect baseline information on the village digital readiness status. Using the Digital Village Ecosystem Approach, this multi-actor survey is being conducted by over 100 designated villages in 10 countries in Asia and the Pacific.

In Ethiopia the Global Network of Digital Agriculture Innovation Hubs in collaboration with Digital Green and the Ministry of Agriculture created an open content knowledge sharing architecture, facilitated by Digital Green's innovative approach and powered by FarmStack, a DPG open-source data and content exchange network to improve advisory services and optimize the use of data and information for the benefit of farming communities and agri-entrepreneurs across the country.

Other digital tools developed by FAO are:

- [dlocust – The potential of drones for locust early warning and preventive control](#)
- [Event Mobile Application \(EMA-i\)](#)
- [FAMEWS – Fall Armyworm monitoring and early warning system](#)
- [FAO Agricultural Stress Index System \(ASIS\)](#)
- [FAO Survey Technology \(FAST\) platform](#)
- [Food Price Monitoring and Analysis \(FPMA\) tool](#)
- [Information Network on Post-harvest Operations \(INPhO\)](#)
- [Open Foris and SEPAL \(System for Earth observation data access, Processing and Analysis for Land monitoring\)](#)
- Water Productivity through Open access of Remotely sensed derived data portal (WaPOR)
- EMPRES Global Animal Disease Information System (EMPRES-i)

7. **Emerging technological trends that affect and will be affecting the implementation of WSIS action lines C3 and C7**

In 2023 and 2024 FAO, in partnership with CIRAD have conducted a strategic foresight, including horizon scanning and technology watch on the emergence of technologies and innovations in agrifood systems. The studies were published in [2023](#) and [2024](#). They concluded **that new trends are emerging**, a blend of efficiency, sustainability and democratization that will drive the technological development up to 2050. The study has identified and analyzed the expected impact in specific time and geographical dimensions of 32 emerging technologies and innovations, among which advanced realtime geospatial and AI technologies have been identified as the most impactful among digital technologies.

Importantly, no single type of technology and innovation has the potential to address current and future challenges. In particular, policy, market and financial innovations are seen as key to advance in equitable access, availability and affordability of new technologies. Caution to Artificial General Intelligence and Artificial Super Intelligence Collective has emerged: governance and ethics, multilateral partnerships, conducive policy environment and repurposing of investments shall surround the digital technological advancements.

Ongoing trends and new developments in technology, particularly in the deployment, access, and use of ICTs, are expected to have significant impacts on future progress toward human development, especially in relation to the Sustainable Development Goals (SDGs). Here's how these trends and developments may influence human development:

- **Advancements in technology** are leading to greater connectivity and expanded access to ICTs, particularly in underserved regions. This increased connectivity can facilitate access to information, knowledge and services, contributing to progress on various SDGs related to poverty reduction, zero hunger, education, health, Gender equality and economic growth.

- **Digital Inclusion and Empowerment:** Efforts to bridge the digital divide and promote digital inclusion are key drivers of human development. By ensuring that marginalized populations, including women, youth, persons with disabilities, and those living in rural areas, have access to ICTs and the skills to use them effectively and efficiently, technology can empower individuals and communities to participate more fully in society and achieve their potential, thus advancing several SDGs related to **poverty reduction, zero hunger, equality, empowerment, and inclusiveness.**
- **Innovation and Technology Development:** Technological innovation, including developments in areas such as artificial intelligence, renewable energy, and precision agriculture, can drive progress toward sustainable development. By harnessing the power of technology to address complex challenges such as climate change, environmental degradation, food security, and sustainable energy access, advancements in ICTs can contribute to achieving multiple SDGs related to **food security, creation of the jobs, economic growth, environmental sustainability and resilient infrastructure.**
- The increase of **data and advancements in analytics and artificial intelligence** enable more informed and evidence-based decision-making processes across various sectors, including agriculture. By leveraging data analytics and predictive modelling, policymakers, businesses, and civil society organizations can optimize resource allocation, identify emerging trends, and tailor interventions to better meet the targets of the SDGs.
- Through technologies such as cloud computing and big data, resource utilization efficiency can be improved, and energy consumption and environmental pollution can be reduced. Technologies such as the IoTs and mobile Internet can also promote the development of intelligent transportation, smart grid, smart city and other fields, thereby improving people's quality of life and environmental conditions.
- Strengthening the access to information, developing more intense periodic training and developing stronger partnerships with various agencies and partners would be key in the process of building resilience of youth, women, and vulnerable groups using ICT. Moreover, innovation strategy development and capacity building are still important but should target farmers and the higher levels such as policymakers to expand the impact.

8. Stakeholders' priorities to achieve the WSIS outcomes in C3 and C7 in view of the new trends and FAO strategy towards implementing them

A. Stakeholders' priorities

Stakeholders seeking to achieve World Summit on the Information Society (WSIS) outcomes and progress towards the Information Society should prioritize the following areas, taking into account ongoing and emerging trends:

- **Digital inclusion and accessibility:** Ensuring universal access to information and communication technologies (ICTs) is essential for bridging the digital divide. Stakeholders should prioritize initiatives that promote digital literacy, infrastructure development, and affordable access to ICTs, particularly in underserved communities and rural areas. This includes integration of gender, youth, and diversity in project planning to ensure the sustainable integration of ICT solutions.

- **Promotion of Open Data and Open Access:** Encouraging the sharing of data and knowledge through open data, open AI models, open-source initiatives and open access publishing promotes innovation, collaboration, and transparency. Stakeholders should prioritize policies and initiatives that facilitate the sharing of data and information while ensuring privacy, security, and equitable access.
- **ICTs for Sustainable Development:** Leveraging ICTs to advance sustainable development goals is critical for addressing global challenges such as poverty, inequality, climate change, and healthcare access. Stakeholders should prioritize initiatives that harness the power of ICTs to drive economic growth, improve social welfare, improve food security and protect the environment.
- **Emerging technologies and innovation:** Embracing emerging technologies such as artificial intelligence, remote sensing, blockchain, and the Internet of Things can unlock new opportunities for economic and social development. Stakeholders should prioritize policies and investments that support research, innovation, and the responsible deployment of emerging technologies to address the real needs and challenges in the community.
- **Capacity Development:** Building digital skills and capacity among individuals, businesses, and governments is crucial for maximizing the benefits of ICTs. Stakeholders should prioritize initiatives that provide training, education, and technical assistance to empower people to effectively use and navigate digital technologies.
- **Cybersecurity and data protection:** With the increasing prevalence of cyber threats and data breaches, stakeholders must prioritize cybersecurity measures to protect individuals, businesses, and critical infrastructure. This includes investing in robust cybersecurity frameworks, promoting awareness of cyber risks, and fostering international cooperation to combat cybercrime.
- **Digital governance and multistakeholder collaboration:** Effective governance mechanisms that involve governments, civil society, the private sector, development partners and other stakeholders are essential for managing the complexities of the Information Society. Stakeholders should prioritize efforts to promote multistakeholder collaboration, inclusive decision-making, and transparent governance frameworks to ensure that the benefits of ICTs are equitably distributed.

B. FAO Strategy and actions

The focus of FAO's work in transforming agrifood systems will transfer from solution provision to more institutional capacity building and systemic approach provision (such as digital extension); from opportunistic initiatives towards coordinated approaches/partnership platforms and strategies.

FAO is working on integrating Large Language Models (LLM) into FAO's capability model. Despite obstacles such as fast-moving technologies, high expense and issues of data governance and AI ethics, there is large potential for developing LLMs for digital agriculture advisory services. FAO chatbot are being implemented at a corporate level model in a sandbox approach - first internal, and some offered as a public services. Several important trends in digital technologies have emerged since the World Summit on the Information Society (WSIS) that have impacted the implementation of WSIS outcomes, particularly in the context of agriculture and rural development.

Several important trends in technology and ICTs have emerged since the World Summit on the Information Society (WSIS) that have impacted the implementation of WSIS outcomes, particularly in the context of agriculture and rural development. Among them we can list:

- The widespread adoption of mobile devices, including smartphones and feature phones, has revolutionized communication and information access in rural areas. **Mobile applications and services** [Digital Services Portfolio](#) (DSP) developed by FAO in collaboration with the countries' concerned institutions provide farmers with real-time weather forecasts, market prices, agricultural and nutrition advisory and extension services, enabling them to make informed decisions and improve productivity.
- Advances in remote sensing technologies, such as satellite imagery, drones, and geographic information systems (GIS), have facilitated monitoring, mapping, and analysis of agricultural landscapes. FAO has utilized remote sensing data for various purposes, including crop monitoring, land use planning, natural resource management, and disaster risk reduction, contributing to evidence-based policymaking and sustainable development. FAO supports the countries' capacities in these emerging technologies and organizes awareness events for their adoption, improvement and policy and regulatory formulation their full adoption and use. For example, FAO has conducted training sessions on the use of drones in Ethiopia and Morocco and hosted a webinar on "Drones for Agriculture" to discuss opportunities and challenges in establishing regulatory frameworks for agricultural drones.
- The availability of open data repositories and tools for data collection, analysis, and visualization has enhanced transparency, collaboration, and knowledge sharing in the agricultural sector. FAO has promoted initiatives such as the FAOSTAT database and the Global Information and Early Warning System (GIEWS) to provide access to agricultural statistics, crop assessments, and food security information, supporting evidence-based decision-making at local, national, and global levels. FAO has also put emphasis on a Digital Public Goods (DPG) first approach with the focus on developing and promoting DPGs that contribute to the advancement of global food security and agricultural development. Another example is FAO's open access [Hand in Hand \(HiH\) Geospatial Platform](#) provides advanced information, including food security indicators and agricultural statistics, for more targeted agriculture interventions. The platform unlocks millions of data layers from different domains and sources to serve as the key enabling tool for FAO's HiH Initiative and serve digital agriculture experts, economists, government and non-government agencies, and other stakeholders working in the food and agriculture sector. The data has been sourced from FAO and other leading public data providers across the UN and NGOs, academia, private sector and space agencies,

including key FAO flagship databases such as [FAOSTAT data](#) on food and agriculture for over 245 countries and territories from 1961 to the most recent year available. Since the launch of the platform in 2020, over 65 countries and institutions have participated in workshops to learn how leveraging data and technology can contribute to digital agriculture transformation and rural development.

- AI and machine learning algorithms have been increasingly applied to agricultural data analysis, predictive modelling, and decision support systems. FAO has utilized AI techniques for crop yield forecasting, pest and disease detection, soil fertility mapping, and yield gap analysis, empowering farmers and policymakers with actionable insights to improve agricultural productivity and resilience.
- Digital platforms and multimedia tools have expanded the reach and effectiveness of agricultural extension services, enabling FAO and its partners to disseminate knowledge, training materials, and best practices to farmers and extension workers. Interactive e-learning courses, mobile apps (DSP), SMS-based advisory services, and online discussion forums have facilitated capacity building, skills transfer, and community engagement in rural areas.
- Social media platforms and online communities have emerged as valuable channels for networking, knowledge sharing, and advocacy in the agricultural sector. FAO has leveraged social media campaigns, webinars, virtual events, and online forums to raise awareness about key issues such as climate change, food security, gender equality, and youth empowerment, mobilizing diverse stakeholders to take collective action towards achieving the sustainable development goals. FAO's beneficiaries' especially farmers, have also been trained to leverage social media more specifically in digital marketing and access to a wide market of their production.