Digitalization of Agrifood Systems

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IICA's Technical Cooperation

The Inter-American Institute for Cooperation on Agriculture (IICA), a specialized international agency of the Inter-American System, supports the efforts of its member countries to achieve agricultural development and rural well-being.

The focus of its work is the provision of technical cooperation (TC) to the Member States by means of a series of strategic actions aimed at addressing, in a contextualized and innovative manner, the principal challenges involved in achieving agricultural and rural development in the Americas. Our TC, renowned for its excellence and capacity to add value, is designed to bring about important transformations through the application of an approach based on collaborative and shared responsibility with strategic partners, for which IICA serves as a catalyst and a coordinator.

The Institute's actions include a wide variety of products and services, such as the sharing of knowledge, skills and experience; institutional and technical capacity building; advisory services for strategic processes and the development of public policies; technical support and coordination for multi-institutional bodies; the development, facilitation and implementation of tools and methodologies; and the management and administration of agricultural projects.

A distinctive feature of our solutions is their adaptability to the specific needs of the countries, taking into account particular situations and contexts, and the scalability of the actions implemented, from the territorial and local level to the national, regional, continental, and even global level. Our innovative solutions are also designed to improve on traditional approaches by harnessing and enhancing environmental synergies, factor productivity, competitiveness, and solid and sustainable development.

The main challenges for rural development in the region transcend national boundaries, as they are affected by regional and global crises. The renewed vision of IICA's TC therefore reflects the different opportunities, challenges and commitments that exist in the Americas. The ultimate goal is to make a decisive contribution to the generation of supranational public goods, closely aligned with the United Nations 2030 Agenda and the attainment of the Sustainable Development Goals (SDGs).

We provide important solutions through collaborative efforts with other organizations that also offer TC, including national and international public entities and the private sector. The Institute acts as a key coordinator in this ecosystem, where all the members assume shared responsibility for the noble task of working together to provide TC.

Therefore, the core purpose of the TC is to fulfill IICA's mission, established in the Convention creating the organization, which is to "encourage, promote and support the efforts of the Member States to achieve their agricultural development and rural welfare." The Technical Cooperation Directorate (DCT), part of the General Directorate, is the entity responsible for the conceptual development and implementation of the TC actions called for in the Institute's Medium-term Plan (MTP), which is reviewed every four years with the participation of the ministries of agriculture of all the member countries.

Under the current MTP (2022-2026), the TC focuses mainly on three key strategic actions:

- Supporting the strengthening and transformation of agrifood systems.
- Providing tools and inputs that contribute to the development of a new generation of public policies.
- Supporting collective action among the member countries in areas related to the Institute's mandate.

The Institute's TC is organized around seven hemispheric action programs that address emerging issues related to the new global scenarios and priorities. IICA's current programs cover the following topics:

- Innovation and Bioeconomy,
- Territorial Development and Family Farming,
- International Trade and Regional Integration,
- Agricultural Climate Action and Sustainability,
- Agricultural Health, Safety and Food Quality,
- Digitalization of Agrifood Systems, and
- Gender Equality and Youth.
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Three innovative, crosscutting, inter-program coordination bodies have also been created to work with the program areas established in the MTP: the Center for Knowledge Management and Horizontal Cooperation Services, the Public Policy

Observatory for Agrifood Systems (OPSAa), and the Leadership School for the Transformation of Agrifood Systems of the Americas (ELTSA).

Interdisciplinary TC initiatives have also been established to address strategic needs related to specific issues that transcend the limits of individual programs and help to link countries, regions and disciplinary areas, including the Living Soils of the Americas Initiative, the Coalition of Action 4 Soil Health, and the Agriculture Innovation Mission for Climate.

Through the DCT's various units and associated bodies, and the solid network of 34 national delegations and various regional and subregional TC mechanisms, we aim to consolidate IICA's vision as an institute that, from its position as a regional organization, projects its influence around the globe, and offers its member countries TC of excellence and impact, providing tangible solutions for the benefit of agriculture in the Americas.

Why is agrifood digitalization important?

Agrifood digitalization: a necessary and high-impact process.

The emergence of digital technologies[1] has transformed different spheres of life and agriculture is no exception. The introduction of digital technologies in value chains leads to radical changes, not only because technologies change the way processes are carried out, but also because they modify the very logic of chains, thanks to a new (and improved) form of interaction between supply and demand. There are clear examples of digital transformation in other industries such as entertainment, hospitality and passenger transport. Digital technologies are already transforming agrifood systems, marking the dawn of the new era of digital agriculture, smart agriculture or agriculture 4.0 (figure 1).

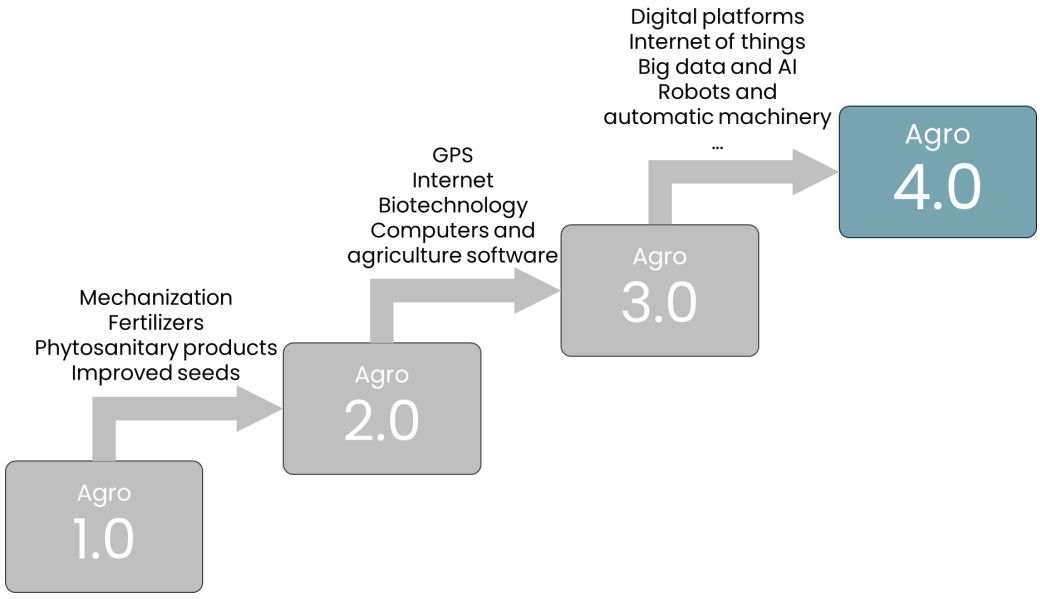

Figure 1. Agricultural eras or revolutions resulting from the incorporation of different technologies.

[1] Digital technologies or solutions: Digital technologies can be defined as IT-based equipment, tools and systems. They include a wide variety of devices and developments (sensors, applications and algorithms, actuators, communication networks) which in combination offer endless solutions and benefits.

The introduction of digital technologies in agrifood systems is necessary to address the growing challenges. The digitalization of agrifood systems offers numerous benefits that make it possible to increase production and resilience, diminish environmental impacts and other negative externalities, facilitate traceability, strengthen communication between stakeholders and their integration in trade circuits, and improve living conditions and rural life. Digital technologies also promise to transform the way governmental agricultural policies and programs are designed and executed, making them more precise and effective thanks to the generation of real-time data and information.

Digitalization can offer major benefits to different stakeholders in the agrifood system. In contrast, those who for different reasons are unable to adapt to the new era may face negative impacts from digital progress. Digitalization on the scale of the people involved in production requires that they access technologies, enjoy good connectivity, have the necessary skills to use technologies, and other factors. Recent studies show that there are major gaps in this respect,[2] meaning that digital transformation could become an element of inequality and exclusion. Digitalization also implies associated risks such as the violation of the ownership of data and information and of people's privacy.

Currently there is a broad and growing availability of digital technologies applicable to the most varied processes that form part of agrifood systems. However, due to diverse barriers (see table 1), the level of use of the available technologies is low and heterogeneous.[3] Agriculture tends to be one of the least digitalized sectors. However, the digital transformation of agriculture is beginning to speed up as a result of the constant increase in the availability of technologies and the growing predisposition towards using them, to a large extent as a result of

[2] IICA (Inter-American Institute for Cooperation on Agriculture, Costa Rica); IDB (Inter-American Development Bank, USA); Microsoft; Ziegler, S. 2021. Habilidades digitales en la ruralidad: un imperativo para reducir brechas en América Latina y el Caribe. San José, Costa Rica. Available at https://repositorio.iica.int/handle/11324/14462.

IICA (Inter-American Institute for Cooperation on Agriculture, Costa Rica); Bayer; CAF (Latin American Development Bank); World Bank; IDB (Inter-American Development Bank); Microsoft; Ziegler, S. 2022. Conectividad rural en América Latina y el Caribe. Estado de situación y acciones para la digitalización y desarrollo sostenible. San José, Costa Rica. Available at https://repositorio.iica.int/handle/11324/21350.

[3] 28 leading digital technology providers in the Americas consulted during the second edition of Digital Agriculture Week said that 63 percent of farmers with whom they regularly interact are "not very digitalized" (they only partially use simple digital solutions, such as weather information and prices on mobile telephones, simple spreadsheets, etc.), while 22 percent show an intermediate degree of digitalization (they regularly use a few specialized digital solutions, such as applications for crop and livestock monitoring and management, sensors and their data, e-commerce platforms, etc.)

the COVID-19 pandemic and the advance of digitalization in other sectors and areas of life.

Given that the digital transformation of agriculture is inevitable and imminent, **this is the right time to drive the process to ensure it is dynamic and inclusive**. This will make it possible to obtain early benefits from this transformation and mitigate or eliminate the threats that it entails.

BOX 1.

Barriers to agrifood digitalization in the Americas. [4]

1. **Relevance and usability of technologies:** Although the number of technologies available has increased, many do not get past the pilot phase and have room to (a) adjust their value proposals to the real needs of users and their contexts, (b) improve their cost/benefit relationship to be attractive and useful to users and (c) adjust their function to facilitate their use and compatibility with other technologies.

2. **Availability and affordability of technologies**: Although the cost of devices and apps tends to decrease, their incorporation into agriculture still faces some restrictions (for example, farmers with very scarce resources and/or still very expensive technologies). Further, in some contexts in LAC, the devices or tools necessary for digital agriculture are not fully available.

3. **Available infrastructure:** The use of digital technologies requires the existence of communication networks that guarantee significant connectivity, an aspect that is still very limited in rural areas of LAC. Although many offline solutions are being developed, some cannot be used without an internet connection.

4. **Users' skills:** The use of digital technologies implies knowledge and skills that are not necessarily available to many farmers and sector professionals. Age and education level are often associated with technology skills.

5. **Available incentives**: The existence of policies and conditions that promote and support digitalization processes are essential to ensure a dynamic and comprehensive implementation.

6. **Conflicts of interest**: The incorporation of digital technologies requires a reconfiguration in the way processes are carried out and registered, which inevitably affect roles and relationships between different stakeholders in different links of the agrifood chain.

[4] Source: IICA (Inter-American Institute for Cooperation on Agriculture, Costa Rica); FAO (Food and Agriculture Organization of the United Nations, Italy); ECLAC (Economic Commission for Latin America and the Caribbean, Chile). 2021. Perspectivas de la agricultura y del desarrollo rural en las Américas: una mirada hacia América Latina y el Caribe 2021-2022. Capítulo 4: Digitalización en la agricultura (online). San José, Costa Rica. Available at https://repositorio.iica.int/handle/11324/18609.

New models of technological innovation and development that emerge with digitalization.

With the advance of digital technologies, the models of technological innovation and development change. [5] Relatively low barriers to develop digital solutions permit the appearance of new stakeholders and a high proliferation in the generation of technologies. In this context, the appearance of multiple ventures, usually called AgTechs, [6] offers many of the available solutions, as these are important stakeholders in the digitalization process. Furthermore, there is a proliferation of organizations that leverage AgTechs, such as accelerators and business incubators, venture capital funds, etc. Public science and technology agencies accompany change by generating actions to integrate into emerging ecosystems and strengthen them.

AgTech development in LAC is interesting, although it is still evolving and far from reaching its maximum potential. A clear indicator of its recent evolution is the multiplicity of AgTechs that have emerged in recent years. In 2019, Vitón et al.[7] mapped over 450 ventures, 84 percent of them in Brazil and Argentina. However, recent mappings show the existence of over 1500 AgTechs in Brazil (https://radaragtech.com.br/), almost 200 in Argentina (https://magyp.gob.ar/agtech/_pdf/Listado-AgTech-Magyp_2022.pdf) and over 100 in the Andean region (https://repositorio.iica.int/handle/11324/21773). In parallel, the presence of accelerators and investment funds has multiplied, many of them originating in LAC countries. Despite this, the level of development of the AgTech ecosystem and of private investment in LAC is still lower than that of

[5] Lachman, J; Bisang, R; López, A; Pereyra, M; Tacsir, E. 2022. Agtech: startups y nuevas tecnologías digitales para el sector agropecuario: los casos de Argentina y Uruguay. Montevideo, Uruguay, Universidad ORT Uruguay, Facultad de Administración y Ciencias Sociales. Available at https://publications.iadb.org/es/agtech-startups-y-nuevas-tecnologias-digitales-para-el-sector-agropecuario-los-casos-de-argentina-y.

[6] The term "AgTechs" is a fusion of the words "agriculture" and "technologies." It refers to technological innovations that offer innovative solutions to problems and challenges that agriculture faces (adapted from Vitón et al., 2019), generally developed by entrepreneurs. There is a broad range of AgTech solutions, although they are predominantly digital.

[7] Vitón, R; Castillo, A; Lopes Teixeira, T. 2019. AGTECH: mapa de la innovación Agtech en América Latina y el Caribe. Washington D. C., United States of America, IDB. Available at https://publications.iadb.org/es/agtech-mapa-de-la-innovacion-agtech-en-america-latina-y-el-caribe.

countries with a long history of innovation and entrepreneurship, such as the USA and Israel.

The nature of the digital technology development and innovation process described gives rise to a new institutionality as a result of the presence of new stakeholders, the evolution of the role of pre-existing stakeholders and the creation of new collaboration spaces. The models of technological innovation and development are progressing and show great dynamism. It is necessary to consider the new configurations and their dynamism to promote effective public policies and boost change to guarantee active development and harness digital technologies.

Main opportunities and challenges of agrifood digitalization

The process of agrifood digitalization brings many opportunities and challenges on different scales and of varying scope. At the most general level, digital transformation is a concrete, major opportunity (given its many benefits) to improve agrifood systems. Digital solutions can make a notable contribution to sustainable development, providing elements to: a) increase production, b) adapt to and mitigate climate change and other environmental changes, striking a new balance between productivity and sustainability, and c) generate opportunities for personal development and a new rurality. Essentially, the introduction of digital technologies enables the generation of data and information to permit a more informed, precise and transparent management of the processes of production, transformation, distribution and marketing of agricultural products.

In addition to the potential benefits of agrifood digitalization, there is an immense challenge to ensure that the process does not increase inequalities, cause exclusion or generate other negative effects that deteriorate system functioning and the wellbeing of rural people and communities. With this in mind, the main challenge is to ensure the advance of digitalization while minimizing risks of negative impacts. Considering the existent gaps in technology access (for example, currently 72 million people in rural areas do not have access to

significant connectivity) [8] and in digital skills in rural areas in the Americas, it is a priority to address these issues to prevent undesired effects.

Digital transformation offers an additional opportunity in the Americas: many countries are leaders in the development of digital technologies, and at the same time, many agricultural sectors in the Americas that are highly competitive position themselves as early adopters of these technologies. This gives the continent the opportunity to exemplify the digital transformation process in agriculture. Equally important is the opportunity of various countries in the Americas to become global suppliers of digital solutions for agriculture. However, behind this opportunity lies the challenge of generating solutions that adapt to the heterogeneous needs and contexts of the diverse agriculture of the Americas.

Agrifood digitalization renders agriculture more attractive, especially for younger generations. The advance of digitalization generates development opportunities for young digital natives, who in turn will be essential for the transformation process to advance. Additionally, the best conditions for rural life and work that digital technologies can generate (for example, better access to education or entertainment, the automation of some arduous tasks, etc.) can attenuate the inconveniences that the work entails and offer advantages. Finally, digitalization can contribute to revitalizing rurality as a space for sustainable socioeconomic development, for which it is necessary to ensure progress through the application of intergenerational and inclusive approaches.

In relation to the work of the Inter-American Institute for Cooperation on Agriculture (IICA), the imminent advance of digitalization of agrifood systems requires actions to guarantee that the process has a positive final impact. As digitalization is probably the most transformative process that agrifood systems will go through in the coming years, IICA has prioritized this issue in its Medium-Term Plan (MTP) for the period 2022-2026. As part of its mission, the Institute will focus on providing technical cooperation of excellence, facilitating collective action among member countries, with the goal of developing a new generation of public policies aimed at improving agrifood systems through the development and incorporation of digital technologies.

[8] IICA (Inter-American Institute for Cooperation on Agriculture, Costa Rica); Bayer; CAF (Latin American Development Bank); World Bank; IDB (Inter-American Development Bank, USA); Microsoft; Ziegler, S. 2022. Conectividad rural en América Latina y el Caribe. Estado de situación y acciones para la digitalización y el desarrollo sostenible. Available at https://repositorio.iica.int/handle/11324/21350.

Digitalization of Agrifood Systems Hemispheric Program

The program and its purpose

The Digitalization of Agrifood Systems Hemispheric Program was created as part of IICA's 2022-2026 MTP. Its creation reflects the relevance given to the issue, due to the implications expected from digitalization in the functioning and configuration of agrifood systems and rurality. The Institute's program will contribute to fostering dynamic, positive digitalization of agrifood systems in the countries of the Americas.

The Program aims to mobilize the digitalization of agrifood systems in the Americas, prioritizing actions to promote the development and use of digital technologies with Member States, seeking to minimize the potential negative impacts of digital transformation. The mechanism underlying the different actions carried out by IICA is to build bridges and catalyze collaboration among relevant institutions and stakeholders (farmers and their organizations, governmental agencies, tech developers, education and research centers, etc.)

Action Lines

The Program has the following action lines:

1. Raise awareness of the importance of digitalization, the existence of a new institutionality and the need for a new generation of public policies to mobilize the development and use of technologies. This includes actions focusing on: 1) raising awareness on the potential benefits and threats of digital transformation and the need to promote it; 2) mapping and analysis of policies and institutional configurations to promote digitalization, as a reference for member countries; and 3) support member countries in the design of policies, interventions and institutional reconfigurations to drive digitalization.

2. Identify and analyze digital technologies and experiences of successful digitalization, promoting scaling up and adaptation to different contexts. This includes actions focusing on: 1) identifying promising digital technologies and

fostering pilot cases; 2) generating links and spaces for collaboration between tech developers and users (from farmers to governments) for the design of solutions adapted to user demands and contexts; and 3) identifying successful experiences, analyzing and sharing them with a view to implementing them in other contexts.

3. Generating and sharing quality information and offering training. This includes actions focused on: 1) generating and processing relevant, high-quality information (through studies) that can be used to characterize, assess and make recommendations in digitalization matters; and 2) identifying needs or opportunities for the development of digital skills and coordination with educational and research institutions and tech developers to offer concrete training opportunities focused primarily on policy makers and professionals.

The implementation of the different actions (in the context of the established guidelines) implies joint work between the Program and the IICA Delegations in the different member countries. Hemispheric actions in the Program actively involve the various country offices. The Program supports the planning and execution of proposed activities led by the Delegations in different countries and regional coordination projects. In all cases and in keeping with the Institute's technical cooperation model, the actions call on public and private organizations from national to global level.

Relevant actions of the Digitalization of Agrifood Systems Hemispheric Program

The following table summarizes the major actions carried out recently as part of the Digitalization of Agrifood Systems Hemispheric Program

1. CIMAG and FABLAB: At IICA Headquarters, the Interpretative Center for Tomorrow's Agriculture (CIMAG) and the Digital Fabrication Laboratory (FABLAB) were set up. The CIMAG, an exhibition

space for learning about new digital technologies for agriculture, has welcomed thousands of visitors since its creation, from school students to high-ranking political authorities. FABLAB offers facilities and initiatives to stimulate the design and prototyping of innovative technologies, especially among young people.

2. Advice in public policies and development of a new institutionality: The Observatory of Public Policies for Agrifood Systems (OPSAa) monitors and carries out a continuous analysis of policies and programs oriented at promoting the digitalization of agriculture in different countries. In turn, spaces of dialog are generated (dialog rooms) to promote the exchange of experiences and lessons learned among countries on policies to promote ecosystems of digital technology development and use. Details of this action line can be found at:
    1. https://opsaa.iica.int/initiatives (filter through digital transformation)
    2. Mapping political initiatives to promote agrifood digitalization in six countries of LAC: https://repositorio.iica.int/handle/11324/21300

3. Technical studies and recommendations for policy design: Different studies have been carried out to generate information and analyze aspects closely tied to digitalization, leading to recommendations for the design of public policies. The most recent include the mapping and study of successful AgTechs in the Andean region (https://repositorio.iica.int/handle/11324/21773) and the study "Rural connectivity in Latin

America and the Caribbean: State of situation and actions for digitalization and sustainable development" (https://repositorio.iica.int/handle/11324/21350).

4. Forum on strategic thinking and promotion of collective action to drive digitalization: Since 2002 IICA has organized the annual Digital Agriculture Week, a space that brings together key stakeholders in the digitalization process: AgTechs, policy makers, farmers' organizations, public and private finance agencies, R&D institutes, etc. At the 2023 edition there were over 50 presentations and exchange forums, with participants from over 15 countries. The event functions as a seed for multiple activities (presentations, workshops, webinars) held throughout the year. All the sessions from the 2023 edition of Digital Agriculture Week can be seen at https://www.youtube.com/@IICAnoticias/streams

Work team

The Digitalization of Agrifood Systems Hemispheric Program has a work team made up of permanent staff members and temporary consultants. The members of the permanent team are:

Federico Bert
Coordinator

Carlos Ruiz Macho
Specialist

Alice Alcántara
Specialist

In addition, the Program has a consultative committee made up of three internationally renowned leaders:

Mariana Vasconcelos
Cofounder and CEO of Agrosmart

Laurens Klerkx
Ex-researcher of Wageningen University, the Netherlands, and current researcher at the Universidad de Talca, Chile

Luis Adrián Salazar Solís
Former Minister of Science, Technology and Communications of Costa Rica

Lastly, the Program has a Practice community, made up of over 30 staff members from 23 IICA units, who meet regularly to coordinate and propose technical cooperation actions in this field and level out and build skills. The community proposes and coordinates actions with different offices of the Institute in its member countries.

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