



Collective Action on Inclusive Digital Transformation of Agriculture in Latin America and the Caribbean

Final technical report

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Introduction

Inclusive digital transformation of agriculture requires joint efforts between national, regional and international organizations, decision makers, producer families and society in general. The agrotechnological ecosystem for small producer families in Latin America and the Caribbean (LAC), where about 55% of the labor force in rural areas is related to agricultural production [1], has large gaps in knowledge, implementation, and use of digital agricultural tools, given that these have failed to reach the appropriate scale and manage to be maintained over time.

This first phase of the initiative "Collective action on inclusive digital transformation of agriculture", carried out in LAC, through different joint activities, managed to identify a series of trends on the current situation in the region and key factors that influence the equitable and inclusive use of digital solutions by small scale family farmers.

As a result of these efforts, a toolbox was developed with material on good practices for the use of digital tools expressed in experiences of inclusive digital agriculture in the region, as well as video tutorials on the use of technologies for small-scale agriculture that were tested in directed training sessions and self-training. This toolbox is expected to be useful material for consultation by producer families, which in turn will allow them to increase their productivity and income, reduce risks, mitigate and adapt to the effects of climate change, and reduce digital divides.

Main activities and results

Within this first stage of the collective action initiative, a review of literature was carried out to obtain information on the current scenario of the use of digital tools in agriculture within the LAC region, the existing restrictions, and the evaluation of the needs of small producer families on this subject. From this base, efforts were focused on the development of subsequent activities and results.

1. Literature review on inclusive digital agriculture

The literature found points to the existence of an imbalance in the use of digital transformation in the agricultural sector, disfavoring small farming families and creating gaps in access and ability to use digital technologies. Among the factors found in LAC that increase this digital divide are the lack of access to connectivity and mobile broadband coverage, access to smartphones, capacities of producers and other actors

to take advantage of digital technologies, lack of a favorable technological agriculture ecosystem, low capital investment and government regulatory policies.

Similarly, the role of women in the digital transformation of agriculture has been neglected in many cases, producing negative effects on productivity due to gender inequalities. According to FAO data [3], women represent, on average, 43% of the labor force in agriculture in developing countries, and specifically 20% in Latin America. Reducing gender gaps in access to productive resources and digital services, information, skills, and tools can increase returns by 20-30%.

Among the concerns expressed by small producer families is the concentration of knowledge, power and income for those who develop and acquire the digital solutions and data generated, creating information asymmetries in digital markets, increasing transaction costs, affecting the functioning of markets and the ability to innovate. On the other hand, the existing heterogeneity in the costs and benefits of the technologies due to differences in farm size, soil quality, human capital and other factors. There is also a need to have adequate internet access and network infrastructure and learning opportunities of digital skills [4].

Different references point out that for small producer families to experience the benefits of digital transformation, it is necessary to implement and share good practices, especially in low- and middle-income countries. For example, in rural areas of the region there is little confidence in the use of digital financial platforms, due to little knowledge or financial education, and it represents a high cost for the end user [2].

With this search, it was possible to visualize the most important points to consider for the development of subsequent activities and to focus the efforts for the generation of useful reference materials for small producer families, decision makers and producer organizations/agricultural cooperatives.

2. Webinar: Data Governance in Agriculture – Including Farmers

This webinar was organized with GFAR partners: FORAGRO, COPROFAM, GODAN and AgGateway, within the framework of the “Collective Action on inclusive digital transformation of agriculture”. It focused on answering questions about data generated in the field by digital technologies, such as: Who can use this generated data? Who does this generated data really belong to? What is its value?

The importance of including producer families as central actors in innovation processes, and not only as recipients of technologies, knowledge and data from external sources, was discussed. In addition to its field of action and negotiation regarding data acquisition practices and business models. These issues were addressed by experts on legal and ethical issues, as well as the views of two farmers, who expressed their concerns and realities about data governance in the field.

3. *Database on AgTech providers and start-ups in Latin America and the Caribbean*

Information was collected on Latin American and Caribbean enterprises, start-ups or companies dedicated to implementing technology in the agriculture sector, in order to map the current situation in the region. The name of the enterprise, the specific area of action, the country of origin, main contact and a description of the products and/or services offered were included. With this database, an interactive map was developed that allows spatially locating each of the enterprises, highlighting the regions that present a greater development of digital agriculture.

It was possible to collect a total of 126 companies in Latin America and the Caribbean that provide some type of technological solution, in areas such as farm and livestock management, information services, software development applied to agriculture, financial applications, e-commerce, precision agriculture and "Big Data", innovative production systems, marketing, reuse of agricultural residues and irrigation management.

4. *Survey on the current scenario and needs on inclusive digital agriculture*

A survey was carried out in the Latin American and Caribbean region, using an online platform which was distributed through the contacts of GFAR partners, FORAGRO, COPROFAM, GODAN and AgGateway. The survey took place from October 11, 2021 to November 1, 2021, and a total of 365 responses were obtained, with a distribution of 167 women and 198 men, geographically distributed as follows: 5 from the Caribbean, 22 from Central America and Mexico, 285 from the Southern Cone region and 53 from the Andean region. The survey consisted of a total of 26 questions, both open and closed questions, related to the use and adoption of digital technologies both for common use and applied to specific agricultural tasks.

Some of the main results obtained are:

- The region of Mesoamerica and the Caribbean presented the highest percentages in the use of smartphones and computers (80%) and in turn the lowest percentage of producers who do not use any technological tool (4%). The Andean region has the lowest percentages in the use of both technologies.
- Among the points considered in the survey, there were questions on what types of services they use and for what purposes. Most of the participants indicated that they use applications for communication with family, friends, and other producers, as well as to attend meetings. It is important to note that few participants use digital applications related to agricultural activities, such as field data acquisition (crop, soil, precipitation, temperature, etc.), financial services, marketing, certifications, traceability, and automation.
- The current uses of digital technologies are mainly concentrated in i) consulting climate forecasts and market information, ii) technical assistance, and iii) making or receiving online payments, and access to public services.
- The survey also indicates that, for producer families, one of the biggest challenges in obtaining benefits from different technological tools is the high cost and property rights of the data, in addition to general connectivity problems and their associated costs.
- International telecommunications companies represent the main providers of connectivity in the region, where the southern region, with 47%, presents the lowest percentage. This data highlights the reduced window of opportunity that local entities or community networks have in order to provide a telecommunication service, which in the case of this survey was 14% of the total responses.

With the information from literature and the results of the survey, it is possible to identify some lines of action for the development of an inclusive digital agriculture agenda:

- a. Expand the range of use of digital tools for family farming, especially in applications related to improve productivity, implementation of data-based

technologies for decision-making, and facilitating credit and input acquisition processes.

- b. Promote improved connectivity in rural areas of the region, through community network initiatives or local entities.
- c. Promote greater inclusion of women producers, young people, and small family producers in rural areas, where there is a gender approach and equal opportunities and conditions.
- d. Actively involve producers in the design of different digital technological tools, in a way that allows collective learning and favoring production processes.

5. *Training programs on inclusive digital agriculture*

The search for training programs focused on the inclusive digitization of agriculture allowed to characterize the current situation regarding the training of professionals in this sector, and to map the regions with the greatest growth in this sector. Table 1 shows a summary of the training programs found:

Table 1. Training programs on inclusive digital agriculture.

Name	Institution	Country
Internet of things for agriculture.	Cenfotec University.	Costa Rica.
Digital skills applied to the agri-food and forestry sector.	Permanent Training Center (CFP) of the University of Seville.	Spain.
Training program of the Ministry of Agriculture, Fisheries and Food (MAPA).	Higher Technical School of Agricultural and Forestry Engineering of the University of Córdoba and Higher Technical School of Agronomic, Food and Biosystems Engineering of the Polytechnic University of Madrid.	Spain.
Introduction to Agriculture 4.0. Course for professionals in the sector.	Official College of Technical Engineers of Western Andalusia.	Spain.

Specialization Course in Agriculture 4.0.	University of Huelva and Official College of Technical Engineers of Western Andalusia.	Spain.
Master in Digital Agriculture and Agrifood Innovation.	Higher Technical School of Agronomic Engineering of the University of Seville.	Spain.
Master in Digital Transformation in the Agrifood Sector.	International University of La Rioja.	Spain.
EU Law Digital Agriculture.	Sant'Anna School of Advanced Studies.	Italy.
Master's Degree in Digital Transformation of the Agrifood and Forestry Sector (DigitalAgri).	University of Cordoba.	Spain.
Master in Agri 4.0.	ENIT Business School.	Virtual.
Digital Transformation of Agribusiness.	INCAE Business School.	Costa Rica.
Specialized Course in Technology for Agriculture.	Latin American School of Agriculture.	Virtual.
Specialized Course in Technology Applied to Agricultural Management.	Latin American School of Agriculture.	Virtual.
Digital Agriculture transformation Program.	Manchester Innovation & Technology Academy.	United Kingdom.

Most of the training programs are located outside the Latin American and Caribbean region, which means a barrier for professionals from the region who seek to specialize in this subject. In addition, by having to move to other regions, the structure and content often do not involve the reality and context of LAC, creating some distortions in the design, implementation, and use of technological tools.

6. *Inclusive business models*

A literature review of business models on inclusive digital agriculture was carried out. In this review, it was possible to determine the approach of inclusive business models, which aims to support the prioritization of activities that contribute to a more effective business relationship between the small producer and/or supplier and the small, medium, or large agribusinesses. Possessing better coordination can be translated into added value, lower transaction costs and a significant competitive advantage over the competition.

Inclusive business models are an approach that seeks to improve communication within the value chain framework, analyzing the interorganizational links between the producer and the immediate buyer, who can be a merchant, wholesaler, or supermarket. In addition, they seek not to leave out small producers from rural areas from developing countries, where the voice and needs of producer families are considered and recognized. Any adjustments to achieve greater inclusivity must not undermine the most sensitive elements of a model, such as the cost of structure, the value proposition and the integrity and safety of the product.

The type of partner networks and the choice of business model will depend on the nature of the product and final buyer, who determines the economic dependence between actors within the chain. New technologies only achieve their goals when they are developed within a functional business model.

A series of associative and alliance models were identified that are capable of promoting inclusiveness in the digitalization of agriculture:

Associative models:

- a. Cooperatives of producers.
- b. Trade associations.

Alliances:

- a. From academic projects.
- b. From state projects.
- c. From cooperation projects.
- d. From productive chains.
- e. From alliances between local technology companies and producers.

7. Inclusive digital agriculture experiences

In order to characterize the current situation regarding digital agriculture in the LAC region, a search of experiences was carried out, focusing on the ones that showed good results related to inclusion of technological tools in the agricultural and livestock sector. Experiences were classified based on five thematic areas of interest, defined after the survey together with COPROFAM:

- i. Management of internet networks by local organizations (community networks).
- ii. Provision of technical advisory services using digital alternatives.
- iii. Use of applications to improve the management of soil, water, herbicides, pesticides, etc.
- iv. Use of applications to connect with buyers and improve sales revenue.
- v. Use of applications to pay, collect and access credits in public and/or private financial institutions.

In total, 20 experiences were identified, in which it was possible to describe:

- The subject area.
- The technological solution.
- Situation prior to the implementation of the technology.
- Reasons for incorporating technology.
- Public/private actors participating in the implementation.
- Farmers/producers reached or impact of the project.
- Costs incurred.
- Obstacles encountered and overcome.
- Main quantitative and qualitative results.
- Expectation of future development.
- Recommendations.
- Characteristics of inclusivity.
- Business model.

Along with the 20 experiences identified, with the collaboration of COPROFAM, it was possible to visit and characterize 5 experiences located in the southern cone, specifically in Brazil, Chile, Paraguay, Argentina, and Uruguay.

8. Identification of good practices

Considering the 25 total experiences, a specific analysis of each experience was carried out, in order to identify common aspects and identify practices that fostered inclusivity of digital technologies in small-scale agriculture. Fourteen (14) good practices were identified, which were grouped and standardized into 5 categories:

- i. The development of communication processes for agriculture based on technological tools available to producer families.
- ii. Inclusive development and technological co-design with the decisive participation of producer families.
- iii. Collaboration and associativity as the basis of inclusive digital agriculture.
- iv. Transformation of extension and advisory services with intensive use of data and digital tools.
- v. Empowerment of producer families and their organizations with a focus on appropriate technology and technological sovereignty.

With the identification of good practices and information on experiences, a series of infographics was prepared, containing contact information of companies or enterprises, the thematic area, characteristics of the inclusive technological solution, results and scope, and the characteristics of inclusion. These infographics are expected to serve as reference material for actors within the production chain, decision makers and producer organizations, which will be included in the toolbox.

In addition to the elaboration of infographics, two interviews were carried out with main actors of the experiences collected, which were carried out remotely. The first interview was conducted with María Fernanda Bonesso, Executive Director of “Agrojusto”, and the second was with Hubert Peri, Executive Director of “The Farmer Box”. Both managers were given a short introduction about the project, along with the objectives of the interview. Subsequently, they were asked about the reasons why progress was made in incorporating the technology, the number of producers reached by the

incorporated technology, some of the obstacles encountered and overcome, the main results obtained to date, and what they consider good inclusion practices that involve their enterprises. With these interviews it was possible to identify some other aspects that are not mentioned in the different information search sources.

9. *INCLUDAS Platform*

The platform called "INCLUDAS" was co-designed by the partners and developed by GFAR to store and manage all the information on experiences, good practices, learning resources through webinars and videos, surveys and studies carried out, news and events related to inclusive digital agriculture. In addition, it allows interested parties to create a user to include their resources. It is designed to be a dynamic platform to allow small farmers, through stories and interviews, to learn about the benefits of technology in agriculture.

The platform includes results from the survey on the current scenario and needs of inclusive digital agriculture, the total number of inclusive digital agriculture experiences together with summary infographics of each experience, the good practices for inclusion extracted from the experiences analyzed and the capsules of training on digital tools. Together, these resources strengthen the toolbox that the INCLUDAS platform represents, and which is expected to be consulted by producer families, decision makers, designers and implementers of technology applied to the agri-food sector, among others.

10. *Capacity building in digital tools*

Following the results of the analysis of training needs that are presented in the "Training Report" of the project, a training program on basic use of digital technologies was developed, which was called: "My first steps towards the digital world as a member of a producing agricultural family". That was produced by the Costa Rican company Cooperativa Sulá Batsú. The Program is made up of 8 capsules with the following topics:

- Internet: Access to services and agricultural information with a single click.
- Email as a communication tool for my farming family.
- The cloud and the agricultural sector: A tool for working and storing my information.

- Closing the gap: Online communication platforms for my farming family.
- Information at your fingertips. Efficient use of the internet as a search tool.
- Digital identity of my farming family: Access ticket to the digital world, its scope, and benefits.
- Social networks as an input to build a community that strengthens my family farming business.
- Digital security first. Good practices for effective digital security.

The Training Program can be found at <https://includas.gfar.net/content/training-capsules-digital-tools>

Two training activities were developed using the capsules produced by the project:

- Directed training: Small producers were invited to a training session where the capsules were used as training material that the facilitators used to accompany the development of new knowledge of the participants.
- Self-directed training: The capsules were placed online and available to producers in the region and an assessment form was kept for 10 days to receive input.

The first training edition that was carried out in September 2022 had the participation of 35 small producers.

The results are satisfactory in terms of utility, pedagogical mediation and learning acquired. Details of the entire assessment can be seen in the Project Training Report.

11. Consultation with stakeholders on good practices for the inclusion of digital agriculture

Coordination, planning and development of a consultation forum with different direct and indirect actors involved in the inclusive digitization of agriculture was carried out. The forum was held virtually on Friday, October 14, 2022, with the total presence of 20 people, belonging to the Inter-American Institute for Cooperation on Agriculture (IICA), the Confederation of Family Producer Organizations of the Expanded Mercosur (COPROFAM), University of Zamorano - Honduras, Cooperativa Sulá Batsú, the Agricultural Research Institute of Panama (IDIAP), the Foundation for the Development of Agricultural and

Forestry Technology of Nicaragua (FUNICA) and some of the people participating in the survey carried out at the beginning of Project. The forum had a final duration of 90 minutes.

A presentation was made on the main results obtained from the activities carried out during the project, developing the following points:

- A review of the context of the project, the proposed objectives and the central theme of the consultation on good inclusion practices.
- Explanation of the challenges encountered to address the issue of inclusive digital agriculture, considering what was obtained from the literature review and the results of the survey.
- A tour of the INCLUDAS platform and the resources that are currently on the website, for later search by those interested.
- A detailed explanation of the 5 categories proposed for good inclusion practices, commenting on each one and exemplifying with one of the most outstanding experiences in each category.
- Lastly, the dialogue was opened to allow participants to share their views and obtain feedback on the content developed regarding good practices, and also learn about new experiences that the participants would like to share.

The presentation made during the event can be found on the INCLUDAS platform at <https://includas.gfar.net/content/presentation-discussion-forum-good-practices-digital-inclusion-agriculture>

Among the main feedback observations, participants highlighted the importance and transcendence of associativity in all processes of development and implementation of inclusive digital projects in agriculture. They also commented on the need to implement technological tools based on the needs of farming families and not as an imposed initiative, which can bring little benefit or advantages to farming families. In parallel, Luis Alberto Sandoval, professor at the University of Zamorano, Honduras, responsible for one of the analyzed experiences, highlighted the need to consider technological surveillance, avoiding duplication through knowing what type of technology is available in the market, the opportunities for improvement and continuing to develop based on this information.

On behalf of IICA, Federico Bert commented on the importance of determining these good inclusion practices and their subsequent development into concrete actions, by means of suggestions and/or recommendations, which become action tools for political decision-makers and technology developers, among others. In addition, he pointed out the complexity of digitizing a sector such as agriculture, since the typology of the producing family and the specific reality of its members must be considered, so that it allows the most inclusive digitization possible. In addition to this, the need for sustainability in the initiatives was highlighted, both from an economic and social perspective, and the implementation time of the technology, which must be sustained for enough time to cause the desired positive effects.

Finally, another of the points discussed was on the governance and privacy of data and the legal framework that involves this issue. At this point, the participants were invited to review the content of the webinar, on the INCLUDAS platform, on data governance of producer families, developed at the beginning of the project with GODAN.

Summary of the specific feedback elements obtained from the consultation participants:

1. Importance of associativity.
2. Development and implementation of technology based on needs and consideration of the topology of the production family and the reality of its members.
3. Development of a technology surveillance methodology.
4. Complement good inclusion practices in concrete action tools.
5. Economic, social and temporal sustainability of the initiatives.
6. Data governance and privacy.

Final reflections

The activities planned for the collective action were completed and the final outputs are all in the INCLUDAS platform. The work carried out shows that it is urgent to continue working on the issue of inclusive digital agriculture. A need and a demand have been identified to continue strengthening this approach with a regional focus.

The default trend mainly favors digital tools for large-scale agriculture, thus increasing the large gaps and inequities in the agricultural sector. Working with an inclusive digital agriculture approach, like the one built in this project, can contribute to other forms of incorporation and appropriation of digital technologies that are useful for small-scale farmers.

References

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