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EL SALVADOR

GREENHOUSES 2.0: TECHNOLOGY ADOPTION AND INNOVATION FOR SMALL FARMERS IN EL SALVADOR

(ES-T1346 AND ES-G1006)

DONORS MEMORANDUM

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PROJECT SUMMARY
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Climate change will undoubtedly be one of the main factors impacting global agricultural production in the future, especially in the case of small and medium producers. In El Salvador, fresh produce (fruits and vegetables) continues to be marketed by traditional means involving a long intermediation chain, very limited information at the field level, and very little coordination of distribution and delivery logistics. Post-harvest handling losses (including during the marketing process) are extensive. In addition, producers are widely scattered and fragmented and have few mechanisms for coordination or information flows.

The exclusion of rural areas from the digital world is not only a sociocultural reality but also a productive, financial, and commercial weakness that has a direct impact on the competitiveness of agricultural enterprises and rural residents' quality of life in El Salvador. The solutions that have been proposed for enhancing small farmers' climate resilience rely on technologies and innovations that are not yet readily available. Clear-cut strategies for advancing and ensuring the sustainability of these types of solutions (precision farming or big data) have also been lacking. The shortage of financing is an additional constraint, and none of the cases have involved the use of farming cooperatives to scale up this kind of initiative.

This project will help to raise the incomes of the small producers and suppliers of the Canasta Campesina Agricultural Production Cooperative and Limited Liability Association (ACPACAC) and enhance the sustainability of the organization. To achieve this objective, the project will seek to overhaul the business strategy of ACPACAC and provide support to 2,000 of its member producers (50% of whom will be women) by: (i) implementing a business model based on climate-smart agriculture that uses precision technology and data management and introduces these solutions onto the ACPACAC farm and member producers' plots to boost the efficiency of production; and (ii) providing innovative marketing solutions that will directly benefit these producers and suppliers by helping them develop and scale up the market to support the sustainability of ACPACAC.

This project will be the first effort to support the transformation and digitalization of the fruit and vegetable production system in El Salvador with a clear gender-based approach, as 50% of the beneficiaries will be women farmers. The IDB Lab operation will involve two different financial instruments totaling US\$400,000 (32.5% from a contingent recovery investment financing and 67.5% from nonreimbursable technical cooperation). ACPACAC will contribute US\$400,000 in counterpart financing for this project, which will be executed over a period of 36 months.

**INFORMATION AVAILABLE IN THE TECHNICAL DOCUMENTS SECTION OF THE IDB LAB
PROJECT INFORMATION SYSTEM**

Annex IV	Itemized budget, including milestones (preliminary)
Annex V	Comprehensive diagnostic assessment of executing agency capacity, including due diligence and an integrity analysis
Annex VI	Integrity due diligence
Annex VII	Terms and conditions for IDB Lab contingent recovery investment financing

ABBREVIATIONS

ACPACAC	Asociación Cooperativa de Producción Agropecuaria Canasta Campesina de Responsabilidad Limitada [Canasta Campesina Agricultural Production Cooperative and Limited Liability Association]
AECID	Agencia Española de Cooperación Internacional para el Desarrollo [Spanish Agency for International Development Cooperation]
AFD	Agence française de développement [French Agency for Development]
AI	Artificial intelligence
ANPECOES	Asociación Nacional de Productores Ecológicos de El Salvador [National Association of Ecological Producers of El Salvador]
B2B	Business-to-business
B2C	Business-to-consumer
CIAT	International Center for Tropical Agriculture
CLUSA	Asociación para el Desarrollo CLUSA de El Salvador [CLUSA Development Association of El Salvador]
ICAFE	Instituto del Café de Costa Rica [Coffee Institute of Costa Rica]
IDB	Inter-American Development Bank
IICA	Inter-American Institute for Cooperation on Agriculture
IoT	Internet of Things

EXECUTIVE SUMMARY
GREENHOUSES 2.0: TECHNOLOGY ADOPTION AND INNOVATION FOR SMALL FARMERS
IN EL SALVADOR
(ES-T1346 AND ES-G1006)

Country and geographic location:	El Salvador		
Executing agency:	Canasta Campesina Agricultural Production Cooperative and Limited Liability Association (ACPACAC)		
Focus area:	Climate-smart farming/Gender and adaptation to climate change		
Coordination with other donors/Bank operations:	The project is closely aligned with the IDB Group's Institutional Strategy and Vision 2025: Reinvest in the Americas, particularly with growth opportunities for small and medium-sized enterprises (SMEs) and support for gender and diversity. It also ties in with operations developed by the Environment, Rural Development, and Risk Management Division of the IDB, notably operation ES-L1135 "Strengthening the Climate Resilience of El Salvador's Coffee Forests," specifically efforts for agricultural diversification of coffee plantations where the experience of ACPACAC can be leveraged.		
Project beneficiaries:	Direct beneficiaries: 2,000 small and medium-sized producers of fruits and vegetables, who are members of ACPACAC or who partner with it (50% women).		
Financing:	Nonreimbursable technical cooperation	US\$270,000	34%
	Contingent recovery investment financing	US\$130,000	16%
	Total IDB Lab (MIF) contribution:	US\$400,000	50%
	Counterpart:	US\$400,000	50%
	Total project budget:	US\$800,000	100%
Execution and disbursement period:	A 36-month execution period and a 42-month disbursement period for the nonreimbursable technical cooperation. ¹		
Special contractual conditions:	The following will be conditions precedent to the first disbursement of the nonreimbursable technical cooperation: (i) the selection of the project coordinator; and (ii) the formulation of the work plan (financial plan, procurement plan).		
Environmental and social impact review:	This operation was screened and classified in accordance with the Bank's Environment and Safeguards Compliance Policy (Operational Policy OP-703) on 8 November 2021. Since the impacts and risks are limited, it is proposed that the project be classified as a Category "C" operation.		
Unit responsible for disbursement:	Country Office in El Salvador (CID/CES)		

¹ Under IDB Lab policies and procedures, the execution period is to be 36 months in duration, starting from the date that the agreement with the executing agency is signed, and the disbursement period for the nonreimbursable technical cooperation is to be up to 42 months in duration.

I. THE PROBLEM

A. Description of the problem

- 1.1 The increase in the mean annual temperature and reduction in precipitation projected for 2030² due to the effects of climate change will have significant impacts on agriculture throughout El Salvador. As a result, the areas suitable for the crops that support agricultural exports and the food security of campesinos are likely to change in the future. Some municipios will gain production capacity for certain crops while others will lose it. The rural population's ability to adapt to these changes, whether they result in losses or gains, will depend on their access to basic services, information, and **resources for innovation and healthy ecosystems**.
- 1.2 In El Salvador, as in several other Central American countries, fresh agricultural products (fruits and vegetables) continue to be marketed by traditional means involving long intermediation chains, very limited information at the field level, and very little coordination of distribution and delivery logistics. A large percentage of this sector's output is lost during the post-harvest marketing process. In addition, stakeholders are widely scattered and fragmented, and they have few means at their disposal for sharing information. Yet another factor is that El Salvador imports over US\$100 million in vegetables from neighboring countries each year, including staples³ such as tomatoes, cucumbers, onions, potatoes, oranges, papayas, pineapples, and avocados. The Salvadoran agriculture sector represents 5.8% of the country's gross domestic product (GDP) and employs nearly 20%⁴ of its economically active population but cannot satisfy domestic demand on its own. One of the main problems in this regard is the low use of new agricultural technologies.
- 1.3 Many obstacles have prevented the agriculture sector in the region, and particularly in El Salvador, from realizing its full potential, including: (i) low productivity; (ii) limited financial inclusion (in terms of access, for example, El Salvador has 14.8 bank branches for every 100,000 adult residents, whereas the regional average is 52);⁵ and (iii) a low level of resilience to external crises, such as those caused by climate change and the global COVID-19 pandemic. According to the 2021 Climate Risk Index, El Salvador is ranked 28th among the countries in the world most affected by climate change from 2000 to 2019.⁶ Between 1980 and 2008, natural disasters affected over 2.9 million people in the country and caused some US\$470 million in economic losses per year (4.2% of GDP). The agriculture sector is highly exposed to the threats associated with climate change, and recurrent droughts in the Central American Dry Corridor exacerbate the country's poverty and food insecurity.

² International Center for Tropical Agriculture (CIAT), 2017.

³ Market Intelligence System, Ministry of Agriculture.

⁴ *Análisis de Políticas Agropecuarias de El Salvador*. 2020. IDB Agrimonitor.

⁵ Financial Development Index.

⁶ Climate Risk Index 2021. Germanwatch.

- 1.4 Available gender statistics for the region of Central America, including the Dominican Republic, indicate that women make up 20% to 30% of the workforce in the agriculture sector,⁷ whereas in Latin America and the Caribbean as a whole, the agriculture sector employs 62.1% of the male workforce in rural areas and 40.8% of the rural female workforce.⁸ This asymmetry is partly a reflection of the high levels of insecurity and violence in Central American and Caribbean countries. Yet obtaining jobs in the agriculture sector is not the only challenge facing women; it is also much more difficult for them to become landowners and gain access to other agricultural assets such as irrigation systems. Women farmers also have more limited access to agricultural extension and technical support services.⁹
- 1.5 Experiences with technology and innovation in certain productive sectors in El Salvador are still very limited, and some of those that do exist have a very specific focus, such as Cacao Móvil¹⁰ (digital consulting), Coffee Cloud¹¹ (pest and disease control), and Smart Agro 4.0¹² (smart-farming remote monitoring). These three projects, some of which are pilot projects, are regional in scope and include El Salvador as one of their execution sites. However, this type of initiative (focusing on precision agriculture or big data) has been impeded by a shortage of financing, and none of these ventures has sought to expand its scope and reach a larger number of producers through the formation of agricultural cooperatives. The exclusion of rural areas from the digital world is not only a sociocultural reality, but also a productive, financial, and commercial weakness that has a direct impact on the competitiveness of agricultural enterprises and rural residents' quality of life in El Salvador.
- 1.6 El Salvador and the Latin American and Caribbean region as a whole have clearly not been taking advantage of rapidly advancing innovations in agrotechnology¹³ or the increasing support for regenerative agriculture, which is a real option for replenishing the soil, boosting productivity, obtaining data that will enhance climate resilience, increasing profit margins and revenues, and doing all of this sustainably.¹⁴ These kinds of innovations continue to be concentrated in large countries, and their adoption by small farmers is limited.

⁷ Inter-American Institute for Cooperation on Agriculture (IICA), 2018, *Atlas for Agriculture in the Americas*.

⁸ Ibid.

⁹ *Panorama del ecosistema agro tecnológico para los pequeños agricultores de América Latina y el Caribe*, IDB Lab, February 2021.

¹⁰ Lutheran World Relief, 2017.

¹¹ Coffee Institute of Costa Rica (ICAFFE), 2017.

¹² Fruit and vegetable pilot program of Telefónica/Food and Agriculture Organization of the United Nations (FAO), 2018.

¹³ Regenerative agriculture involves the adoption of an entire range of natural processes and biological practices that significantly reduce the use of chemical inputs by replacing them with more natural ones that have been shown to be a very effective alternative. Examples include the use of biological methods to control infestations, the use of soil remineralization additives, soil bioactivation, cover crops, fallowing systems, crop rotation, the use of plant-based fertilizers, and crop diversification.

¹⁴ Currently, 80% of the agtech solutions being applied are concentrated in Brazil, Argentina, Chile, Colombia, and Mexico. Source: Yield Lab.

- 1.7 According to a study recently conducted by IDB Lab and GSMA,¹⁵ new technologies such as Internet of Things (IoT) sensors, drones, satellites, artificial intelligence (AI), and big data are increasingly laying the foundation for the use of digital agricultural tools in the region. IoT sensors, drones, and satellites are being used to automate data collection, making it more efficient and accurate for actors in the ecosystem. The use of AI and big data analytics are producing more detailed, personalized, and useful information that small farmers can draw upon to boost their output and cut their costs. This research, which has been validated at the international and regional levels, constitutes the basis for this project proposal.
- 1.8 The Canasta Campesina Agricultural Production Cooperative and Limited Liability Association (ACPACAC) is an anchor cooperative led by women and young people in the community of Comasagua, La Libertad. It has been formally operating for over seven years and is now in the process of piloting the adoption, on a small scale, of integrated precision-agriculture solutions by its member agroecological producers and suppliers. Because of its close ties with the community and the leadership role that it plays, ACPACAC plays a key role in deploying innovative solutions for producers facing the challenges discussed above. ACPACAC promotes agricultural production based on agroecological practices¹⁶ and has positioned itself in the market with a differentiated fair trade model.

II. THE INNOVATION PROPOSAL

A. Project description

Objective

- 2.1 The objective of the project is to help raise the incomes of the small producers and suppliers of the ACPACAC cooperative and enhance the sustainability of the organization. To achieve this objective, the project will seek to overhaul the business strategy of ACPACAC and provide support to 2,000 of its member producers (50% of whom will be women) by: (i) implementing a business model based on climate-smart agriculture that uses precision technology and data management and introduces these solutions onto the ACPACAC farm and member producers' plots to boost the efficiency of production; and (ii) providing innovative marketing solutions that will directly benefit these producers and suppliers by helping them develop and scale up the market to support the sustainability of ACPACAC.

Proposed model/solution

- 2.2 The project will help ACPACAC take its strategy for its fruit and vegetable business to the next stage in its digital transformation process by providing specialized technical assistance and contingent recovery financing for the purpose of boosting

¹⁵ *Landscaping the Agritech Ecosystem for Smallholder Farmers in Latin America and the Caribbean*, IDB, 2021.

¹⁶ Agroecology is a scientific discipline that dates back to the 1930s. It focuses on the biological interactions between the ecosystem and agriculture and is based on the following elements: diversity, co-creation and sharing of knowledge, synergies, efficiency, recycling, resilience, human and social values, culture and food traditions, responsible governance, and a circular and solidarity economy. Source: Food and Agriculture Organization of the United Nations (FAO), 2021.

producers' productivity and revenues. It will also support the climate resilience of ACPACAC and its producers by preparing them to function as part of a value chain that leverages the products and services of the ecosystems in which it operates. The project will provide for the installation of digital greenhouses on the ACPACAC farm and on the farms of its member producers who have the digital maturity to make use of this type of solution. It will also furnish expert assistance in the design and execution of lines of credit to support the implementation of this agricultural technology. These actions will be coupled with digital solutions for strengthening the cooperative's marketing capacity and expanding its business activities at the national level. Lastly, knowledge management activities will be undertaken to help transfer and scale up this model.

- 2.3 The nonreimbursable technical-cooperation component of the project will enable 2,000 member producers, suppliers, and partners of ACPACAC to learn about and implement digital precision-agriculture solutions that will boost their productivity. This will be made possible through data collection and analysis capabilities that will increase the accuracy of their decisions and management practices. Within the context of the project, this innovation is known as Greenhouses 2.0, a digital agriculture solution involving different electromechanical and robotic systems. Different types of sensors will measure internal and external conditions to provide the information needed for proper operation of the electromechanical systems (irrigation, opening and closing of ventilation systems, temperature control, CO₂ generation, solar panels, etc.) in order to monitor and maintain optimal crop conditions.
- 2.4 To help these agricultural producers become more climate resilient, the IoT-based¹⁷ innovations provided for in Greenhouses 2.0 will collect data on the use of water and other inputs in order to measure the reduction in greenhouse gas emissions. This operation will therefore play an important role in piloting efforts to transition the fruit and vegetable production sector toward an impactful climate adaptation and resilience model that lends itself to further replication.
- 2.5 The project will also explore the possibility of installing a renewable energy system using solar panels to power the IoT pumping system for sprinkler irrigation. The production system targeted by this initiative includes nearly 200 producers using different farming methods (market gardens, macrotunnels, parcels, and greenhouses) that produced nearly 60 tons of fruits and vegetables on 5.94 hectares of land in 2019.
- 2.6 The contingent recovery investment financing component aims to assist ACPACAC in building the productive capacity of its inclusive, and sustainable cooperative business model. This is to be accomplished by setting up digitalized greenhouses and other innovations in the commercial link in its value chain to take its member producers' and/or suppliers' productivity rates to the next level. The purchase of equipment and other innovations for the project will be facilitated by the provision of short-, medium-, and long-term credits tailored to the

¹⁷ The term "Internet of Things" refers to clusters of interconnected devices and objects in a network—whether a private one or the Internet (the network of networks)—in which all of them can "see" one another and interact. These can be any types of objects or devices, from sensors and mechanical devices to household appliances, clothing, etc.

agroecological production system used by the cooperative. This will also help to strengthen its business model and ties with its existing international partners (the French Agency for Development (AFD), Secours Populaire Français, the Spanish Agency for International Development Cooperation (AECID), and others).

Innovation

- 2.7 This project will be the first initiative in El Salvador aimed at promoting technologies and innovations that make the agriculture sector more environmentally sustainable, using a business model that is reinforced by various financial tools. The model that it will be piloting is based upon precision agriculture and data management systems that the cooperative's producers will use to increase the efficiency of the production, quality control, and marketing processes.
- 2.8 The services and activities included in the project will promote climate change mitigation and adaptation since these kinds of innovative solutions can be very effective in boosting efficiency, reducing the use of production inputs (such as agrochemicals, water, and energy), and cutting greenhouse gas emissions (mitigation).
- 2.9 Another innovative facet of this project is that ACPACAC will undertake an exhaustive search at the local and regional levels, which may include a call for proposals or an "innovation challenge," to find and select the best technology partner for the initiative and for subsequently scaling it up. Recently, ACPACAC has implemented a semidigital prototype greenhouse with Sistemas de Riego S.A. de C.V.,¹⁸ which has given it first-hand experience with the investments, benefits, and information that can be obtained from this type of innovation. The selection process will draw upon IDB Lab regional contacts (suppliers for IDB Lab operations) and international contacts (innovation hubs), thereby capitalizing on previous experiences.
- 2.10 From a marketing standpoint, the project will pioneer a technology-based model for improving marketing efficiency and linkages using business-to-consumer (B2C) and business-to-business (B2B) solutions to ensure that the cooperative's agroecological products will be readily available on the market. This will open up previously unexplored markets that can bolster the model's growth and sustainability. These innovations will include an e-commerce platform and a mobile application to help producers throughout the country connect with the market.

Lessons learned

- 2.11 **Technology for small farmers.** Since 2018, IDB Lab has been working to deepen its knowledge and actions for addressing the challenges confronting agriculture and natural assets. Its 2022-2023 plan continues to assign an important role to vertical processes and calls for the adoption and dissemination of low-level automation and digital agriculture solutions as a crucial step toward boosting the

¹⁸ <https://sistemasderiegov.com/>.

efficiency of small farmers.¹⁹ Digital agriculture solutions in particular have the potential not only to transform existing food systems into more productive, profitable, transparent, and agile systems, but also to improve farmers' livelihoods and increase their climate resilience by enabling them to optimize their natural resource use, implement sustainable practices, reduce waste, and adapt to climate change.²⁰ Unfortunately, the use of digital agriculture tools has not reached the same scale in Latin America and the Caribbean as it has in Asia and Africa²¹ owing, among other factors, to a lack of impact investors that could help scale up commercial digital agricultural solutions in the region. This makes their use in the proposed operation all the more important.

- 2.12 In terms of value added, IDB Lab will promote linkages with active operations such as "E-Kakashi" (operation CO-Q1007) and others that are incorporating innovations into the fruit and vegetable sector with a view to generating synergies, sharing lessons learned, and exploring the potential for scalability. IDB Lab's involvement will also ensure that the project will include the [Principles for Digital Development of the Digital Impact Alliance \(DIAL\)](#) and the resources made available by [fAIRLAC](#) for the use of AI in development.

Components

- 2.13 **Component I: Precision agriculture and climate resilience (IDB Lab contingent recovery investment financing: US\$130,000; ACPACAC: US\$113,500).** The objective of this component is to boost productivity by providing producers with multiple-source data collection and analysis capabilities that will increase the accuracy of their decision-making and management practices. This will involve the implementation of big data and precision-agriculture innovations such as integrated hardware and software (IoT) solutions, data analytics, and technological support for decision-making. To promote producers' climate resilience and mitigation activities, this technology will also make it possible to collect data on the use of water and other inputs (agrochemicals and energy) and measure the efficiency of production costs and reductions in CO₂ emissions. If this approach proves to be successful and cost-efficient, then this project will play an important role in piloting efforts to transition the fruit and vegetable production sector toward a more efficient, impactful, and replicable climate adaptation and resilience model.
- 2.14 Project resources will be used to provide specialized technical assistance and advisory services in the field for the installation of greenhouses 2.0 on parcels. A call for open innovation proposals will support the component's strategy for identifying the most suitable partner(s) for this initiative. A platform that functions online and offline may also be developed to collect and analyze data that can

¹⁹ Digital agricultural solutions range from low-tech solutions that rely on voice, short message service (SMS), and unstructured supplementary service data (USSD) to high-tech holistic tools that use satellites, drones, sensors, blockchain, artificial intelligence, and big data analytics. Small farmers are increasingly looking for more holistic agritech tools that address multiple pain points but do not require downloading several different applications and tools. Loukos, Panos, and Arathoon, Leslie (2020). [Landscaping the Agritech Ecosystem for Smallholder Farmers in Latin America and the Caribbean](#).

²⁰ GSMA (2020), *Digital Agriculture Maps: 2020 State of the Sector in Low- and Middle-Income Countries*.

²¹ Loukos, Panos, and Arathoon, Leslie (2020). [Landscaping the Agritech Ecosystem for Smallholder Farmers in Latin America and the Caribbean](#).

- improve decision-making by the cooperative and its producers. The component will also seek to link up with solutions for increasing connectivity in the area based on a value proposition that is aligned with the producers' characteristics and needs.
- 2.15 The **main activities** to be carried out by ACPACAC under this component will include: (i) installing and outfitting greenhouses 2.0; (ii) developing a platform for tracking the data collected by the greenhouses 2.0; (iii) providing connectivity services to facilitate the operation of the technology solutions that are installed; (iv) developing policies and manuals for the incorporation of credit products²² to help adapt innovations in agricultural production processes; and (v) providing expert technical support for loan placement and monitoring.
- 2.16 The **main outputs** of this component will be: (i) nine greenhouses 2.0²³ set up on the ACPACAC farm and on producers' plots; (ii) 15 loans issued to member producers of the cooperative to help incorporate technology and innovations that support quality standards and production efficiency (50% of these producers will be women); and (iii) a platform for tracking the data collected by the greenhouses 2.0 that is up and running.
- 2.17 **Component II: Value chain innovations to improve market linkages (IDB Lab nonreimbursable technical cooperation: US\$126,000; ACPACAC: US\$94,900).** The objective of this component is to strengthen producers' linkages with commercial actors in the production chain by promoting a robust e-commerce solution for connecting with customers. This solution should link the processes of growing, harvesting, processing (where applicable), packing, and logistics for the delivery of small farmers' products to their customers. It will include a mobile application, digital marketing, customer service, and sales components for the cooperative, thereby further developing the B2C model (consideration will be given to partnering with the Hugo app and its hugoFresh line for marketing local agricultural products) and developing a B2B model with actors in relevant chains (restaurants, hotels, organic grocery stores, etc.).
- 2.18 The **main activities** to be carried out by ACPACAC under this component include: (i) strengthening the commercial arm of the cooperative through the introduction of innovations such as an e-commerce portal, an app, and digital payment solutions; (ii) providing technical advisory services to assist the cooperative in mapping its producers, connecting them with commercial solutions, and supporting their linkages with the market; (iii) promoting a commercial and marketing strategy, with emphasis on digital media, to support the initiative's commercial efforts; and

²² The loans provided for under Component I will finance the outfitting and installation of the nine greenhouses described in this section. The cooperative will also receive support under this component for: (i) developing policies and manuals for the incorporation of credit products to help adapt innovations in agricultural production processes; and (ii) a technical expert will be hired to provide support for the placement, monitoring, and recovery of credit products designed and implemented as part of the project. Both of these activities are included in the project budget.

²³ The number of greenhouses to be set up under the outputs for Component I has been determined based on: (i) a cost analysis for the semidigital prototype greenhouse developed by the cooperative that is now in operation; (ii) a study of the cooperatives' members and producers that identified the producers with the installed capacity to adopt the technology and make payments on a loan to finance the implementation of this innovation; and (iii) the amount of funding estimated by IDB Lab for the introduction of this equipment under the contingent recovery investment financing.

- (iv) developing the logistics process in conjunction with the commercial partnerships that are formed.
- 2.19 The **main outputs** of this component will be: (i) 10 formally established commercial partnerships to strengthen the model and its sustainability; (ii) one e-commerce platform, app, and digital payment system developed; and (iii) 1,000 agroecological producers, 50% of whom will be women, who join the e-commerce platform developed as part of this initiative.
- 2.20 **Component III: Packaging, sustainability, and scalability of the model (IDB Lab nonreimbursable technical cooperation: US\$78,000; ACPACAC: US\$132,000).** The objective of this component is to validate the model piloted with the support of this project, package it, and share a hybrid (digital and in-person) version with other producers' cooperatives or associations that are interested in taking part in this initiative. Steps will be taken under this component to form a partnership with the National Association of Ecological Producers of El Salvador (ANPECOES), the leading legally constituted association of agroecological producers in the country. The main goal of ANPECOES is to promote and strengthen the work of the many different agroecological production initiatives in El Salvador. Its members are agricultural producers who use organic and agroecological practices to farm indigo, cocoa, coffee, fruits, vegetables, and other crops. A digital platform will be created to link products and consumers across the country, which will support scaling in the neighboring countries of Guatemala and Nicaragua. It is important to point out, however, that funds from this operation will not be used in the countries identified for scaling efforts in the short run.
- 2.21 To achieve this objective, the following **activities** will be carried out by ACPACAC under this component: (i) systematizing the agroecological production process of Canasta Campesina; (ii) developing digital products and a learning management system (LMS) digital platform that will include information on agroecological production methods and how to use commercial innovations to generate more revenues while scaling up the model; (iii) facilitating technical assistance in fine-tuning the Canasta Campesina business plan; and (iv) promoting knowledge products and disseminating information about the model.
- 2.22 The **main outputs** of this component will be: (i) the development of documentation and the packaging of the agroecological production process and its scale model; (ii) at least 10 digital outputs²⁴ to facilitate its transfer and scalability; and (iii) a business plan to support the sustainability of Canasta Campesina.

²⁴ For example, a learning management system (LMS) or e-learning platform that can be used to provide online courses and training materials, administer the courses, manage student data, and do so more efficiently.

B. Project results, measurement, monitoring and evaluation

Main indicators in the Results Matrix

2.23 The following table lists the main indicators²⁵ that will be measured during the life of the project and that will provide inputs for IDB Lab’s key performance indicators (KPIs):

Indicators	Target at project completion
Average increase in the incomes of member producers and/or suppliers of the cooperative	25%
Average increase in the incomes of women producers belonging to the cooperative and/or women suppliers for the cooperative	25%
Increase in the volume of agroecological products placed on new markets ²⁶	20%
Number of producers that succeed in entering new markets ²⁷	500
Average productivity gain ²⁸ on the plots of agroecological producers	15%

2.24 The project will design and implement a monitoring and evaluation system to measure the effects and results of the installation and operation of the greenhouses 2.0. This work will be undertaken with the support of the technology partner selected under Component I through a call for open innovation proposals to support the strategy. Resources will be provided for setting a baseline and undertaking midterm and final measurements of the outcomes, which will help systematize and scale the model based on a highly reliable information system with a standard margin of error for monitoring and evaluation. The data collection and digital processing system will be supported by site visits during which an estimated 200 parcels (producers) will be surveyed and monitored. Funding has been earmarked for an external evaluation upon project completion. The monitoring and evaluation system will report on project indicators, in accordance with the theory of change, to IDB Lab’s project status report system, the project completion report, and the systematization and final evaluation of the model.

²⁵ See the project’s Results Matrix in the annex for further details.

²⁶ In order to determine which indicators to use, the IDB Lab and ACPACAC teams projected scenarios based on the semidigital prototype greenhouse set up in 2022 and looked at the results during the first stage of the harvest. They also examined the statistics compiled by the cooperative on harvests and output over the past five years. This served as a basis for them to work with the executing agency to co-design and validate the targets. One of the project’s primary objectives is to help the cooperative define the unit economics for the cooperative and its producers in a more accurate and automated manner. The IoT devices and monitoring platform installed in the greenhouses 2.0 will track the indicators, check their performance, and, above all, provide quality information to the cooperative for use in decision-making.

²⁷ For the purposes of this project, new markets for Canasta Campesina products are defined on the basis of transactions with other businesses that the cooperative has not yet worked with, such as restaurants, hotels, etc. (a B2B model), or sales in regions where the cooperative has not done business before, such as the eastern and western parts of the country.

²⁸ Productivity gains help improve the cost-benefit structure. Higher output volumes make it possible to place products on new markets and thus boost revenues for the producers and the cooperative. This, in turn, increases their ability to repay the loans issued to enable them to incorporate new technology.

III. ALIGNMENT WITH THE IDB GROUP, SCALABILITY, AND PROJECT RISKS

A. Alignment with the IDB Group

- 3.1 The project is closely aligned with the IDB Group's Institutional Strategy and its Vision **2025: Reinvest in the Americas**, particularly with growth opportunities for small and medium-sized enterprises (SMEs) and support for gender and diversity. It is in keeping with the strategic development objectives of IDB Lab and Sustainable Development Goals **2 (Zero hunger)**, **5 (Gender equality and empowerment of women)**, **8 (Decent work and economic growth)**, and **13 (Climate action)**, particularly as they relate to food security and combatting climate change, since these types of solutions can especially help farmers adapt to climate change (higher revenues and productivity and more knowledge) and contribute to cutting greenhouse gas emissions (mitigation).
- 3.2 The **IDB Group Country Strategy with El Salvador 2021-2024**, particularly the priority area of **reactivation and restructuring of production**, address challenges in access to opportunities and innovation based on rurality, income levels, gender, and digital transformation. It is also closely tied to operations carried out by the Environment, Rural Development, and Risk Management Division of the IDB, specifically project ES-L1135, "Strengthening the Climate Resilience of El Salvador's Coffee Forests," and its efforts for agricultural diversification of coffee plantations, where the experience of ACPACAC and the knowledge, experience, and lessons learned in connection with the greenhouses 2.0 model can be leveraged.
- 3.3 The project falls directly under the vertical of **agriculture and natural capital, especially the areas of gender and climate change adaptation**, all strategic topics for IDB Lab. It is closely aligned with IDB Lab operation CO-Q1007 (E-Kakashi) and others that are incorporating innovations into the fruit and vegetable sector, which will help promote synergies, share lessons learned, and explore scalability. IDB Lab will also ensure that the project includes the Principles for Digital Development of the Digital Impact Alliance (DIAL) and the resources made available by fAIrLAC for the use of AI in development initiatives. Synergies will be sought with the Wayfi S.A. initiative (operation GU-L1187) being supported by IDB Lab direct investment, with a view to determining if it could be scaled to include the project area in El Salvador (Comasagua, La Libertad). Since 31.5% of the operation's resources are invested in climate change mitigation and/or adaptation activities, according to the joint methodology of the multilateral development banks for tracking climate change adaptation finance, the project will also contribute to the IDB climate finance target of 30% of annual approvals.
- 3.4 **Integrity analysis.** With the assistance of the Office of Institutional Integrity, the project team conducted integrity due diligence on the executing agency in accordance with the guidelines set out in Operational Policy OP-474-1. Based on the integrity risk indicators and mitigating factors that were identified, the integrity and reputational risks of this project are considered to be within IDB Lab's tolerance for such risks. See the integrity annex for further details.

B. Scalability

- 3.5 The scale of the project has been determined in coordination with the ANPECOES platform. Tools, knowledge, and lessons learned are being shared with agricultural producer organizations whose membership includes more than 2,000 small-scale producers (50% of whom are women²⁹). ACPACAC plans to make these commercial solutions available nationwide to welcome the participation of as many agroecological producers as are interested in this model. In coordination with the Canasta Campesina cooperative, ANPECOES will place a great deal of emphasis on partnering with other interested parties and is starting up a nationwide digital platform that will bring producers and consumers together. At the international level, the project will share its experience (which is applicable in locations similar to the project area in Central America) with regional and international networks of agroecological and organic producers. ACPACAC will scale up the financing model so that it can be used not only by its members but also by small and medium-sized family farms in Chalatenango and Apaneca in the department of Ahuachapán.
- 3.6 Another strategic partner in the effort to scale up this model will be the CLUSA Development Association (CLUSA), a Salvadoran nonprofit established in response to the agriculture sector's growing need for technical assistance in the areas of production, the development of agribusiness, and the marketing of nontraditional crops for the export and domestic markets that have been grown using environmentally friendly techniques. CLUSA has a significant number of member producers who share the philosophy of ACPACAC regarding agroecological production and is therefore regarded as a good potential partner.
- 3.7 Lastly, an effort will be made to work with restaurants, hotels, and stores specializing in organic and eco-friendly products to increase the private sector's market share based on a B2B model. In the medium or long term, once ACPACAC has come into its own, it will explore the possibility of working with nationwide supermarket chains to market an agroecological line of fair-trade products. The project will also seek to link up with the hugoFresh segment of the Hugo super app to connect more easily with end consumers at the individual and household level.
- 3.8 The French Agency for Development (AFD) may provide resources for scaling up this model. An effort will be made to expand the scope of Component II to include cities and/or regions in the eastern and western parts of the country and to ensure that ACPACAC will carry this initiative forward over time. There are also plans to provide a presentation and evaluation of a scale model for Guatemala and Nicaragua in the next five years. Productivity levels in these countries are also low, and 31% of total employment in both of these countries is in the farm sector.³⁰

C. Project and institutional risks

- 3.9 **Climate or natural disaster risks:** Natural phenomena such as El Niño/La Niña and the effects of climate change that pose threats to the producers belonging to

²⁹ Estimate based on Canasta Campesina's operations over the past 10 years. In Comasagua, 70% of the agricultural producers working with the cooperative are women.

³⁰ World Bank, 2019, <https://datos.bancomundial.org/indicador/SL.AGR><https://datos.bancomundial.org/indicador/SL.AGR.EMPL.ZS.EMPL.ZS>.

- the cooperative could have a direct negative impact on productivity, income, and, consequently, repayments on the loans. **Mitigating factors:** (i) Diversification: These production units' revenues are generally a sum total of more than one income-generating activity, e.g. produce (fruits and vegetables); coffee; organic production inputs; consulting and training; project revenues, etc. This allows for a better distribution of risk for small producers and the cooperative, since some activities may be, for example, more sensitive to drought while others will be more resistant, or they may offer more options for managing sources of risk; (ii) The recommendation that farm protection funds be established: solidarity-based funds of this sort, which fit in with the philosophy of ACPACAC, can be used to shield member producers from certain types of risks. Such funds would be subject to regulations approved by the cooperative's board and could provide members with coverage for such risks as: (a) hailstorms, (b) crop losses due to fires, (c) the failure of plants to germinate because of heavy rain, or (d) crop losses due to strong winds.
- 3.10 **Operational production risks:** Such risks could arise if small producers do not attain the expected productivity gains for any reason, such as difficulties in adopting precision agriculture solutions, communication issues, or management errors. **Mitigating factors:** Stakeholder experience with precision agriculture and technical assistance is a mitigating factor since productivity gains are related to the correct application of the technology in question and access to the knowledge conveyed through technical assistance. The investment and intensive effort to improve technical assistance under this project, together with support and the provision of digital tools, will seek to prevent cooperative members from misapplying or failing to apply the model. Prompt corrective action can lead to better outcomes, which is why the site visits and hands-on producer support in this initiative are so vital.
- 3.11 **Market risk:** Fluctuations in the demand for the types of crops in question (fruits and vegetables) and price volatility. **Mitigating factors:** (i) Ever since Canasta Campesina began operation, it has had pre-sale agreements with its customers for its fruits and vegetables under which a price is set that will cover the operational and production costs for a percentage of the projected harvest. The pre-sale price is reviewed periodically by the cooperative and adjusted for inflation; (ii) A second important mitigating factor is the cooperative's strategy for greater diversification (B2C, B2B, etc.) and the agriculture sector's drive to industrialize its operations in the medium and long terms and to include processed products (sauces, pickled foods, etc.).
- 3.12 **Operational risks for the contingent portion of the project:** Mismanagement of the credit portfolio as reflected in an increase in arrears, refinancing, provisions, and repossessions could reduce asset quality. **Mitigating factors:** (i) The project will provide the cooperative with expert support for the creation of a lending procedure and policy in line with the standards of the regulatory authority;³¹ and (ii) The member producers' adoption of precision agriculture techniques will

³¹ Salvadoran Institute for the Promotion of Cooperatives (INSAFOCOOP), http://www.insafocoop.gob.sv/?page_id=982.

increase their productivity and revenues and will put them in a stronger position to meet their financial obligations.

- 3.13 **Institutional partnership risk:** The relationship between ACPACAC and ANPECOES as they deploy a strategy to strengthen the marketing link and the model's scalability may pose challenges for successful execution. **Mitigating factors: (i)** These organizations have had experience working with each other on various successful initiatives since 2019 and have developed strong mutual trust. During the design of this project, lessons learned from past experiences were analyzed. One key aspect included in the design was the importance of having a focal point (an experienced general coordinator with technical expertise) based in ACPACAC that will communicate and coordinate closely with ANPECOES on operational plans for project execution.
- 3.14 **The impact of COVID-19:** The board of directors of ACPACAC believes that 2022 will yield good results despite the pandemic. From the outset, ACPACAC decided that it would not lay off any employees and would guarantee their job stability, which helped bring trust and peace of mind to cooperative members and the community. The pandemic has had different impacts that have altered habits and places of consumption, which in turn has affected the cooperative's various channels. Nonetheless, Canasta Campesina has succeeded in adapting to the circumstances and has leveraged its commercial partners in order to get its products to market (organic grocery stores, delivery services, etc.). Despite these changes in consumption patterns, the cooperative has grown thanks to its introduction of digital sales channels on social media (WhatsApp, Instagram, Facebook) and digital payments through bank transfers.

D. Financial analysis

- 3.15 As noted in the section on Component I, the project includes a US\$130,000 contingent recovery investment financing from IDB Lab for experimentation with and implementation of greenhouses 2.0, including outfitting and the technology needed for development. The financing will be executed and managed by ACPACAC, which will assume the exposure and potential repayment to the Bank. Detailed information on this financial instrument is provided in the section on the budget.
- 3.16 The project's sustainability is supported by: (i) Canasta Campesina's 10 years in operation and the services it provides to its members in Comasagua; (ii) the sound financial position of ACPACAC, which enables it to back the contingent portion of the operation and meet the financial obligations, if the initiative is successful; (iii) official financial projections for ACPACAC are not available, but support will be provided for it to prepare these projections during the initial months of execution in line with the business plan, which will help the cooperative on its path to sustainability; and (iv) its proven interest in promoting innovation and precision agriculture (it has already built an initial greenhouse 2.0 prototype), along with its pioneering role in agroecological agriculture and now in the implementation of productive innovations.
- 3.17 The ACPACAC financial statements for 2020 (prepared at fiscal year end and included in an annex to this document) indicate that the cooperative had assets totaling US\$442,000, with annual growth of 8% in the past two years. In all, 80%

of its assets are financed by equity and 20% by liabilities. In recent years, its asset position has remained stable and has grown considerably with the cooperative's acquisition of its "Eco finca" (ecological farm) property. The cooperative is not in debt to local or international financial institutions. This operation will be the first undertaking involving anything akin to the assumption of a debt. The most recent audited financial statements are for 2019, so steps will be taken during the first months of execution to provide ACPACAC with support for the preparation of audited financial statements throughout the life of the project.

- 3.18 Sales revenue (including sales of agricultural products, production inputs, consultant services, training, and so forth) amounted to US\$298,000 for 2019 and US\$617,000 for 2020. This strong growth performance attests to the marketing efforts led by the cooperative and its members. In the last five years, ACPACAC has seen an average increase of 20% in gross sales of agricultural products (fruits, vegetables, etc.), from US\$59,200 in 2017 to US\$115,700 in 2021, which reflects a clear growth trend and market diversification (first-time sales to hotels and restaurants and sales of processed products, among others).
- 3.19 It is evident that 2019 and 2020 were important years in the transition of ACPACAC from a deficit to a surplus position. Although the results for those years do not yet reflect a definite trend, they nonetheless point to a path toward steady growth and sustainability of the model, which will be strengthened by this operation.

IV. INSTRUMENT AND PROPOSED BUDGET

- 4.1 The project will have a total cost of US\$800,000, of which \$400,000 (50%) will be provided by IDB Lab and \$400,000 (50%) by ACPACAC as the counterpart.

Annex II					
Summary Budget					
(ES-T1436 and ES-G1006)					
Greenhouses 2.0: Technology Adoption and Innovation					
for Small Farmers in El Salvador					
Components	IDB Lab contingent financing	IDB Lab nonreimbursable	ACPACAC cash	ACPACAC kind	Total
Component I: Precision agriculture and climate resilience	130,000	-	78,500	35,000	243,500
Component II: Value chain innovations to improve market linkages	-	126,000	46,500	48,400	220,900
Component III: Packaging, sustainability, and scalability of the model	-	78,000	55,000	77,000	210,000
Project administration	-	66,000	20,000	39,600	125,600
TOTAL	130,000	270,000	200,000	200,000	800,000
		400,000		400,000	
Pari passu		50%		50%	100%

- 4.2 The instruments to be used for this operation are nonreimbursable technical-cooperation funding of US\$270,000 and contingent recovery investment financing of US\$130,000.

- 4.3 **Contingent recovery investment financing:** The cooperative will repay IDB Lab once its marketing and credit activities begin to generate operating revenues but not before 24 months have elapsed. In other words, it will have a two-year grace period before it starts repaying the principal based on a payment plan up to eight years (96 months) in duration. ACPACAC will repay IDB Lab's contingent financing if it achieves the following results within three years after the project is launched: (a) **A sustained 5% annual increase in revenue including sales, interest, and other income.** This repayment trigger is defined on a preliminary basis in the document and will be subject to review and adjustment 12 months after the effective date of the operation's execution. In the event that a change is required, an addendum to the agreement will be signed. The disbursement of the contingent recovery investment financing is subject to the following conditions:
- (i) The following will be conditions precedent to the first disbursement within the first six (6) months following the date on which the agreement is signed: (a) projected financial statements for ACPACAC, to include its commercial business and credit lines; (b) the ACPACAC business plan based on those financial projections; (c) an analysis of the producers' repayment ability prepared with the assistance of an external consultant with experience in agricultural finance; and (d) a financial analysis and proposal regarding the technologies to be procured with the financing;
 - (ii) The following will be conditions precedent to the second disbursement, to be made within eighteen (18) months from the date on which the agreement is signed: (a) an operations report; and (b) financial statements for the commercial and credit operations of ACPACAC after at least 360 days have elapsed from startup.

V. EXECUTING AGENCY AND IMPLEMENTATION STRUCTURE

A. Description of the executing agency

- 5.1 Canasta Campesina Agricultural Production Cooperative and Limited Liability Association (ACPACAC) is a cooperative association established in 2014 under the laws of El Salvador by women and young farmers of the municipio of Comasagua, La Libertad.³² It produces and markets agroecological products such as vegetables, aromatic herbs, fruits, and eggs. Its chief purpose is to provide legal and financial support to producers for marketing their products and to play a leading role in ensuring the food security of its members and their families. Canasta Campesina is a unique initiative based on a social enterprise model in which the beneficiaries (chiefly women and young people) play an integral, active role in all phases of the business cycle, from production to marketing.

³² This locale has a cool, pleasant climate and a total area of 75.05 square kilometers (km²), almost all of which (7.75 km²) is rural, as its urban area measures just 0.30 km². It is heavily dependent on agriculture. The community of Comasagua is located in an environmentally high-risk area that is prone to landslides. It is also at a high risk of seismic activity owing to the markedly vulnerable nature of the terrain. In addition, houses have been built in hazardous and overcrowded areas. This community sustained major damage during the 2001 earthquake in El Salvador and during Hurricane Ida in 2009. Source: Documento de Sistematización del proyecto "La Canasta Campesina" en El Salvador, November 2019.

- 5.2 The producers who are members of Canasta Campesina all live in the municipio of Comasagua³³ in the department of La Libertad, and over 70% of the members are women. In addition to the actual members of ACPACAC, it has over 100 affiliated vegetable and fruit producers throughout the municipio who have signed supply agreements with it. In total, ACPACAC has 200 producers³⁴ in the member producer and supplier category. The cooperative has a board of directors (the current chair is Kasandra Portillo, 24 years of age) that periodically holds a general assembly. Several thematic councils oversee its administration, marketing, production, etc., to ensure that the initiative is run efficiently.
- 5.3 Canasta Campesina is also participating in the ANPECOES initiative, where it and six other cooperatives are working to transform agroecological production by increasing its efficiency, market linkages, and resilience, thereby improving the lives of the more than 2,000 producers involved. In over seven years of operation, Canasta Campesina has managed projects in conjunction with international organizations such as Secours Populaire Français, AFD, and AECID to support the implementation of community efforts to organize agroecological production. That model has been consolidated, and the focus is now on the adoption of innovations to ensure its social, economic, and financial viability.
- 5.4 Three different farming methods have been used to date: (i) 178 market gardens; (ii) 24 macrotunnels and small plots; and (iii) 14 greenhouses measuring 230 square meters each. In 2019, this strategy produced a yield of 58.78 tons of fruits and vegetables from a total of 5.94 hectares of land. In all, 30% of this harvest was used to ensure the community's food security, and the rest was sold using "short circuit" marketing (direct sales by the cooperative without intermediaries) and B2C (other cooperative members and farm markets) and B2B (hotels and restaurants) models. Canasta Campesina is starting to move into other lines of business and plans to digitalize its distribution and sales processes with a view to increasing its sales substantially. It has identified potential partners for the initiative and plans to start talks to determine their level of interest and what connections they have to offer. These potential partners include the International Center for Tropical Agriculture (CIAT), Alianza Biodiversidad, ANPECOES/Asociación Civil Eco Raíces, Hugo App, Compragro (Colombia), and others that have been identified in a study recently published by IDB Lab and GSMA (IDB Lab, 2021).

B. Structure and implementation mechanism

- 5.5 ACPACAC will establish a project execution unit and the necessary structure for carrying out project activities and managing project resources effectively and efficiently. This unit will be staffed by a project coordinator and a financial/accounting assistant, both of whom will work full time on the implementation of this initiative. ACPACAC will also be responsible for submitting progress reports on project implementation. In its seven years of operation, ACPACAC has gained experience in executing projects with technical and financial support from international cooperation agencies (AECID, Secours

³³ As an indicator of the degree of vulnerability and poverty, it can be noted that Comasagua is located in the department of La Libertad, where 33.5% of households are poor, according to multidimensional poverty metrics. See: <https://despuesdetodoblog.wordpress.com/2016/07/17/no-somos-ni-seremos-un-pais/>

³⁴ Source: ACPACAC, January 2022.

Populaire Français, and AFD), which is knowledge and experience that will be made available to this project with IDB Lab. The specialists and analysts in the IDB Lab team will provide advisory services and support to the project execution unit to ensure the effective execution of this operation, including periodic (quarterly and/or semiannual) site visits and virtual meetings.

- 5.6 As an association of producers, ACPACAC has an operational structure that is in consonance with its membership base. All members take part in the cooperative's general assembly, and there are committees in each of the communities where member producers live. The cooperative also has management monitoring tools, a board of directors, an oversight and auditing board, and an administrative, marketing, and production commission.

VI. FULFILLMENT OF MILESTONES AND SPECIAL FIDUCIARY ARRANGEMENTS

- 6.1 **Results-based disbursements and fiduciary arrangements.** The executing agency will commit to the standard IDB Lab arrangements on results-based disbursements and the Bank's procurement³⁵ and financial management³⁶ policies as specified in Annexes V and VI.

VII. ACCESS TO INFORMATION AND INTELLECTUAL PROPERTY

- 7.1 **Intellectual property.** ACPACAC will retain the intellectual property rights to the outputs and studies produced as part of the project but will grant the Bank nonexclusive access, free of charge and in perpetuity, to those studies and outputs so that the Bank may: (i) disseminate the project's results; and (ii) apply the lessons learned to other projects in the region. This will ensure the greatest possible dissemination of the project's lessons among the target population and the region where ACPACAC serves as a model initiative for other cooperatives. These lessons will also be used to analyze similar projects in the future around the region.
- 7.2 **Access to information.** This document contains confidential information relating to one or more of the ten exceptions of the Access to Information Policy and, therefore, shall not be disclosed to external Bank audiences.

³⁵ [Policies for the Procurement of Goods and Works Financed by the Inter-American Development Bank.](#)

³⁶ [Financial Management Guidelines.](#)