Project Information Document (PID)

Appraisal Stage | Date Prepared/Updated: 02-Feb-2023 | Report No: PIDA34851

BASIC INFORMATION

A. Basic Project Data

Country	Project ID	Project Name	Parent Project ID (if any)
Peru	P179037	Irrigation for Climate Resilient Agriculture	
Region	**Estimated Appraisal Date**	**Estimated Board Date**	**Practice Area (Lead)**
LATIN AMERICA AND CARIBBEAN	03-Feb-2023	23-Mar-2023	Water
Financing Instrument	**Borrower(s)**	**Implementing Agency**	
Investment Project Financing	Republic of Peru	Programa Subsectorial de Irrigaciones - PSI	

Proposed Development Objective(s)

The project development objective (PDO) is to improve the sustainability and efficacy of water services for irrigation and the productivity of water on family farms in selected areas that are vulnerable to climate change.

Components

Component A: Efficient Irrigation Investments for Climate Resilient Agriculture
Component B: Institutional Strengthening for effective and sustainable irrigation services
Component C: Project Management and Interagency Coordination

PROJECT FINANCING DATA (US$, Millions)

SUMMARY

Total Project Cost	130.70
Total Financing	130.70
of which IBRD/IDA	100.00
Financing Gap	0.00

DETAILS

World Bank Group Financing

International Bank for Reconstruction and Development (IBRD)	100.00

Non-World Bank Group Financing

Counterpart Funding	30.70
Borrower/Recipient	25.10
Local Beneficiaries	5.60

Environmental and Social Risk Classification

Moderate

Decision

The review did authorize the team to appraise and negotiate

Other Decision (as needed)

B. Introduction and Context

Sectoral and Institutional Context

1. **Irrigation is a key driver for economic growth; it improves agricultural production, strengthens rural development, and increases resilience to climate change.** The agricultural sector represents approximately six percent of Peru's GDP and 16 percent of the country's total exports. Almost a quarter of the country's total labor force, and more than half of the labor force in rural areas are employed in the agricultural sector. Even though irrigated land represents only 36 percent (2.6 million hectares) of all agricultural land, approximately two-thirds of the country's agricultural output[1] is produced on irrigated land.

2. **Irrigation is also critical to improving Peru's food security in the long-term.** Food and nutritional security in the country is currently at risk due to the high variations in global energy and food prices as well as climate change-induced declines in agricultural productivity. According to FAO esbetimates, the 2022 global crises could cause up to 15.5 million Peruvians to fall into food insecurity due to price increases and shortages of agricultural inputs such as fuel or fertilizer. It is estimated that, as a result, crop production could decline by up to 40 percent. While short-term measures are needed to face these crises, medium and long-term actions, such as investing in irrigation to improve production and productivity, are key to building resilience.

3. **Irrigation is well established in the *Costa* region but less so in the *Sierra* and *Selva* regions.** The *Costa* enjoys diverse conditions that are favorable for agriculture, including fertile soils, adequate air temperature and sunshine, and easy access to national and international markets. However, given the generally low levels of annual rainfall, agriculture would be much less productive without irrigation. Hence, approximately 70 percent of cultivated land in the *Costa* is irrigated, allowing Peru to produce high-value crops that are exported to international markets. The main water sources used for irrigation in the *Costa* are inter-basin water transfers and the abstraction of groundwater resources. In the *Sierra* and high-altitude areas of the *Selva* only around 20 percent of the cultivated land is under irrigation, thereby exposing agricultural production to shifts

[1] Agricultural output is defined as the total value of crops produced in economic terms, although it has also been used to denote to (physical) crop yields.

in rainfall patterns linked to climate change and climate variability.

4. **Small- and medium-sized family farmers are particularly limited by both the lack of access to technological irrigation solutions and training on their effective usage.** Small- and medium-sized family farmers are among the most vulnerable groups.[2] Fifty percent of family farmers are defined as being in a critical state, meaning that they hold less than two hectares of land, possess no or limited irrigation capacity for their plots, and do not use certified seeds[3] (Plan Nacional de Agricultura Familiar 2019 –2021). In addition to lacking irrigation infrastructure to deliver water to their fields in the amounts and at times needed, many of these farmers lack access to the information and training necessary to grow their businesses and to gain improved access to markets. For example, nearly two thirds of small- and medium-scale farmers have indicated that they need information on crop management and breeding techniques to further develop their businesses, and 50 percent reported needing information on disease and pest management.[4]

5. **Despite the need for relevant technical assistance (TA) and capacity building, only five percent of small- and medium-sized farmers have received TA and only 11 percent have received training.** Moreover, out of these 11 percent, only 21 percent were women.[5] The World Bank–financed Sierra Irrigation Subsector Project (P104760) (The Sierra Project), which extended access to TA, training, and efficient irrigation systems to farmers in the *Sierra*, demonstrated the effectiveness of such investments on poverty reduction for the rural population. Farmers who participated in the project reported 25 to 500 percent increases in net household income per hectare due to improved water availability and improvements in irrigation technique. The Sierra Project, recognizing the important role women hold in agriculture, developed tailored training to respond to their specific needs, and effectively increased the participation of women in the management of water user organizations (WUOs).

6. **While women comprise a significant share of the agricultural workforce, play a critical role in how water is used, saved and managed[6] and play a key role in agricultural family businesses, they generally hold limited decision-making power.** In Peru, women make up nearly half (46 percent) of agricultural producers in rural areas, and female-headed households (FHH) account for 35 percent of all households.[7] An estimated 43.5 percent of women in rural areas do not generate their own income rendering them economically dependent on men. Moreover, 52.6 percent of rural women are poor, compared to only 15 percent of men.[8]

7. **Female farmers oftentimes do not own the land that they farm, or if they do, do not hold the land titles under their names, which impacts their productivity and decision-making opportunities.** They have less

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[2] Estrategia de Imprendimiento de la Mujer Rural e Indigena, 2022.

[3] In traditional or ancestral production of crops in Peru, concentrated in the Andes (in subsistence or highly vulnerable family agriculture), 95% of farmers use native seeds that have been historically domesticated and selected each agricultural season using local criteria.

[4] These include on-farm agronomic practices that are regenerative in nature, use natural pest and plant disease management methods, and conserve the moisture already in the soil to limit the need for irrigation water supply.

[5] This data is derived from PSI's program proposal (perfil del proyecto).

[6] World Bank, Empowering women in irrigation management: The Case of the Gender Pilot Plan in Peru. Agriculture and Environmental Services Department, Issue 8 February 2014.

[8] INEI, 2020 Perú: Brechas de Género 2020 Avances hacia la igualdad de mujeres y hombres https://www.inei.gob.pe/media/MenuRecursivo/publicaciones_digitales/Est/Lib1801/libro.pdf.

access than male farmers to irrigation technology, extension services, finance, and information about markets and innovative concepts such as climate resilient agriculture. Women are often under-represented, both as members and leaders, in irrigation institutions, such as WUOs, thereby limiting their voice in decision-making processes pertaining to the management of irrigation systems. While women represent 31.6 percent of all members of the 127 Water User Boards that exist in Peru, only 13.6 percent of the board of directors appointed for the period of 2021-2024 are women.[9] Such challenges make it difficult for WUOs to manage water resources more equitably, efficiently, and sustainably. Studies in Peru indicate that women's participation in WUOs results in better enforcement of rules, collection of fees, conflict management and resolution, more orderly and disciplined meetings, and sustainable irrigation systems.

Institutional Context

8. The Ministry of Agricultural Development and Irrigation's (*Ministerio de Desarrollo Agrario y Riego*, MIDAGRI) Sub-sectoral Irrigation Program (*Programa Subsectorial de Irrigaciones,* PSI), serves as the irrigation subsector's executing body at the national level. The PSI aims to improve agricultural water productivity by: (i) expanding the use of efficient irrigation technologies and on-farm practices as a means of promoting the efficient and sustainable use of water for irrigation; (ii) strengthening the management capacity of WUOs; and (iii) supporting the development and strengthening the capacities of Farmer's Groups (FGs) to invest in and manage irrigation hydraulic blocks.[10]

9. Farmer Groups (FGs) [*Grupos de Gestión de Riego Tecnificado* – GGRT][11] comprise of farmers from a particular hydraulic block, who have a joint professional interest to help ensure that the water needs of each farmer are met and that the block remains in good condition. FGs are responsible for management of the irrigated water from the intake structure (point 1 in Figure 1) to the application of water on-farm (point 10), while WUOs are responsible for managing the supply of water in the canals and ensuring adequate delivery of water as agreed upon with the farmers in their respective water distribution plans. WUOs typically serve more than one FG and the majority of farmers of one FG belong to one or more of the respective WUOs within which their hydraulic block is located. FGs are further considered able to assume the commitment to make economic counterpart contributions to the Project.

10. Regional[12] and Local Governments[13], in coordination with the WUOs, are responsible for planning and promoting the implementation of irrigation development within their jurisdiction; as well as managing both own- and externally- financed program resources. Subnational (regional and local) governments are responsible for applying relevant standards and policies to the design and implementation of sector investments within their jurisdictions. Regional governments are also responsible for providing support to both local governments and irrigation service providers. Examples of irrigation development include, among others, the concept of "Technified Irrigation" technology (*riego tecnificado*), which, as defined by Law No. 28585, seeks to promote "irrigation systems that allow the rational and efficient use of water to increase

[9] World Bank, Peru Water Security Diagnostic (WSD), 2022.

[10] Hydraulic block is defined by PSI as a group of individual farms (farms) in close proximity to each other that share common (off-farm) irrigation infrastructure.

[11] FGs (GGRTs) are defined PSI Specific Directive N° 001-2020-PSI-UGERT, originally as "*Grupo de Gestión Empresarial de Riego Tecnificado*" (GGERT), but was later adapted to "*Grupos de Gestión de Riego Tecnificado*" (GGRT)

[12] Regional Governments are in charge of the higher administration of each of the departments, with political, economic and administrative autonomy for matters within their competence. They comprise (i) a Regional Council and (ii) a Regional Governor.

[13] Local governments are the basic entities of the territorial organization of the State. Their purpose is to promote adequate provision of local public services and the integral, sustainable, and harmonious development of the area they cover.

agricultural productivity"[14].

11. WUOs are responsible for distributing water among users as well as the management, operation, and maintenance (MOM) of irrigation systems. In accordance with Peru's Water Resources Law[15], WUOs are civil associations whose purpose is the organized participation of users in the multisectoral management and sustainable use of water resources. Under the auspices of Peru's National Water Authority (*Autoridad Nacional del Agua*, ANA) -- the highest technical and regulatory body for the management of water resources in the country -- the term "WUO" describes three different types of user organizations that are hierarchically organized depending on the scale of the shared water source: (i) water user boards (*junta de usuarios*), which encompass (ii) several water user commissions (*comisiones de usuarios*) and these, at the most basic level, include (iii) different water user committees (*comités de usuarios*)[16]. Users within each irrigation WUO include farmers that share a water source, pool their financial, technical, material, and human resources for the operation and maintenance (O&M) of water delivery systems under their control.

Specific Challenges

12. WUOs have struggled to achieve financial and technical autonomy as well as operational efficiency. Although responsible for the MOM of over 1.4 million hectares of irrigated land and serve almost three quarters of a million users, WUOs lack sufficient technical capacity, specialized equipment, and reliable information on the availability and use of water resources (supply and demand) in their respective areas. As a result, operational efficiency remains low. WUOs also struggle to reach financial sustainability due to low water tariffs and collection rates.

13. The sustainability of these organizations is also threatened by a lack of adequate institutional support and capacity building. There is currently no entity responsible for providing TA or training to WUOs that would enable them to improve their service delivery to farmers. The PSI's current budget program does not reflect the latest, sustainability-focused advances in irrigation interventions, making it difficult to provide adequate support to water users and farmers.

14. In addition to lack of access to an irrigated water supply, deteriorating irrigation systems, poor irrigation practices, and limited use of efficient irrigation technologies are contributing to low overall agricultural and water productivity. The agriculture sector is Peru's biggest water consumer, accounting for 89 percent of the freshwater withdrawn from available sources.[17] However, agricultural water use efficiency[18] (measured by

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[14] As defined in the "Technified Irrigation Law" (*Ley que crea el Programa de Riego Tecnificado y su Reglamiento*, No. 28585), 2020. "Technified" irrigation systems comprise two interrelated components: (i) common (off-farm) irrigation infrastructure that serve all corresponding users of the system, e.g. catchment works, storage reservoirs, conveyance and distribution pipes up to the plot head level; (ii) plot (on-farm) irrigation installation, irrigation components and equipment on beneficiaries' plots, e.g. valves, irrigation laterals, emitters (sprinklers, micro-sprinklers, drippers), which guarantee irrigation uniformity at the plot level (*Source*: Project Perfil, PSI, 2022).

[15] WUOs are established in Article 26 of the Water Resources Law "*Ley de Recursos Hídricos"* (N°29338, 2009).

[16] Types of WUOs: Water Boards (*Juntas de Usuarios*) are organized based on a shared hydraulic sector (e.g. an irrigation system); User Commissions (*Comisiones de Usuarios*) are organized by hydraulic sub-sector; User Committees (C*omités de Usuarios*) are the base level of WUOs, organized around conduction or distribution structrues, such as "hydraulic blocks". Roles and functions include management of the O&M of the respective system, the distribution of water, and/or the collection and administration of water tariffs.

[17] INEI, 202.

[18] Water use efficiency (WUE) is defined as the ratio between the actual volume of water used for irrigation and the volume extracted or derived from a supply source for that purpose (consisting of storage, conveyance, distribution, and application efficiencies). In many cases, losses are encountered through seepage and evaporation. The classical notion of 'irrigation efficiency'

crop water consumption[19] per water withdrawals[20]) is only 35 percent.[21] These low levels of water use efficiency in irrigation systems can be attributed to the fact that approximately 57 percent of Peru's existing irrigation infrastructure is in poor condition. As a result, a large portion of the systems do not effectively respond to farmers' irrigation demands.

15. **Moreover, only 12.8 percent of irrigated farmland (335,482 hectares) employs efficient on-farm water application methods (defined as the ability to apply water where and in volumes).** Improved on-farm irrigation systems (such as drip or sprinkler irrigation) enable farmers to use less water and other inputs for their crops, thereby improving irrigation performance, increasing agricultural water efficiency from 35 to 80 percent, and boosting agricultural productivity and output.[22] In addition to the problems with existing irrigation systems' infrastructure, low capacity to operate and maintain these systems, insufficient coordination between various levels of government, and lack of strategic planning are all limiting productivity and the optimization of the potential benefits from irrigation (for farmers, and the country's overall water and food security and economic performance).

16. **Subnational governments have limited capacity to design and implement irrigation investment projects.** Although subnational governments are the main financiers and implementers of irrigation investments, representing roughly 80 percent of the total budget for irrigation,[23] these investments have not translated into significant improvements in irrigation coverage or efficiency. On average, only 60 percent of irrigation investments were fully executed, and only about one percent was used for the installation of efficient irrigation systems. Little is known about the quality or impact of these investments given the lack of a sound monitoring and evaluation (M&E) system that would allow for performance assessments of irrigation schemes.

17. **In addition to the governance challenges mentioned above, irrigation investments are often made without considering the broader hydrological and hydrogeological context.** Water resources are generally scarcely distributed and insufficiently managed across many of the most densely and economically active areas of Peru such as the *Costa* and the *Sierra*, leading to water deficits in many basins, and hence an intense competition for water resources among water users. Many irrigation systems have been established without detailed knowledge about water supply or demand in the respective watersheds.

18. **While water resource management has been improving across the country since ANA's formation in 2009, relevant information and management capacity at local level remains limited.** Under the World Bank-financed IWRM in 10 Basins Project (P151851), ANA is installing water flow meter monitoring systems at hydraulic blocks across the *Costa*; however, specific information on the water balance of irrigation systems or

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was developed in irrigation engineering and commonly measures the ratio of water consumed to water applied or withdrawn from a source. On the other hand, plant physiologists and agronomists often apply a definition of the ratio of plant biomass or yield to transpiration or the ratio of yield to water consumed. Please note that the terms 'efficiency' and 'productivity' tend to focus on different measures of water use.

[19] Water consumption (or consumptive use, depletion, evapotranspiration) refers to the amount of water that is actually depleted and thus unavailable for further use. In the case of irrigated agriculture, it is the amount transferred to the atmosphere through evaporation from plant and soil surfaces and through transpiration by plants, incorporated into plant products, or otherwise removed from the immediate water environment.

[20] Water withdrawal refers to the amount of water removed (or diverted) from a surface water or groundwater source.

[21] This is notably less than levels of water use efficiency in Mexico (44 percent) and in Brazil (48 percent).

[22] Programa Subsectorial de Irrigaciones (PSI) concept note 2021. *80-85% is based on sprinklers, but drip irrigation can reach 95%.

[23] 47 percent departmental/regional governments, 33 percent local governments, and 20 percent at national level.

their respective small watersheds is still not available. A first step to better understanding the water balances at these watershed levels would include accounting for both upstream and downstream users of water, particularly those impacted by irrigation investments and interventions. In addition to water quantity, special attention should also be given to water quality, e.g., pollution from mining operations in the upstream parts of the basin, or run-off of polluted water from agricultural fields.

19. Through this Project, the Government of Peru (GoP) aims to integrate the needs of the irrigation sub-sector, and of the water resources management, to upgrade irrigation systems to become more sustainable, effective and productive, and thereby more resilient in the face of increased negative impact of climate change. This Project is part of the PSI's National Efficient Irrigation Program (NEIP). The NEIP supports the implementation of infrastructure and equipment for efficient irrigation[24] and the strengthening of capacity to manage such irrigation systems in prioritized agricultural areas including the use of climate-smart concepts and the consideration of a gender dimension.

C. Proposed Development Objective(s)

Development Objective(s) (From PAD)

20. The Project development objective (PDO) is to improve the sustainability[25] and efficacy[26] of water services for irrigation and the productivity of water on family farms in selected areas that are vulnerable to climate change.

Key Results

21. The PDO level indicators are the following:

PDO 1: Improve the sustainability and efficacy of water services for irrigation.

- Water User Organizations that increase operational efficiency in their hydraulic blocks by 10%.[27](Percentage)
- Beneficiaries report an increase in satisfaction with the efficacy of water services for irrigation provided. (Percentage)
- Regional Governments (GOREs) that have at least 500 hectares of 'technified' irrigation projects in their respective multiannual investment portfolios. (Number).
- Increase in water use efficiency at subproject level (Percent)

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[24] Efficient irrigation encompasses greater efficiency in overall irrigation water management (by WUOs), including hydraulic efficiency.
[25] "Sustainability" is defined as operational efficiency (see footnote **Error! Bookmark not defined.**) and collection ratio associated with financial sustainability; water accounting and water reallocation based on the TA work from component B on environmental sustainability.
"Efficacy" is defined as farmers' group satisfaction with the volume provided at the required opportunity as outlined in the irrigation plan.

[27] "Operational efficiency" evaluates the quality of the operation of the irrigation system between the intake of the water source and the input to the plots and is defined by the relationship between the water volumes distributed at the level of the users' properties or plots and the volumes extracted or derived from a given water source

PDO 2: Improve the productivity of water on family farms in selected areas that are vulnerable to climate change.

- Increase in efficiency of application of irrigation water on-farm in areas with 'technified' irrigation. (Percentage)
- Increase in agricultural water productivity (Percentage)

D. Project Description

22. **The proposed Project is a US$130.7 million Investment Project Financing (IPF) operation, financed by a US$100 million IBRD loan and US$30.7 million in counterpart funds.** The Project will be implemented over a six-year period. Proposed interventions are grouped around the following three components: (i) Component A: Efficient Irrigation Investments; (ii) Component B: Institutional Strengthening for Effective and Sustainable Irrigation Services; and (iii) Component C: Project Management and Interagency Coordination.

23. **Component A: Efficient Irrigation Investments for Climate Resilient Agriculture (US$107.3 million, of which US$87 million is financed by the IBRD).** Adequate irrigation is critical for enabling farmers to cope with the climate-exacerbated occurrences of floods and droughts, to increase crop yields, and to grow higher value crops, both in terms of nutritional value and financial returns from their sale. Component A aims to improve water services for irrigation and agricultural water productivity in 130 selected subprojects on a total of 8,000 hectares, thereby benefitting 130 FGs. Of the total, 72 percent of the subprojects are located in the *Sierra*, 22 percent in the *Costa*, and five percent in the *Selva*. Each subproject represents a different hydraulic block that consists, on average, of 60 hectares of land and serves around 60 farmers. Figure 1 illustrates the main elements (points 1-10) of a hydraulic block. This component is divided into the following three sub-components supporting off-farm and on-farm infrastructure and TA to the FGs administrating it:

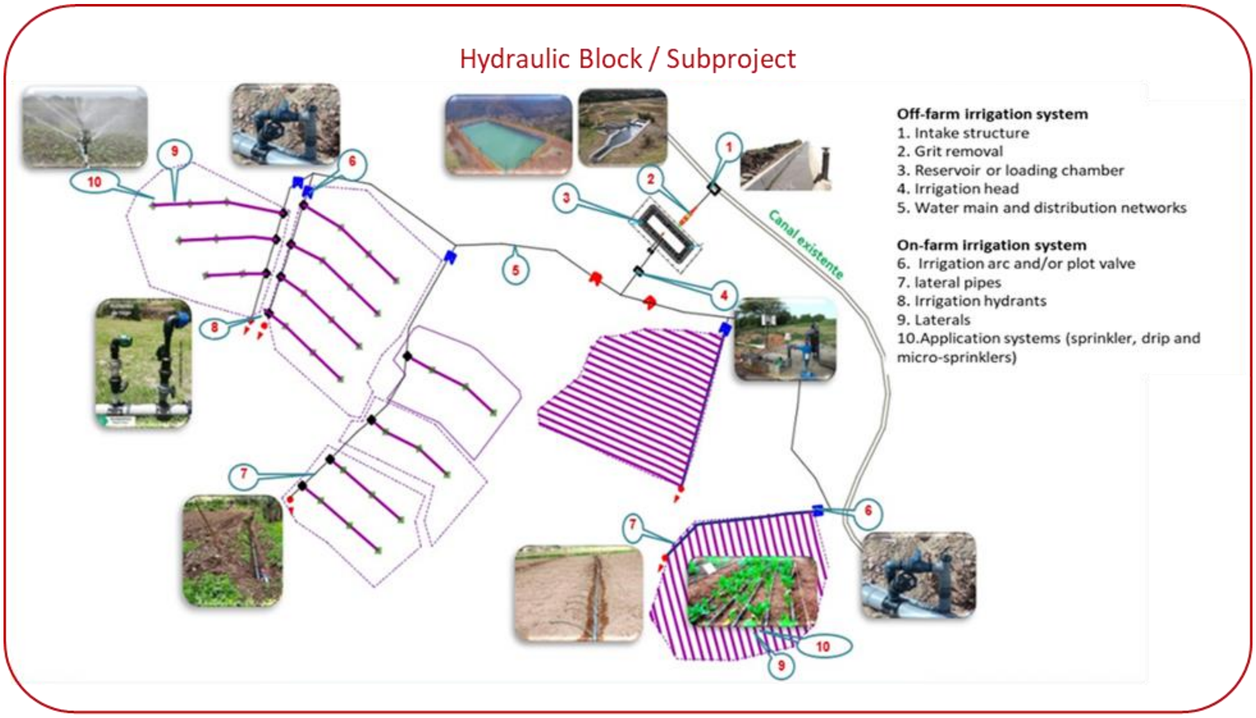
24. **Subcomponent A.1. Modernization of Off-Farm Irrigation Systems.** This subcomponent aims to modernize existing off-farm irrigation systems within the designated hydraulic blocks by converting open canals to pressurized piped[28] networks in areas with natural slopes (refer to points 1-5 in Figure 1). This not only makes use of gravity to naturally pressurize the water in the systems without the need for additional energy, but also reduces levels of evaporation from open canals, thereby reducing losses and increasing resilience to water stress, especially as exacerbated by climate change.

25. **Activities under this subcomponent include**: (i) construction of new and improvement of existing water intake structures and loading chambers or small reservoirs within existing off-farm delivery systems; (ii) grit removal works; (iii) construction of water mains and distribution networks from the intake structure up to the farm gates, including energy-efficient hydro-mechanical equipment and smart measuring devices and ensuring designs consider resilience against climate change exacerbated floods and droughts; (iv) development of feasibility studies, detailed designs and environmental and social instruments to identify and manage risks; (v) monitoring and supervision of civil works; and

[28] As part of a modernization process, physical systems may be adapted from open canals to pressurized (pumped) or gravity piped systems. There are several advantages in using piped systems compared to that of open canals. Pipe systems are characterized by high water-use efficiencies due to negligible seepage and operational losses. Piped systems also facilitate adoption of advanced on-farm irrigation technology (typically in the form of sprinklers and micro-irrigation), thereby enabling more efficient application of water, with little labor input involved.

(vi) implementation of the respective Environmental and Social Management Plan (ESMP), which includes reforestation[29] activities to improve soil moisture content, soil carbon storage, and increase the overall long-term sustainability of the hydraulic blocks.

*Figure 1: Schematic layout of a subproject including the off-farm component (Subcomponent A1), the on-farm component (Subcomponent A2). This red circle corresponds to a red circle (hydraulic block) in **Error! Reference source not found.** in Annex 2. Numbers 1-10 describe the main features of a hydraulic block, which is under the responsibility of one FG.*



26. Subcomponent A.2. Irrigation Technology Improvement (On-Farm Irrigation Systems). This subcomponent aims to support farmers in increasing their agricultural water productivity by improving the efficiency of water applied to the **crops** at the farm level through the installation of improved on-farm irrigation systems (refer to points 6-10 in Figure 1). Activities include the following interventions on existing irrigation schemes: (i) construction and provision of water-efficient field application systems (e.g. drip irrigation, sprinklers, micro sprinklers), land leveling,[30] lateral pipes, equipment for improved control and regulation of water flow, such as motors, pumps, valves, and flow rate measuring devices for improved monitoring; (ii) development of feasibility studies, detailed designs, and environmental and social instruments; (iii) monitoring and supervision of civil works; and (iv) implementation of the ESMP, including reforestation activities to improve soil moisture and environmental base flow, increase efficiency of sprinkler and micro-sprinkler systems, and increase the sustainability of the block. This subcomponent will be implemented through a cost-sharing arrangement with the farmers that follows the NEIP's guidelines. Farmers in the

[29] The main benefit of planting shrubs or trees is for keep the soil structure intact, which in turn helps with maintaining its moisture content. It is worth pointing out that newly planted trees tend to consume larger quantities of water during the first years of their life, but have a positive, retaining, effect on the water balance in the long run.

[30] Land leveling is commonly applied to mildly sloping land, with a process that grades the field to an even slope, thereby eliminating high and low spots to ensure uniformity of flow of water on and into the soil.

Costa will contribute 50 percent of the investment costs, and farmers in the *Sierra* and *Selva* will contribute 20 percent or less of the investment costs.

27. **Subcomponent A.3. Technical Assistance and Capacity Building to FGs.** This subcomponent aims to strengthen the capacity of FGs participating in subprojects under Subcomponents A.1 and A.2 to ensure the sustainability of the investments under those subprojects and increase water productivity in their hydraulic blocks through TA as well as capacity building and knowledge sharing activities centered on the following three main areas: (i) MOM of the hydraulic blocks; (ii) strengthening the capacities of the farmers, ensuring the inclusion of female farmers, to improve the productive use of natural resources at their disposal and to adopt regenerative and conservation agronomic practices for the management of their crops, particularly in light of increasing climate variability leading to floods and droughts; and (iii) helping farmers form gender inclusive rural associations for working together to leverage economies of scale, strengthen commercial management, and connect with national and international markets. The latter will be done in alliance with main actors in the agrarian public sector[31].

28. **By investing in 'technified' irrigation systems and capacity building, it is expected that farmers will be able to avoid significant decreases in crop yields caused by climate change and the variability of water resources, thereby increasing farmers' resilience to water stress in the form of water shortages and droughts**. Improved irrigation can mitigate the impacts of climate change and increase the yields of most crops' by up to 100 percent,[32] thereby allowing farmers to optimize water and other inputs while increasing the efficiency of their water use and overall productivity as well as improving grazing land and pasture. As a result, in addition to building water security, this Project will improve the food security and prosperity of the agricultural, mostly rural, areas of Peru.

29. **The Project's use of topographic elevation to allow for a gravity-based, pressurized flow of water through conveyance and distribution systems to the fields** requires no pumps and produces zero GHG emissions, while providing high efficiency water conveyance, distribution, and delivery to farms in a sustainable manner. Additionally, the soil and vegetation carbon stock will be increased under the Environmental and Social Impact Assessment's (ESIA) tree-planting activities, while CSA practices, which focus on sustainably increasing productivity and income while increasing climate change adaptation and contributing to carbon sequestration, thereby mitigating climate change overall. An analysis calculating GHG mitigation potential of the Project concluded that an estimated 5.562 tons CO2-equivalent per year can be saved by the project´s activities.[33]

30. **Component B: Institutional Strengthening for Effective and Sustainable Irrigation Services (US$9.8 million, of which US$9 million is financed by the IBRD).** To complement Component A's block-level interventions, this Component focuses on providing support to improve water services for irrigation at the WUO, subnational and national levels. It aims at strengthening the capacity of WUOs to ensure an adequate, flexible, and timely supply of water for each hydraulic block. At the sub-national and national levels, it aims to build the capacity of relevant institutions to strategically support FGs and to extend access to 'technified' irrigation solutions throughout Peru. This component is divided into the following three sub-components:

31. **Component B.1. Strengthening WUOs for Improved Management of Sustainable Water Services for Irrigation**. This subcomponent aims to support participating WUOs in ensuring equitable, reliable, and timely distribution of water to the hydraulic blocks under Component A. This subcomponent is designed to improve water management and administration in the WUOs' areas of influence, promote adequate O&M of their hydraulic assets, and promote efficient use of water for irrigation through water monitoring and accounting tools. Specific focus will be placed on

[31] These agrarian public sector institutions include INIA, SENASA, AGROIDEAS, Sierra- Selva Exportadora, AGROURURAL and other public and private entities.
[32] ICR PSI Sierra.
[33] More information on the GHG analysis can be found in Annex 6.

capacity building and awareness raising of reducing the potential impact of increased absolute water use of savings derived from increased water use efficiency to avoid negative impact on downstream users by inadvertently reducing return flow.

32. **Specific activities include:** (i) updating and implementing key technical instruments, including water distribution plans, O&M plans, asset management plans; (ii) the installation of water control and measuring devices coupled with TA on water efficiency and accounting assessments; (iii) the implementation of demonstration parcels to promote the conversion to 'technified' irrigation systems among other FGs; (iv) and development of potential water tariff restructuring strategies following improvements in services. Climate-change related aspects such as drought and flood early warning systems and data collection for improved water planning towards climate risks will be considered in the water distribution plans.

33. **Component B.2: TA to Subnational Governments for the Scaling Up of Improved Irrigation Investments**. This subcomponent aims to build the capacity of subnational governments to scale up the use of 'technified' irrigation systems in 16 departments. Activities include the: (i) development of regional efficient irrigation investment plans based on water resources information and potential agricultural production opportunities; (ii) strengthening of subnational governments' Regional Agricultural Departments (*Dirección Regional de Agricultura* – DRA) and Planning Directorates (*Dirección de Planificación*) and the establishment of irrigation units; and (iii) development of a strategy, following national best practices gained by the PSI, for the implementation of the investment programs derived from the regional efficient irrigation investment plans.

34. **To contribute to the achievement of a sustainable nexus between water resources management and sustained or increased agricultural productivity, this component will support specific measures** to assist in: (i) the promotion of integrated water storage solutions and comprehensive water resources planning at the watershed level; (ii) the development of an irrigation smart subsidy program that focuses on small farmers in an effort to provide incentives for the adoption of 'technified' on-farm irrigation systems and water management practices that conserve soil moisture and reduce polluting effects of crop cultivation; and (iii) the establishment of hydro-agro informatics, which will combine field data with remote sensing-derived data and analytics to improve resilience-based planning and enable performance or impact evaluations of irrigation and agricultural systems in targeted sub-watersheds, thereby also informing O&M of irrigation assets. The Project will implement these measures in two river basins – Chancay-Lambayeque and Quilca-Chili. These basins have mature levels of relevant governance structures[34] that allow for a coordination among the respective planning instruments, i.e. the water resources basin plans and the regional 'technified' irrigation investment plans.

35. **Component B.3. TA and Studies to Strengthen Peru's National Irrigation Policy and Strategy.** This subcomponent comprises: (i) studies to support the updating of the national irrigation strategy to ensure the inclusion of water storage, equitable water allocation, upstream and downstream linkages of water use, capacity building, modernization of irrigation systems, and various innovative irrigation approaches including social and gender dimensions to promote and incentivize the expansion of irrigation to areas with irrigation potential; and (ii) the development of a national information system that integrates information on water resources, including extreme floods and drought events as exacerbated by climate change, and agricultural land use in a single knowledge management center.

36. **Component C: Project Management and Interagency Coordination (US$13.6 million, of which US$4 million financed by the IBRD).** This component includes activities to support the administration of the Project and the strengthening of the PSI – the Project implementation unit (PIU). The component will support capacity building on

[34] The River Basins of Chancay-Lambayeque and Quilca-Chili have operational Water Resources Basin Committees (*Consejo de Recursos Hídricos de la Cuenca*, CRHC)

financial, environmental, social, and technical management as well as M&E. In addition, this component will include activities to support ANA and MIDAGRI's other ongoing rural programs (AGROIDEAS, AGRORURAL, etc.) with the implementation of Components A and B.

37. **Support for the coordination with relevant sector entities.** To carry out parts of the TA under Subcomponents A3 and Component B, the PSI will enter into agreements to coordinate with other public sector institutions, such as the ANA, INIA, SENASA, AGROIDEAS, Sierra- Selva Exportadora, AGROURURAL and other public and private entities.

Legal Operational Policies

	Triggered?
Projects on International Waterways OP 7.50	Yes
Projects in Disputed Areas OP 7.60	No

Summary of Assessment of Environmental and Social Risks and Impacts

38. **The overall environmental and social (E&S) risk classification is considered Moderate. From the environmental perspective, Project-related risks and impacts will mainly stem from civil works under subcomponents A.1 and A.2,** including the construction of canals and water mains, rehabilitation and construction of small water reservoirs, installation of equipment, pipes, meters, pressure regulators, sprinklers, drips systems, and land leveling. It should be noted that Project activities will take place in previously disturbed areas, since the purpose of the Project is to improve existing irrigation systems; therefore, no significant risks or impacts to living natural resources are envisioned. Moreover, due to the small-to-medium scale and location of the civil works anticipated for each subproject, potential environmental and safety risks and impacts can be easily mitigated in a predictable manner.

39. **As such, the anticipated key issues derived from physical interventions while implementing civil works are:** (i) consumption of water and raw materials; (ii) generation of construction-related wastes; (iii) nuisances related to traffic, dust generation, vibration and noise; (iv) water overuse for irrigation purposes; (v) possible encounters of archaeological remains; and (vi) occupational health and safety hazards. Given that, overall, the anticipated environmental and safety risks of the Project are not likely to be significant, and should be easily mitigated in a predictable manner, the task team has determined the Environmental Risk Rating to be moderate.

40. **From the social perspective, the proposed Project is expected to generate important positive impacts and opportunities for small and medium-sized farmers and their families, considering the outcomes of similar past projects in Peru**. Nonetheless, possible social risks could include: (i) exclusion of vulnerable populations, whose interests could be under-represented, from taking full advantage of the Project's different benefits and opportunities, including how to access modernized infrastructure and water services, how to participate in offered training and TA, and how to benefit from labor opportunities, among others; (ii) possible complaints from local farmers not considered in the Project scheme; (iii) minor labor influx risks; and (iv) health challenges to workers and communities posed by the ongoing COVID-19 health context.

41. A cross-cutting risk that might impact beneficiaries and stakeholders is related to weak/deficient levels of coordination among the multiple entities that need to be involved in the preparation and implementation of the Project. Considering the risks above, as well as the measures that will be put in place to mitigate them, the task team has determined the Social Risk Rating to be moderate.

42. To adequately identify and manage the E&S risks and impacts, the Borrower has prepared an ESMF, which includes mitigation measures according to the scale and nature of the activities. ESMPs, a Social and Gender Assessment (SGA), an Indigenous Peoples Planning Framework (IPPF), and Labor Management Procedures (LMP) have also been prepared according to the environmental and social standards of the ESF. The E&S instruments were disclosed on January 30, 2023 and feedback was received from stakeholder engagement activities will be incorporated into the instruments' final versions.

E. Implementation

Institutional and Implementation Arrangements

43. The PSI will be responsible for the overall implementation of the Project. The PSI was established in 1996 to implement an irrigation program along the *Costa* that had the objective of improving the existing irrigation infrastructure, promoting efficient irrigation, and providing training to WUOs on irrigation. In 2006, the PSI was designated as the governing entity of the irrigation subsector at the national level to encourage and promote the efficient and sustainable use of water for irrigation in agriculture.

44. The PSI currently works nationwide through its seven regional offices and seven local units[35] on the implementation of irrigation projects. The PSI is headquartered in Lima and has departments focused on: (i) administration and financing; (ii) infrastructure; (iii) irrigation management; and (iv) planning, budgeting and M&E. Annex 3 includes the PSI organizational chart. The PSI will accompany the farmers in each of the stages, coordinating with MIDAGRI, ANA and its deconcentrated entities, regional and local governments, and the private sector.

45. The PSI has been successfully implementing investment projects with development institutions for several years. These engagements include the recently closed World Bank Sierra Project. The Implementation Completion and Results Report, which was finalized in June 2017, rated the Project's overall outcome, the Project's implementation, and the implementation agency performance as satisfactory. The PSI also has extensive experience implementing projects supported by Peru's national investment program (Invierte.pe), the Inter-American Development Bank (IADB), the Agency for Japan International Cooperation (JICA), and the Global Environmental Facility (GEF).

46. The Borrower proposed designating the PSI as the implementing agency given its local presence and experience with Bank-financed projects. The Bank team rates the PSI's current capacity (including technical, environmental, social, financial management (FM), and procurement) to implement the Project as moderate. Given the geographic scope and overall scale of the Project, it is likely that additional resources will be needed to support the PSI during implementation.

47. The Project design calls for interaction and coordination among different agencies. The Project will

[35] The seven regional units are (i) Piura y Tumbes, (ii) Lambayeque, Amazona and Cajamarca, (iii) La Libertad y San Martin, (iv) Junin, Huancavelica, Huanuco, Ayacucho y Pasco, (v) Arequipa, Moquegua, Tacna y Puno, (vi) Cusco y Apurimac, and (vii) Ancash. The local units (also known as zonal management units) are at the district level and include Piura, Chiclayo, Trujillo, Huancayo, Arequipa, Cusco, and Casma.

require the active participation of FGs, WUOs, local and regional governments, and ANA. Specifically, the Project will support the involvement of the Local Water Authorities (ALA)[36] to strengthen the continuous monitoring of Project interventions, water consumption, related system parameters, and enforcement of effective regulatory instruments to manage water use.

48. **In addition, the Project will require coordination with MIDAGRI's ongoing rural programs (AGROIDEAS, AGRORURAL, and Sierra-Selva Exportadora) and the INIA**.[37] Governance and institutional related activities under Component B will require strong collaboration between several of MIDAGRI's offices and ANA. Given the need for strong coordination among various agencies, MIDAGRI with the support of and MEF, will create a Project Steering Committee to provide high-level guidance, oversight, and control of the Project as well as inter-institutional agreements with key agencies (i.e., ANA).

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[36] Local offices in ANA refer to the local water administration units (*Administración Local del Agua* [ALA]).

[37] Partnerships with MIDAGRI's rural programs are envisioned to support improvements to the supply chain of strategic crops and to apply research results and extension services to farmers benefiting from on-farm irrigation improvements. These partnerships are especially important to ensure that increases in productivity due to irrigation improvements are accompanied by integration into agricultural supply chains and connection to national and international markets.

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