



# **Water Management Program in the Artibonite Basin**

**(HA-L1087; 3089/GR-HA)**

## **Project Completion Report (PCR)**

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## **Electronic Links**

1. [Development Effectiveness Matrix \(DEM\) Summary](#)
2. [Final version of the Progress Monitoring Report \(PMR\)](#)
3. [PCR Checklist](#)

## **Optional Electronic Links**

1. [Ex post Cost-Analysis Report](#)
2. QRR Results and Procedures Report (if applicable)
3. [Final Evaluation Report](#)

### **Acronyms and Abbreviations**

CIA	Coordination of Agricultural Infrastructures
EDH	Electricity of Haiti
ESMR	Environmental and Social Management Report
GoH	Government of Haiti
Ha	Hectare
IADB	Inter-American Development Bank
IRR	Internal Rate of Return
MARNDR	Ministry of Agriculture, Natural Resources and Rural Development
M&E	Monitoring and Evaluation
NPV	Net Present Value
ODVA	Organism for the Development of the Artibonite Valley
O&M	Operation and maintenance
PBG	Policy-Based Grants
PCR	Project Completion Report
PROGEBA	Water Management Program in the Artibonite Basin
SO	Specific Objective
UIS	Update to the Institutional Strategy
US\$	United States Dollars
WUA	Water User Associations

## BASIC PROJECT INFORMATION

12/14/21, 3:38 PM

VPF-ADS PCR Dashboard

### HA-L1087 Water Management Program in the Artibonite Basin

<b>Country Beneficiary</b> Haiti	<b>Loan Instrument</b> Investment Loan	<b>Borrower</b> HA-HA - REPUBLIQUE D'HAITI	<b>Loan(s)</b> 3089/GR-HA	<b>Sector</b> Agriculture And Rural Development	<b>Sub-Sector</b> Sustainable Agricultural Development
<b>Date of Board Approval</b> Nov 27, 2013	<b>Date of Eligibility for First Disbursement</b> Feb 13, 2014	<b>Date of Closure (CO)</b> Jul 23, 2021	<b>Loan Amount - Original</b> 25,000,000.00	<b>Loan Amount - Current</b> 24,824,968.25	<b>Pari Passu</b>
<b>Total Project Cost</b> 27,500,000.00	<b>Months In Execution from Approval</b> 92	<b>Months In Execution from First Disbursement</b> 85	<b>Original Date of Final Disbursement</b> Feb 13, 2019	<b>Actual Date of Final Disbursement</b> Feb 04, 2021	<b>Cumulative Extension(Months)</b> 24
<b>Total Amount Disbursed</b> 24,824,968.25	<b>Total Percentage of Disbursement</b> 99%				

### ^ Ratings of project Performance in PMRs



Has This Project Received Funds from another Project? ☐ Yes ☒ No

Has This Project Sent Funds to Another Project? ☐ Yes ☒ No

#### Development Effectiveness Classification

No	PMR Date	PMR Stage	Classification	Disbursement Percentage (As of Dec 31)
1	May 06, 2015	Second period Jan-Dec 2014	Satisfactory	19%
2	Apr 14, 2016	Second period Jan-Dec 2015	Problem	19%
3	Apr 27, 2017	Second period Jan-Dec 2016	Satisfactory	37%
4	Apr 19, 2018	Second period Jan-Dec 2017	Satisfactory	60%
5	May 15, 2019	Second period Jan-Dec 2018	Satisfactory	75%
6	May 03, 2020	Second period Jan-Dec 2019	Satisfactory	75%
7	May 16, 2021	Second period Jan-Dec 2020	Satisfactory	94%



## I. INTRODUCTION

- 1.1 With an area of 6,800 km<sup>2</sup>, representing 25% of the of the Haitian territory, the Artibonite watershed is the country's largest hydrographic basin. The Artibonite River is the largest source of hydroelectric power and irrigation water in the country. In the upper watershed, the Péligre dam was built in 1956 to control flooding and to supply water to the irrigation district located downstream in the valley. In 1971, it was upgraded to produce electricity, and its management was transferred to Electricity of Haiti (EDH). As of 2013, around 150,000 rural households lived upstream Péligre dam, earning most of their income from agriculture, livestock and charcoal production.<sup>1</sup> That same year, approximately 70,000 rural families cultivated 80% of Haiti's rice as well as high-value vegetables in the valley's irrigation district, Haiti's largest with more than 30,000 hectares (Ha).<sup>2</sup> Total annual value of agricultural production in the irrigation district was then estimated at US\$57.5 million.<sup>3</sup>
- 1.2 The entire Artibonite basin had long been suffering from the lack, or poor state, of water management infrastructures all along the watershed. The upper Artibonite watershed was suffering from similar environmental challenges as the rest of the country. Poverty and demographic pressure resulted in deforestation and unsustainable agricultural practices: an estimated 97.5% of the area was under cultivation, while more than 50% of it was considered unsuitable for agriculture and 47% faced severe erosion risks.<sup>4</sup> In the absence of infrastructures to retain water and sediments, most rain events produced large run-offs leading to flash floods and high levels of erosion. A direct consequence of the latter was the silting of the Péligre reservoir, whose storage capacity was cut in half (from 600 Mm3 to 300 Mm3) in 60 years, making it more difficult to regulate floods, to provide water for irrigation and to generate hydropower.<sup>5</sup> Conversely, during the dry season, water scarcity became a major constraint to agriculture and livestock production. Downstream Péligre, the gates and automatic commands of the Canneau dam, the head of the irrigation district, were out of order, making it impossible to control the waterflow entering the district and thus damaging its riverbanks. In addition, the irrigation network was still incomplete, with insufficient canals and drains, and with the absence of waterflow regulating devices.
- 1.3 The outcomes of poor water and sediment management infrastructures were exacerbated by institutional weaknesses. EDH managed water at Péligre dam with the objective to produce electricity and was giving little consideration to irrigation and flood mitigation. In the irrigation district, institutional weaknesses also generated serious deficiencies in operation and maintenance (O&M) of existing hydraulic infrastructures. The Organism for the Development of the Artibonite Valley (ODVA), the entity in charge of managing the Canneau dam as well as primary canals, had been suffering from severe management weaknesses and budgetary restrictions for decades. Water User Associations (WUA), on the other hand, were too weak to collect water tariffs to finance the O&M of second and third-level canals and drains.

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<sup>1</sup> [Loan Proposal](#) the Water Management Program in the Artibonite Basin (HA-L1087).

<sup>2</sup> [Loan Proposal](#) the Water Management Program in the Artibonite Basin (HA-L1087).

<sup>3</sup> *Projet binational de réhabilitation du bassin versant du fleuve Artibonite, dans la zone frontalière entre Haïti et la République Dominicaine – Diagnostic*, ACDI/OXFAM Québec/CRC Sogema, 2007; *HA-L1074 economic assessment*, Agueda/IDB, 2012.

<sup>4</sup> [Loan Proposal](#) the Water Management Program in the Artibonite Basin (HA-L1087).

<sup>5</sup> [Loan Proposal](#) the Water Management Program in the Artibonite Basin (HA-L1087).

- 1.4 This combination of poor infrastructures and institutional weaknesses led to low agricultural productivity, in particular in the irrigation district where rice yields averaged 2.65 tons per Ha compared to 4.61 in the Dominican Republic, as well as significant crop, livestock and infrastructure losses caused by floods (estimated at US\$8.7 million in 2013).<sup>6</sup>
- 1.5 Between 1976 and 2002, the Bank financed five (5) operations in the Artibonite valley (473/SF-HA, 690/SF-HA, 845/SF-HA, 322/OP-HA and 526/OP-HA) aiming at upgrading the irrigation system and helping farmers increase their productivity, for a total investment amount of US\$37.75 million. Despite actual achievements in terms of infrastructures built, these operations were all rated “unsatisfactory” because of the political context and execution issues. In 2003, the Bank approved the Agricultural Intensification Program (1490/SF-HA), a loan of US\$41.9 million, which was supplemented in 2007 by a grant of US\$12.5 million (1917/GR-HA). By the time it closed in 2013, it had, among other things, clarified the land tenure status of approximately 17,300 Ha of land, increased the irrigated area by about 5,000 Ha and started to structure 12 WUAs.<sup>7</sup> Despite this, the program was considered “unsustainable” because it had failed to provide an adequate solution to O&M-related issues.
- 1.6 After decades of investments in the Artibonite valley by the Bank, it became quite clear that significant institutional reforms were required to make any additional investment in the area viable: (i) supporting WUAs under the then-current legal framework had failed as those were not legally allowed to recover O&M costs via the collection of water user fees and to allocate water among their members; (ii) the Bank’s strategies to build institutional capacity at ODVA (through investment operations, technical co-operations, support by technical advisors, application of conditions prior to first disbursements, etc.) had also not worked, and ODVA remained incapable of fulfilling its core mission to operate and maintain irrigation infrastructures and to ensure farmers’ access to water; and (iii) all efforts to improve irrigation in the valley had repeatedly failed, often as a result of floods caused by the unilateral management of water at Péligre dam by EDH.
- 1.7 In this context, the Bank supported several key institutional reforms through the implementation of two Policy-Based Grants (PBGs) “Institutional strengthening and reform of the agriculture sector I and II” (HA-L1074 and HA-L1082, approved in May 2012 and June 2013, respectively). This PBG series aimed at addressing the policy, legal and institutional constraints that were affecting, and were often preconditions, to an effective and sustainable implementation, output delivery and impact of the IDB-financed investment operations under execution at that time and programmed for the following years in the agricultural sector. Among other elements, this PBG series included the approval of an updated irrigation policy and the creation of an Inter-Ministerial Commission, the Péligre Commission, to oversee the management of the waters of Lake Péligre (and to ensure that EDH’s water management decisions better integrate irrigation needs and flood mitigation). To build upon the Government of Haiti’s (GoH) momentum for reforms, a third and last PBG was to be approved in 2014 to continue the operation of the Péligre Commission and demonstrate its sustainability, and to push for the approval of two key pieces of legal reform: (i) a bill on the transfer of management responsibilities over irrigation districts to WUAs; and (ii) a reform of the institutional and legal frameworks for O&M in the Artibonite Valley irrigated district (including a reform of the mandate and

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<sup>6</sup> [Loan Proposal](#) the Water Management Program in the Artibonite Basin (HA-L1087).

<sup>7</sup> [Loan Proposal](#) the Water Management Program in the Artibonite Basin (HA-L1087).



functioning of ODVA). However, this third PBG was never approved. Please see box at paragraph 2.13 with context and details.

- 1.8 In this context, in order to support the GoH in its strategy to rehabilitate the Artibonite irrigation district and building on lessons learnt from previous Bank operations in the region, the Bank approved in 2013 a US\$25 million grant (HA-L1087; 3089/GR-HA) to finance the five (5) year Water Management Program in the Artibonite Basin (PROGEBA, for its French acronym). The GoH also committed to provide US\$2.5 million in local co-financing, thus bringing the Program's total budget to US\$27.5 million. The Program was to be executed by the Ministry of Agricultural, Natural Resources and Rural Development (MARNDR), through a dedicated Implementation Unit, or Executing Agency.
- 1.9 The general objective of PROGEBA was to decrease crop, livestock and infrastructure losses due to floods, and to increase agricultural productivity in the Artibonite basin, through the following specific objectives (SO): (1) improve water and sediment management in selected areas of the upper and lower watershed; (2) increase area suitable for agriculture; and (3) improve operation and maintenance of hydraulic infrastructures and equipment at the Péligre dam and in the irrigation district. In order to address these SO, two components were developed: Component 1, "Water and sediment management infrastructures", was implemented to reach SO1 and SO2, through various infrastructure investments such as the construction of 950 small-size sediment and water containment infrastructures (such as check-dams and rainwater harvesting water-tanks), the electromechanical rehabilitation of the Canneau dam, the construction of walls to strengthen the Artibonite river's banks (immediately downstream of the Canneau dam), and the construction of approximately 50 Km of secondary and tertiary irrigation canals and drains; Component 2, "Institutional strengthening", was implemented to reach SO3, through the provision of technical assistance to the Péligre Commission, ODVA and WUAs.
- 1.10 This Project Completion Report (PCR) presents the results and achievements of PROGEBA, but also the challenges that it faced and the lessons that have been learnt as part of its execution.

## **II. CORE CRITERIA. PROJECT PERFORMANCE**

### **II.1 Relevance**

#### **a. Alignment with country development needs**

- 2.1 As described in the introduction, the context of intervention in the Artibonite basin at the time of approval (2013) was characterized by low agricultural productivity and high levels of agricultural losses caused by floods, both explained to a large extent by a combination of poor infrastructures and institutional weaknesses. PROGEBA's specific objectives aimed at resolving these two root causes. At the institutional level, the context of intervention was also characterized by a positive momentum for legal and institutional reforms. Those were expected to create an enabling environment for the implementation of PROGEBA and, more generally, for the development of the Artibonite valley.

- 2.2 Haiti's development needs were set out in several key policy documents. In the [2010-2016 National Agriculture Investment Plan](#), the rehabilitation of the Artibonite irrigation district was considered one of the country's priorities, as part of the GoH's efforts to transform the agricultural sector into a pillar for growth and poverty reduction, in the aftermath of the 2010 earthquake. According to the Plan, the rehabilitation of irrigation districts required: (i) investments in physical infrastructures; (ii) the strengthening of WUAs; (iii) support to agricultural intensification in order to enhance agricultural productivity and revenues; (iv) institutional strengthening of both public and private actors in the fields of water management and infrastructures; and (v) a land tenure security program. The [2012-2016 National Irrigation Plan](#) mentioned that sedimentation and water management were the main issues affecting the Artibonite basin, and that a proper strategy to tackle those would require actions both in the upper and in the lower watersheds. Haiti's [2006 National Action Plan for Adaptation](#), on the other hand, emphasized the "high vulnerability" of the department of Artibonite to floods and erosion. Similar diagnoses and investment proposals were made in the GoH's [Three-Year Agricultural Recovery Program Document \(2013-2016\)](#) and [2010-2025 Agriculture Development Plan](#).
- 2.3 PROGEBA's specific objectives and design were fully aligned with the development needs and priorities set out in these policy documents, at the time of approval, during the entire implementation, and at the time of closure (July 2021).

#### **b. Strategic Alignment**

- 2.4 At the time of approval and during execution, the Program was fully aligned with the [Bank's Country Strategy with Haiti for 2011-2015](#), in which agriculture is considered a priority sector of intervention. The Program's specific objectives would indeed significantly contribute to the Bank's strategic objective set out in this document, which is "to protect the environment, respond to climate change and improve food security".
- 2.5 PROGEBA's specific objectives would also contribute to the output "farmers given access to improved agricultural services and investments" under the "[Protecting the environment, responding to climate change, promoting renewable energy and enhancing food security](#)" strategic priority of the Bank for 2012-2015, established by the Ninth General Increase in the Resources of the IADB (IDB-9).
- 2.6 In addition, the Program was consistent with the [Update to the Institutional Strategy \(UIS\) 2010-2020](#) of the Bank, approved in 2015, as it dealt with the challenge of "low productivity and innovation". The Program was also aligned with the cross-cutting issue of "climate change and environmental sustainability", as it aimed at improving water and sediment management in an already highly vulnerable context.
- 2.7 At the time of closure, PROGEBA's specific objectives were fully aligned with the [Bank's Country Strategy with Haiti for 2017-2021](#), which has a strong focus on agriculture. One of the two pillars of this latest strategy is indeed to increase productivity in the agricultural sector by "expanding irrigation and watershed management", among other things.

#### **c. Relevance of Design**

- 2.8 **Figure 1** illustrates the vertical logic of the Program at approval (i.e., as it appears in the [Loan Proposal](#)). The general objective was to decrease crop, livestock and infrastructure losses due to floods, and to increase agricultural productivity in the Artibonite basin. For

this purpose, the Program aimed at achieving three specific objectives (SO): (1) improve water and sediment management in selected areas of the upper and lower watershed (SO1); (2) increase area suitable for agriculture (SO2); and (3) improve operation and maintenance of hydraulic infrastructures and equipment at Péligré dam and in the irrigation district (SO3). The Program expected to achieve SO1 and SO2 through Component 1, and SO3 through Component 2.

- 2.9 With respect to SO1, the Program intended to build 950 small-size sediment and water containment infrastructures such as check-dams (**Photo 1**), in gullies located in the upper watershed (**P.1.1**). According to the Program's theory of change, sediment and water containment infrastructures would retain flood water (**R.1.3**) and intercept soil sediments (**R.1.1**) coming from upstream. Over time, the accumulation of sediments on the upstream side of these infrastructures would create a flat and humid area, suitable for agriculture (an area hereinafter referred to as "market garden") (**R.1.2** and **R.1.4**). At the time of approval, the existing literature supported this relationship. In the Loess plateau of China for instance, Xu (2002-2004) had shown that the construction of check dams was one of the most effective means of soil conservation. On average, it estimated that the sediment reduction ratio could reach up to 60%. In Haiti, several projects had financed the construction of check-dams. The French NGO "SOS Enfants Sans Frontières" for instance had built 42 check-dams in 11 different gullies in Gros Morne between 2006 and 2011. An ex-post economic analysis of this intervention (Bayard, 2013) showed that the combination of a better access to water and the creation of market gardens had a significant impact on crop diversification and agricultural productivity in the gullies, as well as on livestock husbandry conditions. In the lower watershed, on the other hand, the Program sought to rehabilitate the electromechanical system (gates and automatic control) of the Canneau dam (**P.1.2**), build protection walls downstream of the Canneau dam to prevent the master canal's left and right banks from collapsing (**P.1.3**), and install 100 equipment to regulate and measure the waterflow on the irrigation district's main canals (**P.1.6**). According to the Program's theory of change, these interventions would increase the surface of the irrigation district benefitting from optimal waterflows (which refers to the absence of excess, scarcity, or waste of water in the irrigation system) (**R.2.1** and **R.2.2**). Taken together, the outputs listed in this paragraph would contribute to improve water and sediment management both in the upper and in the lower watershed (SO1).
- 2.10 With respect to SO2, the Program intended to build, or rehabilitate, 50.4 Km of secondary as well as tertiary irrigation and drainage canals in the irrigation district (**P.1.4**), and to dredge 25,000 meters of primary and drainage canals every year (**P.1.5**). According to the Program's theory of change, these interventions would help deliver water to areas previously non-irrigated, while better drainage would reduce the hydromorphic area, which was estimated to represent approximately 15% of the valley's total area at the time of approval.<sup>8</sup> Taken together, this would increase the area of the irrigation district suitable for agriculture (**R.3.1** and **R.3.2**) (SO2).
- 2.11 With respect to SO3, the Program aimed at strengthening the different institutions involved in the O&M of hydraulic infrastructures and equipment (1) at Péligré dam, (2) at Canneau dam and in the upper irrigation district (primary canals and drains) and (3) in the lower irrigation district (second and third-level canals and drains). At the level of Péligré dam, the Program sought to set up a flood management system (**P.2.8**), to be operated by EDH, and to facilitate communication as well as coordination between the dam's operator (EDH)

<sup>8</sup> [Loan Proposal](#) the Water Management Program in the Artibonite Basin (HA-L1087).

and downstream entities affected by its functioning (MARNDR, ODVA and WUAs) through the Péligre Commission (**P.2.7**). The management of Péligre dam being itself affected by upstream conditions (in the upper watershed located above/upstream of Péligre dam, parts of which are in the Dominican Republic), the Program also intended to maintain a continuous dialogue between Haiti and the Dominican Republic on the management of the entire Artibonite watershed through a Binational Commission (**P.2.9**). Providing EDH with the equipment (**P.2.8**) and decision-making tools for flood management (**P.2.9**) would help it comply with existing operating rules aimed specifically at flood management: keep the water level below the maximum limit for flood management (**R.4.1**) and release no more than 400m<sup>3</sup>/sec of water (**R.4.2**). Compliance monitoring by the Péligre Commission (**P.2.7**) would provide an additional incentive for EDH to comply with these operating rules. At the level of Canneau dam and in the upper irrigation district (primary canals and drains), the entity responsible for O&M was ODVA. As described in the introduction, at the time of approval, ODVA had long been suffering from severe management weaknesses and budgetary restrictions. In this context, the Program sought to equip, structure and train ODVA's O&M unit (the Coordination of Agricultural Infrastructures, or CIA for its French acronym) (**P.2.10-13**), and Administrative and Financial Service (**P.2.14-16**). The support provided would contribute to improve ODVA's internal management, measured by its ability to produce financial statements and have them approved by external auditors (**R.5.1**), which ODVA had not done since 1998. Strong internal management at ODVA would, in turn, increase its general capacity to properly operate and maintain the irrigation infrastructures that fall under its responsibility. Lastly, at the level of the lower irrigation district (second and third-level canals and drains), WUAs were responsible for O&M but because they had just been formally created during the Agricultural Intensification Program (1490/SF-HA), they were not strong enough yet to fulfill this mission. As a result, PROGEBA intended to equip, structure and train them (**P.2.18** and **P.2.20**), while also strengthening ODVA's unit responsible for supporting and overseeing their work (the Department of Social Water Management, or DGSE for its French acronym) (**P.2.17** and **P.2.19**). Strengthening WUAs would increase their capacity to dredge secondary and tertiary canals and drains (**R.6.1**). This would, in turn, improve the perception among water users that WUAs can indeed deliver such services and thus enhance WUA's ability to recover a share of their O&M costs to remain financially viable (**R.6.2**). Taken together, the outputs listed in this paragraph would contribute to improve O&M of hydraulic infrastructures and equipment at Péligre dam and in the irrigation district (SO3).

- 2.12 At the impact level, the Program aimed at decreasing crop, livestock and infrastructure losses due to floods (**Impact 1**) and increasing agricultural productivity in the Artibonite basin (**Impact 2**). By improving water and sediment management in the upper watershed (SO1) through small infrastructures such as check-dams, the Program would increase agricultural productivity in the gullies via the creation of market gardens (**Impact 2**), but also reduce erosion and contribute to slow the silting process of Péligre's reservoir, thus preserving its capacity to mitigate floods. By improving water and sediment management in the lower watershed (SO1), on the other hand, the Program would increase the surface of the irrigation district benefitting from optimal waterflows, and thus increase agricultural productivity in this area (**Impact 2**). Similarly, by increasing the area of the irrigation district suitable for agriculture (SO2), primarily through the reduction of the size of the hydromorphic area, the Program would also contribute to increase agricultural productivity (**Impact 2**). Lastly, while improving O&M of hydraulic infrastructures and equipment at the level of Péligre dam would decrease the probability of EDH failing to comply with operating rules, which had caused significant flood-related losses in the past (**Impact 1**), improving O&M of hydraulic infrastructures and equipment at the level of Canneau dam and in the

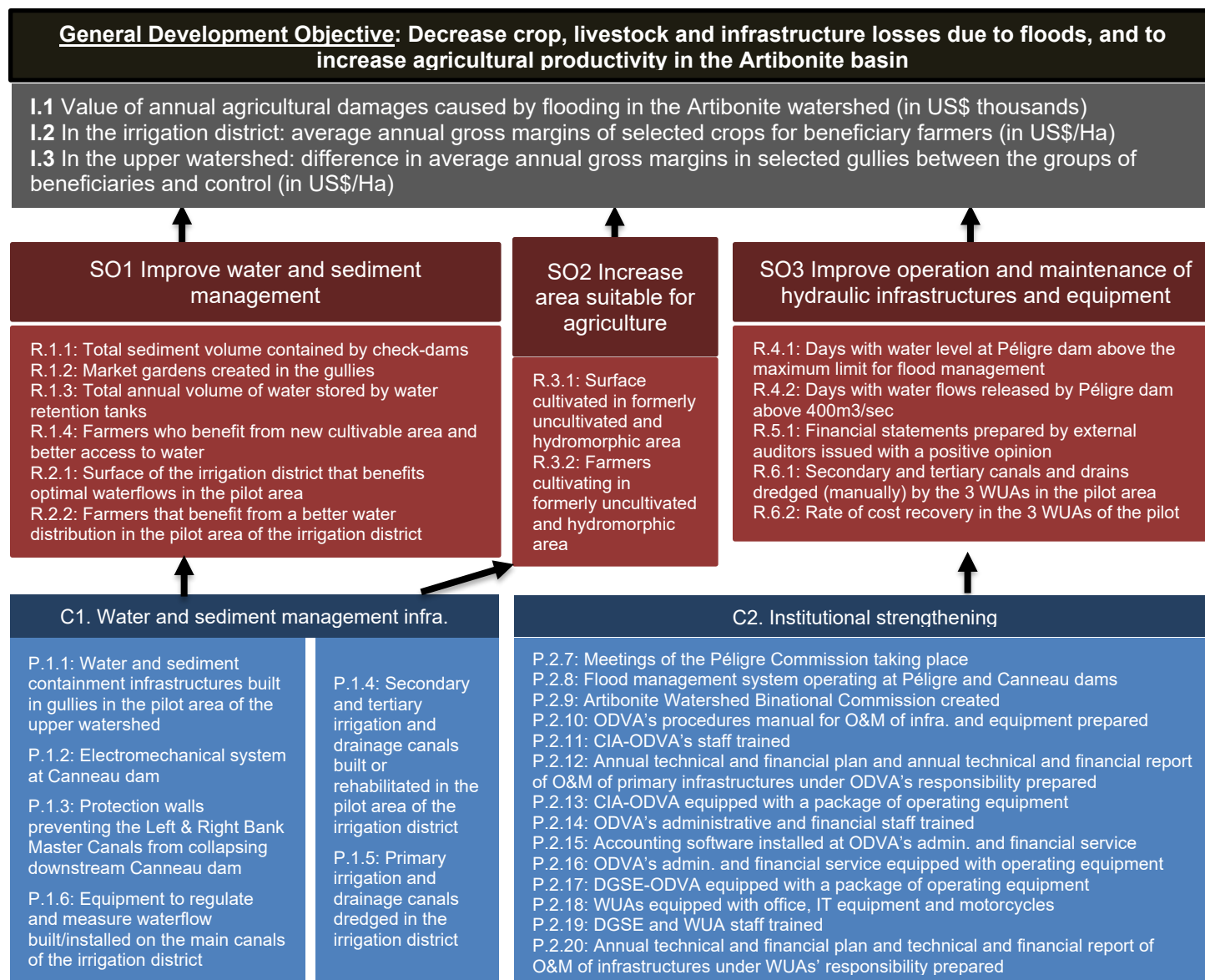
irrigation district would contribute, first and foremost, to increase agricultural productivity (**Impact 2**) through more optimal waterflows.<sup>9</sup> According to the Program's monitoring and evaluation (M&E) plan, **Impact 1** would be measured using an experimental impact evaluation methodology (with a counterfactual), to obtain rigorous, unbiased and attributable results. **Impact 2**, on the other hand, would be measured using a reflexive methodology (before-after comparison, without counterfactual).

- 2.13 **Table 1** presents the Results Matrix of the Program at approval (i.e. as it appears in the [Loan Proposal](#)), startup plan (i.e. as it appears in the first PMR after eligibility: "First period Jan-Jun 2014" in Convergence) and at completion. No changes were made between approval and the startup plan. However, output **P.2.9**, "Artibonite Watershed Binational Commission created", was removed after the startup plan, during an administration mission that took place in April 2018. It was removed because the context (bilateral relations between Haiti and the Dominican Republic) had deteriorated. This removal did not affect the Program's vertical logic, or the achievement of any other output. In addition, a new output, **P.2.21** "Farmers in Artibonite and Centre receiving agricultural inputs in support of agricultural operations in the context of the Covid-19 pandemic", was added in 2020. Following an official request from MARNDR, financial resources from PROGEBA were mobilized in the Program's areas of intervention (departments of Artibonite and Centre) to provide agricultural inputs and services to farmers. This change did not affect the Program's vertical logic as it contributed to SO2 and SO3. There was no other change (including reformulation) in the Results Matrix between startup plan and completion. The PCR will thus report on all indicators as they appear in the startup plan as well as on the three additional outcomes and the additional output that were added during execution.

The Program's specific objectives and vertical logic were aligned with country development needs and priorities (IDB country strategy) at the time of approval and at closure. The vertical logic of the Program was also clear, quite robust, and demonstrated the relevance of the operation. However, the reform process, which was expected to reach completion in 2014 with the support of the Bank's third PBG, stalled due to changes in the local political and institutional dynamic. This third PBG was never approved. As a result, at closure, (i) WUAs remained without legal status, thus still not legally allowed to recover O&M costs via the collection of water user fees and to allocate water among their members; (ii) the institutional and legal frameworks for O&M in the district were not reformed, thus making the prospect of any sustainable institutional improvement at ODVA unlikely; and (iii) the Peligre Commission was never institutionalized, thus making it still possible for floods caused by the unilateral management of water at Peligre dam by EDH to occur. Despite this, the Program remained aligned with country development challenges at closure. Component 1's main infrastructure investments and dredging operations, for instance, which are critical for the development of the Artibonite valley, would not have been possible without the operational and technical support of the different entities strengthened through Component 2. In addition, the reform process has never been formally abandoned. Overall, the Program's relevance can be considered satisfactory.

<sup>9</sup> *Evaluation de la vulnérabilité aux inondations des infrastructures hydro-agricoles dans la Vallée de l'Artibonite*, BID/Body, 2009; COB-LGL, 2009.

**Figure 1. Vertical Logic of the Program at approval**



**Table 1. Results Matrix (@ approval, Startup plan and @exit)**

Indicators	At approval <sup>10</sup>			Startup plan <sup>11</sup>			At project completion (PCR)			Comments
	Unit of measure	Baseline	EOP (P)	Unit of measure	Baseline	EOP (P)	Unit of measure	Baseline	EOP (A)	
<b>Specific Objective 1: Improve water and sediment management</b>										
R.1.1 Total volume of sediment contained by check-dams	m3	0	66,500	m3	0	66,500	m3	0	43,110	
R.1.2 Market gardens created in the gullies	Ha	0	620	Ha	0	620	Ha	0	2.43	
R.1.3 Total annual volume of water stored by water retention tanks	m3	0	52,000	m3	0	52,000	m3	0	7,230	
R.1.4 Farmers who benefit from new cultivable area and better access to water	Farmers	0	2,350	Farmer	0	2,350	Farmer	0	975	
R.2.1 Surface of the irrigation district that benefits optimal waterflows in the pilot area	Ha	0	3,300	Ha	0	3,300	Ha	0	2,256	
R.2.2 Number of farmers that benefit a better water distribution in the pilot area of the irrigation district	Farmers	0	6,400	Farmer	0	6,400	Farmer	0	6,441	
<b>Specific Objective 2: Increase area suitable for agriculture</b>										
R.3.1. Surface cultivated in formerly uncultivated and hydromorphic area	Ha	0	3,000	Ha	0	3,000	Ha	0	444	
R.3.2 Number of farmers cultivating in formerly uncultivated and hydromorphic area	Farmers	0	7,500	Farmer	0	7,500	Farmer	0	239	
<b>Specific Objective 3: Improve operation and maintenance of hydraulic infrastructures and equipment at Péligre dam and in the irrigation district</b>										
R.4.1. Days with water level at Péligre dam above the maximum limit for flood management	Day	75	0	Days	75	0	Days	75	31	
R.4.2. Days with water flows released by Péligre dam above 400m3/sec	Day	18	0	Days	18	0	Days	18	0	

<sup>10</sup> Data source: POD.

<sup>11</sup> Data source: PMR "First period Jan-Jun 2014" in Convergence.

Indicators	At approval <sup>12</sup>			Startup plan <sup>13</sup>			At project completion (PCR)			Comments
	Unit of measure	Baseline	EOP (P)	Unit of measure	Baseline	EOP (P)	Unit of measure	Baseline	EOP (A)	
<b><i>Specific Objective 3: Improve operation and maintenance of hydraulic infrastructures and equipment at Péligre dam and in the irrigation district</i></b>										
R.5.1. Financial statements prepared by external auditors issued with a positive opinion	Audit	0	1	Audit	0	1	Audit	0	0	
R.6.1. Secondary and tertiary canals and drains dredged (manually) by the 3 WUAs in the pilot area	Km <sup>14</sup>	86	136.4 <sup>15</sup>	Km	86	136.4 <sup>16</sup>	Km	86	24.95	
R.6.2. Rate of cost recovery in the 3 WUAs of the pilot area	%	0	75	%	0	75	%	0	0	

<sup>12</sup> Data source: POD.

<sup>13</sup> Data source: PMR "First period Jan-Jun 2014" in Convergence.

<sup>14</sup> This unit of measure was wrongly entered in Convergence as "meters" instead of "kilometers". The information presented in this table is correct.

<sup>15</sup> The EOP (P) for this indicator was wrongly entered in Convergence as "1,364" instead of "136.4". The information presented in this table is correct.

<sup>16</sup> The EOP (P) for this indicator was wrongly entered in Convergence as "1,364" instead of "136.4". The information presented in this table is correct.



## II.2 Effectiveness

### a. Statement of project development objectives.

- 2.14 As originally stated in the Grant proposal approved by the Bank, the general objectives of the Program were to decrease crop, livestock and infrastructure losses due to floods, and to increase agricultural productivity in the Artibonite basin. The specific objectives were to improve water and sediment management in selected areas of the upper and lower watershed; to increase area suitable for agriculture; and to improve operation and maintenance of hydraulic infrastructures and equipment at Peligre dam and in the irrigation district.

### b. Results Achieved

- 2.15 **Table 2** presents the Results Matrix achieved at the time of completion. Achieved outputs are presented in **Annex 1**. The Program's duration was extended by 24 months in 2019, mainly because an increase in fuel price led to severe and nationwide security issues, which paralyzed the country on several occasions that year.<sup>17</sup>

#### **Specific Objective #1: Improve water and sediment management**

- 2.16 In the upper watershed, check-dams have contributed to reduce erosion by helping contain an estimated 43,110 m3 of sediments, which represents 65% of the target set out in the startup plan (66,500 m3) (**R.1.1**). This gap is explained by the fact that only 42% of planned water and sediment containment infrastructures were built by the Program (**P.1.1**; **Table A**), due to issues to identify appropriate construction sites, followed by construction delays as well as by other factors that negatively impacted the timing of construction. Among others, missing supporting documents (patent, tax clearance, residence permit), which led to a postponement of one year of the start-up order to June 1, 2015.<sup>18</sup> While this indicator and its target were appropriate at the level of the micro- or sub-watershed where check-dams were built, they seemed less so when considering the entire upper watershed. A 2021 study indeed estimated that the volume of sediments deposited in Peligre's reservoir every year, as a consequence of erosion, ranged from 2 to 7.3 million m3, over 45 times the (accumulated) result achieved over the course of the Program (when considering the lower range of 2 million m3 of sediments).<sup>19</sup>
- 2.17 Still in the upper watershed, check dams have only helped create 2.43 Ha of markets gardens (**R.1.2**; 0.4% of the target achieved) and store an estimated annual volume of 7,230 m3 of water in retention tanks (**R.1.3**; 14% of the target achieved), which benefited 975 farmers (**R.1.4**; 41% of the target achieve). Only concrete (**Picture 1**) and gabion (**Picture 2**) check dams were expected to create market gardens. However, the Program only built 212 of them, 61% of what had been planned (**Table A**), for reasons explained in the previous paragraph. In addition, as described in the Program's final evaluation, the assumption that each concrete or gabion check dam would create, on average, 1.6 Ha of

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<sup>17</sup> [PROGEBA – Évaluation finale – Rapport final](#). Duchier. Juin 2021.

<sup>18</sup> [PROGEBA – Évaluation finale – Rapport final](#). Duchier. Juin 2021.

<sup>19</sup> *Études de la sédimentation du réservoir de Péligre et propositions d'alternatives techniques de gestion*. AECOM. Janvier 2021. P.21.

market gardens was not realistic.<sup>2021</sup> Instead, the Program's concrete and gabion check dams created, on average, 128.3 m<sup>2</sup>, or less than 0.013 Ha, of market gardens per dam. Issues to identify appropriate construction sites with parameters (i.e., soil type, micro- or sub-watershed's slope, and land use, in particular) conducive to the accumulation and stabilization of fertile soil sediments, have been considered one of the main factors behind this gap. In particular, the discrepancy between the original estimate (1.6 Ha) and the ex post calculation (0.013 Ha) is the result of: (i) measurement mistakes made in the 2013 study; and (ii) differences in the nature, scale and context of intervention (different areas of intervention; the 31 check dams of Gros Morne had a single purpose, agricultural intensification, while those built by the project also aimed at reducing erosion; etc.).<sup>22</sup> This very factor was already considered a high risk in the Program's Risk Matrix but the proposed mitigation measure, "to develop the capacities of local firms/engineers", proved insufficient. On the other hand, of the 200 concrete check dams with water retention tanks that the Program hoped to finance, only 34 were built, which explains the lower than anticipated annual volume of water stored in retention tanks (**R.1.3**). Nevertheless, farmers' satisfaction with these tanks, used both as irrigation and livestock-watering tools, was as high as 75%, in particular during dry seasons.<sup>23</sup> In sum, while **R.1.3** and **R.1.4** were appropriate indicators, **R.1.2** was not.

**Table A. Water and sediment containment infrastructures planned and built**

Type of water and sediment containment infrastructures	Target <sup>24</sup>	Actual achievement	% achieved
Concrete check dams with water retention tanks	200	34	17%
Concrete check dams without water retention tanks	70	0	0%
Gabion baskets check dams	80	178	222%
Loose stone/rock dams	100	0	0%
Biological dams	500	185	37%
<b>TOTAL</b>	<b>950</b>	<b>397</b>	<b>42%</b>

<sup>20</sup> *PROGEBA – Évaluation finale – Rapport final*. Duchier. Juin 2021.

<sup>21</sup> [PROGEBA – Consultoría para el Análisis Económico ExAnte – Informe Final. De Agueda Corneloup. Octobre 2013.](#)

<sup>22</sup> [PROGEBA – Rapport Final – Enquête Suivi Évaluation Finale](#). Angrand, Felix, Rozefort, Saint-Dic. Février 2021.

<sup>23</sup> *PROGEBA – Rapport Final – Enquête Suivi Évaluation Finale*. Angrand, Felix, Rozefort, Saint-Dic. Février 2021.

<sup>24</sup> [M&E plan](#).

**Picture 1. Concrete check dam with water retention tank**



**Picture 2. Gabion check dam**





- 2.18 In the lower watershed, the Program helped provide optimal waterflows to 2,256 Ha of the irrigation district (**R.2.1**; 68% of the target achieved), which benefitted an estimated 6,441 farmers in the area (**R.2.2**; more than 100% of the target achieved). The Program managed to build protection walls downstream of the Canneau dam to prevent the master canal's left and right banks from collapsing (**P.1.3**) and contributed to the rehabilitation of Canneau's electromechanical system (**P.1.2**). The target of the latter has been achieved but, because of repeated unsuccessful procurement processes, the nature (or content) of the work that was conducted (maintenance and repairs of Canneau's gates and automatic commands) differed from what had been originally planned (replacement of those gates and automatic commands). Last, the Program failed to build and install equipment to regulate and measure water flow on the main canals of the irrigation district (**P.1.6**; 1% of the target achieved), mainly because of failures by ODVA to ensure appropriate conditions for the realization of the work (failure to secure water users' support and compliance, and lack of coordination with other interventions in the area).<sup>25</sup> **P.1.6** then became irrelevant after a GOH's initiative, called the Caravane, dredged several canals in the district between 2017 and 2018, but damaged their profiles while doing so, thus making it impossible for regulation devices to function properly.
- 2.19 In sum, SO1 was only partially achieved. In the lower watershed, the Program did contribute to improve water management. In the upper watershed, however, improvements in sediment and water management were significantly lower than the targets that had been defined at startup plan.

### **Specific Objective #2: Increase area suitable for agriculture**

<sup>25</sup> PROGEBA – Évaluation finale – Rapport final. Duchier. Juin 2021.

- 2.20 With respect to SO2, the Program contributed to increase the surface cultivated in formerly uncultivated and hydromorphic area by 444 Ha (**R.3.1**; 15% of the target achieved), which benefited 239 farmers (**R.3.2**; 3% of the target achieved). In sum, SO2 was not achieved, even though the associated outputs (**P.1.4** and **P.1.5**) had almost fully reached their targets (83% and 96% of their targets achieved, respectively). While **R.3.1** and **R.3.2** were appropriate indicators for SO2, a combination of internal factors (the partial achievement of SO1 and SO3, and over ambitious targets) and external ones (farmers' financial constraints, land tenure clarity issues and the lack of support from ODVA which failed to provide agricultural inputs and plowing services, in particular) made it difficult to reach their targets. In addition, the monitoring of **R.3.2** was made increasingly difficult because of the security context, which significantly deteriorated starting from 2019.<sup>26</sup>

**Specific Objective #3: Improve operation and maintenance of hydraulic infrastructures and equipment at Péligre dam and in the irrigation district**

- 2.21 As described above, with respect to SO3, the Program aimed at strengthening the different institutions involved in the O&M of hydraulic infrastructures and equipment (1) at Péligre dam, (2) at Canneau dam and in the upper irrigation district (primary canals and drains) and (3) in the lower irrigation district (second and third-level canals and drains).
- 2.22 At Péligre dam, the Program contributed to reduce the number of days per year (i) with water level above the maximum limit for flood management from 75 down to 31 (**R.4.1**; 59% of the target achieved) and (ii) with water flows released by the dam above 400m3/sec from 18 to zero (**R.4.2**; 100% of the target achieved). Monitoring by the Péligre Commission was expected to incentivize compliance with these operating rules. But the collapse of the reform process as early as 2014, which led to the cancellation of the Bank's third PBG, weakened the Commission. It was never institutionalized as initially planned, it did not secure full administrative and financial support from the GoH, and, after 2014, only met sporadically and under the pressure from the Program
- 2.23 At Canneau dam and in the upper irrigation district, the Program was not able to get ODVA's financial statements issued with a positive opinion from external auditors (**R.5.1**; 0% of the target achieved). As described in the Program's final evaluation, even though all but one (**P.2.12**) of the outputs leading to **R.5.1** were either fully met or exceeded their targets (see **Annex 1**), ODVA was never able to register all its financial transactions properly and exhaustively.<sup>27</sup> Despite various recommendations made by external auditors aiming at improving ODVA's administrative and financial management, ODVA failed to comply. As a result, external auditors were never able to issue a positive opinion on ODVA's financial statements during the course of the Program. The risk of "inefficient use of resources by ODVA and inability to justify the use of resources" had been identified in the Program's risk matrix and classified as high. But the proposed mitigation measures, operationalized in outputs **P.2.10-16**, proved ineffective in the absence of wider institutional reforms (of the mandate and functioning of ODVA, in particular), which were included in the Bank's third PBG. Similarly, an administration mission, which took place in April 2018 with participants from the Bank, the Program, MARNDR and ODVA, and aimed specifically at defining detailed steps (including deadlines) for ODVA to fulfill its different activities as part of the Program, did not achieve the intended results.<sup>28</sup> As highlighted in

<sup>26</sup> PROGEBA – Évaluation finale – Rapport final. Duchier. Juin 2021.

<sup>27</sup> PROGEBA – Évaluation finale – Rapport final. Duchier. Juin 2021.

<sup>28</sup> PROGEBA – Évaluation finale – Rapport final. Duchier. Juin 2021.

the Program's final evaluation, the deterioration of the context (social, political, economic, sanitary and security), which accelerated in 2019, made the prospect of any sustainable institutional improvement at ODVA even more unlikely.

- 2.24 In the lower irrigation district, the Program only got WUAs to dredge 25 Km of secondary and tertiary canals and drains in the pilot area (**R.6.1**; 18% of the target achieved) and failed to have them recover any of their costs from their members (**R.6.2**; 0% of the target achieved). Outputs contributing to these two results (**P.2.18** and **P.2.20**, in particular) fell quite short of their targets (see **Annex 1**). Here as well, the risk of "O&M of hydraulic infrastructures and equipment in the Valley remain poor/inexistent" had been identified in the Program's risk matrix and classified as high, but the proposed mitigation measures also proved ineffective. **R.6.1** was an appropriate indicator, monitoring improvements in the main service provided by WUAs, but the deterioration of the context as well as the collapse of the reform process described above made it difficult to reach the target set at approval. The same applies to **R.6.2**. Overall, the deterioration of the context during the Program's execution (an external factor) is likely to have been the main factor behind the Program's inability to reach the targets of **R.6.1** and **R.6.2**, despite the Program's 24 months extension, conceded to compensate the delays in the execution of the contracts, that were related to the insecurity in the Program areas of intervention.

#### **General Objectives (Impacts)**

- 2.25 As described in more details in the following paragraphs, during the course of the Program, the value of annual agricultural damages caused by flooding in the Artibonite watershed decreased from an estimated US\$8.7 million in 2013 down to US\$4.5 million in 2020 (**Impact 1.1**). The Program, however, did not lead to any improvement in agricultural productivity in the Artibonite watershed (**Impacts 2.1** and **2.2**).

**Table 2. Results Achieved Matrix**

Table 2: Results Achieved matrix							
Impacts/Specific Objectives/Indicator	Unit of Measure	Baseline value <sup>29</sup>	Baseline year	Targets and Actual achievement <sup>30</sup>		% Achieved <sup>31</sup>	Means of verification
Impact 1: Decrease crop, livestock and infrastructure losses caused by flooding in the Artibonite watershed							
I.1.1 Value of annual agricultural damages caused by flooding in the Artibonite watershed	'000 US\$	8,700	2013	P P(a) A	1,738 1,738 4,500	60.3%	Enquête de suivi Bas Artibonite (2020)
Impact 2: Increase agricultural productivity in the Artibonite watershed							
I.2.1 In the irrigation district: average annual gross margins of rice for beneficiary farmers	US\$ / Ha	1,176	2013	P P(a) A	1,515 1,515 575	0%	Enquête suivi-évaluation finale (2021)
I.2.2 In the upper watershed: difference in average annual gross margins in selected gullies between the group of beneficiaries and control	US\$ / Ha	0	2013	P P(a) A	1,556 1,556 0	0%	Enquête suivi-évaluation finale (2021)
Specific Objective #1: Improve water and sediment management							
R.1.1 Total volume of sediment contained by check-dams	m3	0	2013	P P(a) A	66,500 66,500 43,110	64.8%	M&E reports
R.1.2 Market gardens created in the gullies	Ha	0	2013	P P(a) A	620 620 2.43	0.4%	Enquête suivi-évaluation finale (2021)
R.1.3 Total annual volume of water stored by water retention tanks	m3	0	2013	P P(a) A	52,000 52,000 7,230	13.9%	Enquête suivi-évaluation finale (2021)
R.1.4 Farmers who benefit from new cultivable area and better access to water	Farmer	0	2013	P P(a) A	2,350 2,350 975	41.5%	Enquête suivi-évaluation finale (2021)
R.2.1 Surface of the irrigation district that benefits optimal waterflows in the pilot area	Ha	0	2013	P P(a) A	3,300 3,300 2,256	68.4%	Évaluation finale externe du Consortium (2020)

<sup>29</sup> Sources: POD or Convergence for additional indicators added during execution.

<sup>30</sup> Where: P = Start-Up Plan (source: PMR "First period Jan-Jun 2014" in Convergence); P (a) = Revised Annual Target (source: last PMR in Convergence); A = Actual (source: last PMR in Convergence).

<sup>31</sup> Relative to P.

Specific Objectives/Indicator	Unit of Measure	Baseline value <sup>32</sup>	Baseline year	Targets and Actual achievement <sup>33</sup>		% Achieved <sup>34</sup>	Means of verification
R.2.2 Number of farmers that benefit a better water distribution in the pilot area of the irrigation district	Farmer	0	2013	P P(a) A	6,400 6,400 6,441	+100%	Évaluation finale externe du Consortium (2020)
<b>Specific Objective #2: Increase area suitable for agriculture</b>							
R.3.1. Surface cultivated in formerly uncultivated and hydromorphic area	Ha	0	2013	P P(a) A	3,000 3,000 444	14.8%	M&E reports
R.3.2 Number of farmers cultivating in formerly uncultivated and hydromorphic area	Farmer	0	2013	P P(a) A	7,500 7,500 239	3.2%	M&E reports
<b>Specific Objective #3: Improve operation and maintenance of hydraulic infrastructures and equipment at Péligre dam and in the irrigation district</b>							
R.4.1. Days with water level at Péligre dam above the maximum limit for flood management	Days	75	2011	P P(a) A	0 0 31	58.7%	M&E reports
R.4.2. Days with water flows released by Péligre dam above 400m3/sec	Days	18	2011	P P(a) A	0 0 0	100%	M&E reports
R.5.1. Financial statements prepared by external auditors issued with a positive opinion	Audit	0	2012	P P(a) A	1 1 0	0%	M&E reports
R.6.1. Secondary and tertiary canals and drains dredged (manually) by the 3 WUAs in the pilot area	Km <sup>35</sup>	0	2012	P P(a) A	136.4 <sup>36</sup> 136.4 24.95	18.3%	Évaluation finale externe du Consortium (2020)
R.6.2. Rate of cost recovery in the 3 WUAs of the pilot area	%	0	2012	P P(a) A	75 75 0	0%	Évaluation finale externe du Consortium (2020)

<sup>32</sup> Sources: POD or Convergence for additional indicators added during execution.

<sup>33</sup> Where: P = Start-Up Plan (source: PMR "First period Jan-Jun 2014" in Convergence); P (a) = Revised Annual Target (source: last PMR in Convergence); A = Actual (source: last PMR in Convergence).

<sup>34</sup> Relative to P.

<sup>35</sup> This unit of measure was wrongly entered in Convergence as "meters" instead of "kilometers". The information presented in this table is correct.

<sup>36</sup> The EOP (P) for this indicator was wrongly entered in Convergence as "1,364" instead of "136.4". The information presented in this table is correct.



### c. Counterfactual Analysis

#### **Specific Objective #1: Improve water and sediment management**

- 2.26 In the upper watershed, no counterfactual was identified, as the result indicators (**R.1.1**, **R.1.2**, **R.1.3** and **R.1.4**) were directly attributable to the check dams built by the Program ((**P.1.1**). Instead, a before-after comparison was implemented.<sup>37</sup>
- 2.27 In the lower watershed, there was no counterfactual as the interventions (**P.1.2**, **P.1.3** and **P.1.6**) benefitted the entire irrigation district. The associated result indicators (**R.2.1** and **R.2.2**) were measured by the technical assistant responsible for the strengthening of WUAs, based on field observations and reports from WUAs.<sup>38</sup> It is reasonable to assume that these changes were mainly attributable to the Program, considering the absence of any other similar and large-scale intervention in the irrigation district over the same period.

#### **Specific Objective #2: Increase area suitable for agriculture**

- 2.28 Similarly, here, there was no counterfactual as the interventions (**P.1.4** and **P.1.5**) benefitted the entire irrigation district. The associated result indicators (**R.3.1** and **R.3.2**) were estimated by the Program's M&E Team, given the information found in the WUAs' member registries. It is also reasonable to assume that these changes were mainly attributable to the Program, considering the absence of any other similar and large-scale intervention in the irrigation district over the same period.

#### **Specific Objective #3: Improve operation and maintenance of hydraulic infrastructures and equipment at Péligre dam and in the irrigation district**

- 2.29 Result indicators associated with SO3 were also measured using a before-after comparison. **R.4.1** and **R.4.2** were directly attributable to the O&M of Peligre dam, which improved with the Program (no other similar and large-scale intervention at the level of Peligre dam took place over the same period). Such a change could have also been explained by lower rainfalls, but there is no evidence or available data to support this hypothesis.
- 2.30 With respect to **R.5.1**, **R.6.1** and **R.6.2**, the Program failed to lead to any change in **R.5.1** and **R.6.2**, and only achieved 18% of the target for **R.6.1**. As described in the Program's [M&E plan](#), there was no counterfactual to measure the latter, because the three WUAs supported by the Program had been selected non-randomly and possessed unique characteristics in the irrigation district, namely: they were the three WUAs located at the most upstream point of the irrigation district, and thus had the best access to water, and their hydraulic infrastructures were the most developed of the irrigation district. **R.6.1** was measured by the technical assistant responsible for the strengthening of WUAs, based on field observations and reports from WUAs.<sup>39</sup> It is reasonable to assume that the changes observed in **R.6.1** were mainly attributable to the Program, considering the absence of any other similar and large-scale intervention in the irrigation district over the same period.

<sup>37</sup> PROGEBA – Rapport Final – Enquête Suivi Évaluation Finale. Angrand, Felix, Rozefort, Saint-Dic. Février 2021.

<sup>38</sup> [Évaluation finale externe du consortium](#). Montès. Octobre 2020.

<sup>39</sup> [Évaluation finale externe du consortium](#). Montès. Octobre 2020.

### **General Objectives (Impacts)**

- 2.31 The Program's impact on losses caused by flooding in the Artibonite watershed (**I.1.1**) was measured using a before-after comparison, as the Program benefitted the entire Artibonite lower watershed.<sup>40</sup> Attributing the changes observed to the Program is difficult, mainly because the definition of the indicator ("losses caused by the most significant last flood") is not precise enough to ensure comparability between before- and after-estimates.
- 2.32 Regarding the Program's impact on agricultural productivity (**I.2.1** and **I.2.2**), it was measured using a before-after comparison in the lower watershed (as the Program benefitted most farmers in the area) and using a counterfactual in the upper watershed. For the latter, a baseline was conducted in 2016, followed by a random allocation of surveyed farmers to treatment and control groups. Despite failures to comply with the results of this randomization and other methodological issues, an analysis was still conducted but failed to measure any impact.<sup>41</sup>

#### **d. Unanticipated outcomes**

- 2.33 The Program did not lead to unanticipated outcomes.

In sum, while SO2 was not achieved, both SO1 and SO3 were partially achieved. For the former, SO1: in the lower watershed, the Program did contribute to improve water management; in the upper watershed, however, improvements in sediment and water management were significantly lower than the targets that had been defined at startup plan. For the latter, SO3, the Program did contribute to improve O&M of hydraulic infrastructures and equipment at the level of Peligre dam but failed to achieve similar results in the irrigation district. The overall Program's effectiveness is thus unsatisfactory, despite the Program's 24 months extension. It is important to note, however, that despite a very unfavorable and fragile intervention context, the Program's investments did contribute, at least, to sustain existing and crucial irrigation infrastructures. For instance, by building protection walls downstream of the Canneau dam to prevent the master canal's left and right banks from collapsing, the Program in effect secured the supply of irrigation water for the entire Artibonite Valley irrigated district (30,000 Ha), Haiti's largest rice-producing area, for several years to come. The same applies to the rehabilitation of Canneau's electromechanical system. Without the Program, the viability of the entire irrigation district (meaning its ability to deliver irrigation water) would today be at serious risk.

### **II.3 Efficiency**

- 2.34 According to the ex-ante economic evaluation (2013) of the Program, its internal rate of return (IRR) would reach 26% over 20 years.<sup>42</sup> Four economic benefits were expected to generate this IRR: (1) an increase in the value of agricultural production in the upper watershed; (2) an increase in agricultural productivity in the lower watershed; (3) a reduction of agricultural losses caused by floods in the irrigation district; and (4) an

<sup>40</sup> [Enquête de suivi Bas Artibonite](#). Rambao. Mars/mai 2020.

<sup>41</sup> [PROGEBA – Rapport Final – Enquête Suivi Évaluation Finale](#). Angrand, Felix, Rozefort, Saint-Dic. Février 2021.

<sup>42</sup> [PROGEBA – Consultoría para el Análisis Económico ExAnte – Informe Final. De Agueda Corneloup. Octubre 2013.](#)

increase in the surface cultivated in formerly uncultivated and hydromorphic area (lower watershed).

- 2.35 The objective of the ex-post economic analysis is to measure the Program's economic viability at the end of its execution, based on estimates of all the incremental costs and benefits that can be attributed to it.<sup>43</sup>
- 2.36 Incremental benefits are benefits which can be linked directly to the Program and which would not have arisen in its absence. Because most of the benefits listed above failed to materialize (see **Table 2**), and despite the attribution problem described in the previous section, the ex-post economic analysis considers the Program's benefit to be the reduction in the value of annual agricultural damages caused by flooding in the Artibonite watershed (**1.1.1**), estimated at US\$ 4.2 million per year.<sup>44</sup>
- 2.37 Incremental costs, on the other hand, correspond to expenditures which would not have been incurred in the absence of the Program such as the actual Program expenditures (see **Table 3**) and associated recurrent costs.
- 2.38 For the entire Program, and using the recommended discount rate of 12%, the Net Present Value (NPV) is US\$ 5.9 million and the IRR 21% over 20 years, which indicates that the Program was economically viable but less so than anticipated in the ex-ante economic evaluation.
- 2.39 A sensitivity analysis is conducted to see how the viability of the Program is affected by changes in the durability of infrastructures built by the Program (**Table B**) and in the value of avoided annual agricultural damages caused by flooding (**Table C**).

**Table B. Sensitivity Analysis – Durability of infrastructures**

Durability of infrastructures	NPV	IRR
20 years	US\$ 5.9 million	21%
15 years	US\$ 3.2 million	18%
10 years	- US\$ 1.6 million	6%

**Table C. Sensitivity Analysis – Avoided annual agricultural damages caused by flooding**

Avoided annual damages per year	NPV	IRR
US\$ 4.2 million	US\$ 5.9 million	21%
US\$ 3 million	US\$ 0	12%

- 2.40 According to **Table C**, keeping costs constant, a decrease in expected annual benefits of 29% (relative to the hypothesis considered here of US\$ 4.2 million) would make the NPV equal to zero (breakeven point).

In sum, the Program's ex-post cost-benefit analysis estimates an internal rate of return (IRR) of 21%, which exceeds the discount rate (12%). Potential comparability and attribution problems associated with the Program's expected benefits do exist but are common and difficult to mitigate when estimating such benefits. In addition, the Program's 24 months extension did not affect the results of this analysis. However, it provided more time to finalize infrastructure works, and thus enhanced their durability. The overall Program's efficiency is thus considered satisfactory.

**Table 3. Costs of the Project**

										Component Revised Cost
<b>1 Component 1. Water and sediment management infrastructures</b>										<b>\$12,165,819.98</b>
Outputs		2014	2015	2016	2017	2018	2019	2020	2021	Cost
1.1 Output 1: Water and sediment containment infrastructures built in gullies in the pilot area of the upper watershed	P	\$50,000.00	\$1,552,500.00	\$1,220,000.00	\$1,220,000.00	\$1,220,000.00				\$5,262,500.00
	P(a)	\$50,000.00	\$1,349,858.00	\$300,000.00	\$500,000.00	\$3,000,000.00	\$1,392,888.48	\$400,000.00	\$60,000.00	\$3,622,111.27
	A	\$9,584.00	\$136,524.00	\$253,853.25	\$421,424.85	\$1,489,492.60	\$584,747.57	\$666,485.00	\$188,785.40	\$3,750,896.67
1.2 Output 2: Electromechanical system (gates and automatic control) at Canneau dam rehabilitated	P	\$150,000.00	\$471,143.00							\$621,143.00
	P(a)	\$150,000.00	\$165,286.00	\$27,800.00	\$0.00	\$2,195.00	\$330,815.00	\$233,250.00	\$70,000.00	\$1,234,624.57
	A	\$0.00	\$60,206.00	\$39,918.33	\$0.00	\$166,564.57	\$14,949.67	\$882,986.00	\$524,870.07	\$1,689,494.64
1.3 Output 3: Protection walls preventing the Left and Right Banks Master Canals from collapsing downstream Canneau dam: built	P	\$1,000,000.00	\$1,690,986.00							\$2,690,986.00
	P(a)	\$1,000,000.00	\$1,150,099.00	\$1,541,713.00	\$595,778.84	\$0.00	\$0.00		\$0.00	\$1,881,593.95
	A	\$0.00	\$556,459.00	\$1,138,748.16	\$144,922.85	\$14,627.94	\$0.00	\$26,836.00		\$1,881,593.95
1.4 Output 4: Secondary and tertiary irrigation and drainage canals built or rehabilitated, and equipped, in the pilot area of the irrigation district	P	\$1,500,000.00	\$1,821,105.00	\$1,120,603.00						\$4,441,708.00
	P(a)	\$1,500,000.00	\$2,457,003.00	\$3,000,000.00	\$115,036.77	\$79,060.41	\$500,000.00	\$88,685.42	\$0.00	\$3,485,935.64
	A	\$0.00	\$822,569.00	\$2,325,612.62	\$241,548.34	\$63,292.50	\$32,913.18	\$0.00		\$3,485,935.64
1.5 Output 5: Primary irrigation and drainage canals dredged in the irrigation district	P	\$0.00	\$929,250.00	\$796,500.00	\$796,500.00	\$796,500.00	\$132,750.00			\$3,451,500.00
	P(a)	\$0.00	\$828,360.00	\$255,970.00	\$157,326.72	\$121,436.44	\$47,474.00	\$1,000,000.00	\$220,000.00	\$1,742,556.04
	A	\$0.00	\$0.00	\$393,086.43	\$1,045,791.20	\$83,678.41	\$0.00	\$0.00	\$654,658.86	\$2,177,214.90
1.6 Output 6: Equipment to regulate and measure water flow built/installed on the main canals of the irrigation district	P		\$669,667.00	\$765,653.00						\$1,435,320.00
	P(a)		\$894,417.00	\$20,000.00	\$79,722.92	\$8,728.77	\$0.00		\$0.00	\$198,998.51
	A	\$0.00	\$0.00	\$118,711.27	\$76,324.49	\$0.00	\$3,962.75	\$0.00		\$198,998.51
										Component Revised Cost
<b>2 Component 2. Institutional strengthening</b>										<b>\$8,086,293.45</b>
Outputs		2014	2015	2016	2017	2018	2019	2020	2021	Cost
2.1 Output 7: Meetings of the Péligre Commission taking place	P	\$10,000.00	\$69,000.00	\$69,000.00	\$69,000.00	\$69,000.00	\$59,000.00			\$345,000.00
	P(a)	\$10,000.00	\$79,615.00	\$0.00	\$30,000.00	\$60,000.00	\$219,151.00	\$20,000.00	\$0.00	\$187,041.13
	A	\$0.00	\$1,352.00	\$0.00	\$55,766.59	\$59,025.54	\$33,672.00	\$37,225.00	\$0.00	\$187,041.13
2.2 Output 8: Flood management system (composed of water level gauges, flood management software and one computer per dam) operating at the Péligre and Canneau dams	P	\$50,000.00	\$288,725.00							\$338,725.00
	P(a)	\$50,000.00	\$338,725.00			\$0.00	\$248,000.00	\$200,000.00	\$30,000.00	\$30,000.00
	A	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$158,798.98	\$158,798.98
2.3 Output 9: Arribonite Watershed Binational Commission created	P		\$0.00	\$62,500.00	\$62,500.00	\$62,500.00	\$62,500.00			\$250,000.00
	P(a)		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00			\$0.00
	A		\$0.00	\$0.00	\$0.00	\$0.00				\$0.00

Outputs		2014	2015	2016	2017	2018	2019	2020	2021	Cost
2.3 Output 10: ODVA's procedures manual for operation and maintenance of infrastructure and equipment prepared	P	\$58,011.00	\$70,000.00							\$128,011.00
	P(a)	\$58,011.00	\$19,609.28	\$40,800.00	\$24,952.10	\$31,659.38	\$36,337.00	\$5,000.00	\$0.00	\$173,535.22
	A	\$0.00	\$21,914.00	\$47,648.17	\$55,569.82	\$34,072.23	\$14,331.00	\$0.00	\$599.55	\$174,134.77
2.4 Output 11: CIA-ODVA's staff trained	P		\$85,342.00	\$85,340.00	\$85,342.00					\$256,024.00
	P(a)		\$41,669.72	\$80,000.00	\$130,932.21	\$63,318.76	\$57,345.00	\$10,000.00	\$0.00	\$347,069.44
	A	\$0.00	\$43,827.00	\$95,296.33	\$111,139.64	\$68,144.47	\$28,662.00	\$0.00	\$1,200.10	\$348,269.54
2.5 Output 12: Annual technical and financial plan and annual technical and financial report of operation and maintenance of primary infrastructures under ODVA's responsibility prepared	P	\$21,206.00	\$51,205.00	\$51,204.00	\$51,204.00	\$51,204.00	\$30,000.00			\$256,023.00
	P(a)	\$21,206.00	\$80,500.00	\$45,500.00	\$130,932.21	\$63,318.76	\$12,990.00	\$10,000.00	\$0.00	\$347,069.34
	A	\$9,530.00	\$51,602.00	\$77,991.23	\$111,139.64	\$68,144.47	\$28,662.00	\$0.00	\$1,200.10	\$348,269.44
2.6 Output 13: CIA-ODVA equipped with a package of operating equipment	P	\$30,000.00	\$60,000.00							\$90,000.00
	P(a)	\$30,000.00	\$30,000.00	\$34,125.00	\$0.00	\$0.00	\$57,876.00	\$1,300,000.00	\$0.00	\$2,052,914.00
	A	\$0.00	\$32,124.00	\$0.00	\$0.00	\$0.00	\$0.00	\$2,020,790.00		\$2,052,914.00
2.7 Output 14: ODVA's administrative and financial staff trained	P	\$0.00	\$50,000.00	\$50,000.00	\$50,000.00					\$150,000.00
	P(a)	\$0.00	\$120,000.00	\$90,000.00	\$14,850.00	\$0.00	\$131,889.00		\$0.00	\$21,110.39
	A	\$0.00	\$3,083.00	\$0.00	\$16,180.30	\$1,847.09	\$0.00	\$0.00	\$0.22	\$21,110.61
2.8 Output 15: Accounting software installed at the ODVA's administrative and financial service	P		\$15,000.00							\$15,000.00
	P(a)		\$7,156.44	\$4,586.44		\$1,782.00	\$2,025.00		\$0.00	\$19,474.65
	A	\$7,843.56	\$2,570.00	\$3,000.00	\$6,061.09	\$0.00	\$0.00	\$0.00	\$0.26	\$19,474.91
2.9 Output 16: ODVA's administrative and financial service equipped with a package of operating equipment	P		\$60,000.00							\$60,000.00
	P(a)		\$60,000.00	\$30,000.00	\$0.00	\$0.00	\$240.00		\$0.00	\$65,759.42
	A	\$0.00	\$0.00	\$61,179.42	\$4,580.00	\$0.00	\$0.00	\$0.00		\$65,759.42
2.10 Output 17: DGSE-ODVA equipped with a package of operating equipment	P	\$50,000.00	\$90,000.00							\$140,000.00
	P(a)	\$50,000.00	\$70,000.00	\$70,511.82	\$0.00	\$72,433.52	\$51,699.00	\$44,000.00	\$0.00	\$191,370.94
	A	\$550.18	\$68,938.00	\$73,465.37	\$16,670.17	\$13,231.22	\$18,516.00	\$0.00	\$0.73	\$191,371.67
2.11 Output 18: Water Users Associations (WUAs) equipped with office, IT equipment and motorcycles	P	\$0.00	\$260,625.00	\$347,500.00	\$86,875.00					\$695,000.00
	P(a)	\$0.00	\$260,625.00	\$80,000.00	\$34,275.28	\$470,033.98	\$353,714.00	\$254,000.00	\$15,000.00	\$596,923.00
	A	\$37,076.82	\$0.00	\$23,647.90	\$1,338.09	\$178,591.19	\$121,875.00	\$219,394.00	\$56,631.49	\$638,554.49
2.12 Output 19: DGSE and WUA staff trained	P	\$50,000.00	\$326,322.00	\$288,161.00	\$278,161.00	\$274,080.50	\$270,330.00			\$1,487,054.50
	P(a)	\$50,000.00	\$362,946.65	\$100,000.00	\$200,000.00	\$350,000.00	\$277,129.00	\$130,000.00	\$50,000.00	\$1,794,563.10
	A	\$0.00	\$28,643.00	\$23,109.37	\$243,482.65	\$456,503.08	\$819,002.00	\$173,823.00		\$1,744,563.10
2.13 Output 20: Annual technical and financial plan and annual technical and financial report of operation and maintenance of infrastructures under WUAs' responsibility: prepared	P	\$50,000.00	\$326,322.00	\$288,161.00	\$278,161.00	\$274,080.50	\$270,331.00			\$1,487,055.50
	P(a)	\$50,000.00	\$370,081.35	\$100,000.00	\$150,000.00	\$350,000.00	\$266,140.00	\$130,000.00	\$50,000.00	\$1,794,564.09
	A	\$0.00	\$28,643.00	\$23,109.37	\$243,482.65	\$456,503.07	\$819,002.00	\$173,824.00		\$1,744,564.09
2.14 Output 21: Farmers in Artibonite and Centre receiving agricultural inputs in support of agricultural operations in the context of the Covid19 pandemic	P									\$0.00
	P(a)							\$1,000,000.00	\$88,862.73	\$464,898.73
	A	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$376,036.00		\$376,036.00

										Component Revised Cost
3 Administration, Monitoring and Evaluation, Audits, Contingencies										
Other Cost		2014	2015	2016	2017	2018	2019	2020	2021	Cost
Administration, Monitoring and Evaluation, Audits, Contingencies	P	\$725,253.00	\$739,451.00	\$739,451.00	\$739,451.00	\$739,451.00	\$215,893.00			\$3,898,950.00
	P(a)	\$725,253.00	\$783,281.00	\$809,581.00	\$706,583.92	\$711,434.32	\$967,504.00	\$400,000.00	\$400,000.00	\$4,641,558.57
	A	\$414,618.00	\$778,603.00	\$709,392.64	\$721,546.66	\$713,360.46	\$252,168.69	\$651,869.12	\$775,966.07	\$5,017,524.64
Total Cost		2014	2015	2016	2017	2018	2019	2020	2021	Total Cost
	P	\$3,744,470.00	\$9,626,643.00	\$5,884,073.00	\$3,717,194.00	\$3,486,816.00	\$1,040,804.00			\$27,500,000.00
	P(a)	\$3,744,470.00	\$9,469,232.44	\$6,630,587.26	\$2,870,390.97	\$3,385,401.34	\$4,973,216.48	\$5,224,935.42	\$983,862.73	\$24,893,672.00
	A	\$479,202.56	\$2,637,057.00	\$5,407,769.86	\$3,516,969.03	\$3,867,078.84	\$2,772,463.86	\$5,229,268.12	\$2,362,711.83	\$26,272,521.10

## II.4 Sustainability

### a. General Sustainability Aspects

- 2.41 The timeframe for this sustainability assessment is 20 years after the Program's closure (same as in the ex-post economic analysis of the Program), which corresponds to the period during which benefits associated with the Program are expected to be realized. The assessment focuses primarily on the sustainability of changes induced by the infrastructures built by the Program (in particular those located at Peligre dam and in the irrigation district).
- 2.42 The sustainability of changes induced by the infrastructures built by the Program, namely the reduction in the value of agricultural losses caused by floods, depends on different factors:
- a. Institutional factors: At the time of approval, a third PBG was in the process of being approved to push, among other things, for the approval of two key pieces of legal reform: (i) a bill on the transfer of management responsibilities over irrigation districts to WUAs; and (ii) a reform of the institutional and legal frameworks for O&M in the Artibonite Valley irrigated district (including a reform of the mandate and functioning of ODVA). As described above, however, the reform process stalled in 2014, which led to the cancellation of the Bank's third PBG. As described in the [PCR of the first two PBGs](#) (HA-L1074 and HA-L1082), unachieved reforms are likely to have impacted PROGEBA, especially its sustainability, by failing (i) to provide a more robust institutional and legal framework for water management and infrastructure O&M in the Artibonite valley and (ii) to bring about an effective Peligre Commission capable of managing water resources at Peligre dam, among other elements.
  - b. Financial factors: Timely and sufficient budgetary resources will be needed at the level of Peligre dam, ODVA and WUAs to finance the continued O&M of existing infrastructures (including canals and drains). In the current economic context, this represents a high probability risk with a high negative impact.
  - c. Technical factors: Other infrastructural weaknesses in the irrigation district might threaten its overall viability.<sup>45</sup> Additionally, in the longer-term (less than 50 years), the continued inability to prevent the silting of the Peligre reservoir will end the dam's capacity to prevent/control floods.<sup>46</sup> Mitigating these two factors would require significant additional investments in the irrigation district and in the upper watershed, which is unlikely considering the current context (characterized by social, political, economic, sanitary and security crises). These two technical factors represent a high probability risk with a high negative impact.
  - d. Environmental factors: The infrastructures built by the Program and their ability to reduce agricultural losses caused by floods are vulnerable to extreme adverse climatic events such as hurricanes. Such events represent a medium probability risk with a high negative impact.

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<sup>45</sup> PROGEBA – Évaluation finale – Rapport final. Duchier. Juin 2021.

<sup>46</sup> PROGEBA – Évaluation finale – Rapport final. Duchier. Juin 2021.

## **b. Environmental and Social Safeguards**

- 2.43. The Grant proposal document states that the Program was classified as Category B and that Bank guidelines for this category were duly respected. The Program was never rated with High or Substantial risk at any point during its execution.
- 2.44. An Environmental and Social Management Report (ESMR) was prepared at the start of the Program. It anticipated two main negative environmental and social impacts: (1) dust, soil/sediment displacement, mud slides and environmental degradation as a result of transport and infrastructure work in the upper watershed (material extraction and waste generation, in particular); and (2) social conflicts between WUAs and/or members following rehabilitations in the irrigation district. The ESMR recommended some actions to mitigate these potential impacts: (i) draft and implement a communication plan; (ii) execute infrastructure work during the dry season (between December and March); (iii) conduct further studies, prior to implementation, on the selection of sites for infrastructure work in the upper watershed, looking specifically at existing erosion level, land tenure and logistics (transport of construction material and waste); (iv) train construction engineers and workers on conflict management; and (v) anticipate the development/growth of seedlings to be planted around new infrastructures in the upper watershed. Some of these mitigation actions were implemented by the Program. Contracts with construction companies contained specific clauses on the management of waste and construction material, for instance. A communication strategy was also developed and implemented. In the upper watershed, however, the construction of small-size sediment and water containment infrastructures was carried out by smaller firms, with limited capacities. Frequent social unrest in the area (barricades) as well as a high turnover within the Program's M&E Team made the supervision of their activities in relation to environmental and social safeguards (including consultations with local beneficiaries and stakeholders) more difficult. Nevertheless, the above-mentioned potential negative impacts of the Program did not materialize.

The biggest risk to the sustainability of changes induced by the Program is Haiti's ongoing socio-economic and political crises, worsened by the Covid-19 pandemic. While the absence of a more robust institutional and legal framework in the valley also represents a risk, its potential influence, had it been in place, in such a fragile context where enforcement and budgetary support capacities are extremely limited, is likely over-estimated. In addition, as described in the Program's final evaluation, similar infrastructures were built by the Bank-financed Agricultural Intensification Program (1490/SF-HA) and demonstrated a durability that extends beyond 15 years, despite facing similar significant risks (including the absence of maintenance). The main environmental and social risks identified at the design stage did not materialize. Some issues during execution did arise but were primarily the result of external factors (insecurity and political instability, in particular). The overall Program's sustainability is considered partly unsatisfactory.



### **III. NON-CORE CRITERIA**

#### **III.1 Bank Performance**

- 2.45 Overall, the Bank's performance was satisfactory during the design and implementation of the Program. The Program was designed based on rigorous studies, which were conducted to assess the institutional, technical and economic viability of the proposed interventions, using the information available at the time and based on the conditions which were then prevailing. However, the Program, designed as an integrated approach to intervene over the entire Artibonite watershed, was quite ambitious, and thus complex, given the vulnerability of the context in which it took place, the limited capacity of local institutions involved in its implementation and the budget available. In addition, the Program was designed based on the hypothesis that key institutional and legal reforms in the agricultural sector would be approved, which did not happen. This hypothesis, however, was crucial for the effectiveness and the sustainability of PROGEBA.
- 2.46 The Bank's supervision took place through regular meetings with the Program's Executing Agency, the collection of data to monitor financial and physical outputs, and frequent field visits in various areas of intervention. Overall, the relationship between the Bank (including Sector's, Financial Management and Procurement Specialists) and the Program's Executing Agency was considered "good" by both parties. No-Objection requests were also treated in a timely manner by the Bank.
- 2.47 Financial management by the Bank was also satisfactory. The Program's Executing Agency indicates that the Bank responded quickly to disbursement requests and provided adequate support whenever requested.

#### **III.2 Beneficiary Performance**

- 2.48 Overall, the Beneficiary's performance was unsatisfactory during the Program's preparation and execution, primarily because of its failure to take ownership and support the institutional reform process described above.
- 2.49 MARNDR played a key role in the design of the Program by providing close guidance to align the Program's objectives with sectorial needs and national development objectives. The Ministry also assisted with the elaboration of the Program's technical details such as the identification of infrastructure needs, as well as the identification of institutional weaknesses and needs to strengthen the different stakeholders in the Artibonite watershed.
- 2.50 The Program was executed by an Executing Agency at MARNDR. The Executing Agency was composed of a team of civil servants and consultants with long standing experience working in Haiti's agricultural sector, in water and sediment management in the Artibonite watershed, as well as in financial and project management. Overall, the Executing Agency complied with all agreements and covenants (including the environmental and safeguard policies) and carried out its responsibilities and tasks entitled, but the degradation of the context made it difficult to do so in timely manner. The Beneficiary's performance was also significantly constrained by procurement issues, and in particular by a change in national procurement practices which occurred in 2014. It required MARNDR to obtain the approval of Haiti's High Court of Auditors (CSCCA, for its French acronym) for all its bidding

documents, which considerably weighed down procurement processes, delaying those on numerous occasions by up to three months simply to obtain CSCCA's approval.<sup>47</sup>

- 2.51 Other issues also constrained the performance of the Executing Agency: (i) there was a high turnover within the M&E Team and lack of presence on the field, which led to a weak supervision of impact evaluation activities, and issues to monitor thoroughly and consistently some indicators; and (ii) field supervision by the Coordinating unit within the Executing Agency became increasingly difficult starting from 2019 because of the deterioration of the security context.<sup>48</sup>

#### **IV. FINDINGS AND RECOMMENDATIONS**

##### **IV.1 Dimensions 1 to 5**

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<sup>47</sup> *PROGEBa – Évaluation finale – Rapport final*. Duchier. Juin 2021.

<sup>48</sup> *PROGEBa – Évaluation finale – Rapport final*. Duchier. Juin 2021.

**Table 4**  
**Findings and Recommendations**

Findings	Recommendations
<b>Dimension 1: Technical-sectorial dimension</b>	
During design, it was clearly recognized that the effectiveness and sustainability of the Program strongly depended on the achievements of reforms supported by PBGs. Based on the optimistic assumption that critical reforms would be undertaken in 2014, the Program was approved in 2013. But the reforms didn't occur, leading to effectiveness, and sustainability issues.	In the Artibonite valley irrigation district, the institutional dimensions of water management must be fixed before increases in production can be achieved. This means having a more robust institutional arrangement in place constituted by (i) WUAs with legal status, (ii) a reformed institutional and legal framework for water management and infrastructures maintenance in the Artibonite valley irrigation district, and (iii) an effective and institutionalized Peligre Commission with capabilities to manage water resource at Péligre dam. Such reforms should be a prerequisite for the Bank to consider any further investment in the Artibonite valley. Given the negative evolution of the institutional context and the lack of progress on the reform agenda that was agreed upon when this operation was prepared, and although irrigation had remained one of the Borrower's top priorities during the whole implementation of this operation, the Bank should have engaged in discussions with the borrower to consider a reformulation, in order to reorientate resources towards other types of interventions, whose effectiveness and sustainability are less reliant on institutional capacities..
<b>Dimension 2: Organizational and managerial dimension</b>	
Insufficient skills, lack of tools and high turnover in the M&E Team led to missing information, monitoring gaps and impact evaluation implementation failures.	Recruit members of the M&E Team using a knowledge test and provide continuous training/technical support once recruited.
	Develop M&E tools to be used as a common database (preventing information loss) and monitoring tasks reminder.
	Provide additional technical support to the M&E Team (for the design and implementation of the impact evaluation, in particular) with a full-time and country-based technical assistant.
The M&E Team was mainly conducting desk work, with little presence on the field. As a result, Program implementation was inadequately monitored, and the M&E system was not able to help respond quickly to potential problems (impact evaluation implementation issues, issues to identify check-dam construction sites, etc.).	The work of the M&E Team should primarily take place on the field and goes beyond simply reporting program indicators. M&E officers should play a key role in the identification of unanticipated problems.
<b>Dimension 3: Fiduciary dimension</b>	
Program execution was slowed down by procurement issues, and in particular by a change in national procurement practices which occurred in 2014. It required MARNDR to obtain the	Before the start of the Program, an institutional and technical assessment of the procurement team and its technical counterpart should be conducted to identify relevant reinforcement and capacity strengthening needs. More generally,

approval of Haiti's High Court of Auditors (CSCCA, for its French acronym) for all its bidding documents, which considerably weighed down procurement processes, delaying those on numerous occasions by up to three months simply to obtain CSCCA's approval.	procurement processes need to be mapped out entirely (especially those under the responsibility of third-party public entities) in order to identify potential bottlenecks and anticipate mitigation measures.
Dimension 4: Risk management dimension	
Risks evolve over time and can significantly affect the Program's chances of success. In addition to the deteriorating context of intervention (insecurity, in particular), the Program's effectiveness and sustainability was also significantly threatened by the collapse of the reform process.	Update the risk matrix on a regular basis to facilitate decision-making.

## ANNEX 1 – Outputs Achieved

Outputs	Unit of Measure	Baseline value <sup>49</sup>	Baseline year	Targets and Actual achievement <sup>50</sup>		% Achieved <sup>51</sup>	Means of verification
Component #1							
P.1.1. Water and sediment containment infrastructures built in gullies in the pilot area of the upper watershed	Infra.	0	2013	P	950	41.8%	M&E reports
				P(a)	397		
				A	397		
P.1.2. Electromechanical system (gates and automatic control) at Canneau dam rehabilitated	System	0	2013	P	1	100%	M&E reports
				P(a)	1		
				A	1		
P.1.3. Protection walls preventing the Left and Right Banks Master Canals from collapsing downstream Canneau dam	Wall	0	2013	P	2	100%	M&E reports
				P(a)	2		
				A	2		
P.1.4. Secondary and tertiary irrigation and drainage canals built or rehabilitated in the pilot area of the irrigation district	Km	86	2013	P	50.4	82.7%	M&E reports
				P(a)	41.7		
				A	41.7		
P.1.5. Primary irrigation and drainage canals dredged in the irrigation district	Meter	0	2013	P	120,000	95.9%	M&E reports
				P(a)	115,168		
				A	115,168		
P.1.6. Equipment to regulate and measure water flow built/installed on the main canals of the irrigation district	Device	0	2013	P	100	1%	M&E reports
				P(a)	1		
				A	1		
Component #2							
P.2.7. Meeting of the Péligre Commission taking place	Meeting	0	2013	P	27	51.9%	M&E reports
				P(a)	14		
				A	14		
P.2.8. Flood management system (composed of water level gauges, flood management software and one computer per dam) operating at the Péligre and Canneau dams	System	0	2013	P	1	0%	M&E reports
				P(a)	0		
				A	0		
P.2.9. Artibonite Watershed Binational Commission created	Commissi on	0	2013	P	1	N/A	
				P(a)	0		
				A	N/A <sup>52</sup>		

<sup>49</sup> Source: POD or Convergence for additional indicators added during execution.

<sup>50</sup> Where: P = Start-Up Plan (source: PMR "First period Jan-Jun 2014" in Convergence); P (a) = Revised Annual Target (source: last PMR in Convergence); A = Actual (source: last PMR in Convergence).

<sup>51</sup> Relative to P.

<sup>52</sup> P.2.9 was removed in 2018.

Outputs	Unit of Measure	Baseline value <sup>53</sup>	Baseline year	Targets and Actual achievement <sup>54</sup>		% Achieved <sup>55</sup>	Means of verification
P.2.10. ODVA's procedures manual for operation and maintenance of infrastructure and equipment prepared	Manual	0	2013	P	1	100%	M&E reports
				P(a)	1		
				A	1		
P.2.11. CIA-ODVA's staff trained	Staff	0	2013	P	20	+100%	M&E reports
				P(a)	20		
				A	54		
P.2.12. Annual technical and financial plan and annual technical and financial report of operation and maintenance of primary infrastructures under ODVA's responsibility prepared	Report/ plan	0	2013	P	9	44.4%	M&E reports
				P(a)	4		
				A	4		
P.2.13. CIA-ODVA's equipped with a package of operating equipment	Package of equipment	0	2013	P	1	100%	M&E reports
				P(a)	2		
				A	1		
P.2.14. ODVA's administrative and financial staff trained	Staff	0	2013	P	10	100%	M&E reports
				P(a)	10		
				A	10		
P.2.15. Accounting software installed at the ODVA's administrative and financial service	Accounting software	0	2013	P	1	100%	M&E reports
				P(a)	1		
				A	1		
P.2.16. ODVA's administrative and financial service equipped with a package of operating equipment	Package of equipment	0	2013	P	1	100%	M&E reports
				P(a)	1		
				A	1		
P.2.17. DGSE-ODVA equipped with a package of operating equipment	Package of equipment	0	2013	P	1	100%	M&E reports
				P(a)	1		
				A	1		
P.2.18. WUAs equipped with office, IT equipment and motorcycles	WUA	0	2013	P	16	25%	M&E reports
				P(a)	4		
				A	4		
P.2.19. DGSE and WUA staff trained	Staff	0	2013	P	170	+100%	M&E reports
				P(a)	268		
				A	268		

<sup>53</sup> Source: POD or Convergence for additional indicators added during execution.

<sup>54</sup> Where: P = Start-Up Plan (source: PMR "First period Jan-Jun 2014" in Convergence); P (a) = Revised Annual Target (source: last PMR in Convergence); A = Actual (source: last PMR in Convergence).

<sup>55</sup> Relative to P.

Outputs	Unit of Measure	Baseline value <sup>56</sup>	Baseline year	Targets and Actual achievement <sup>57</sup>		% Achieved <sup>58</sup>	Means of verification
P.2.20. Annual technical and financial plan and annual technical and financial report of operation and maintenance of primary infrastructures under WUA's responsibility prepared	Report/plan	0	2013	P	24	12.5%	M&E reports
				P(a)	3		
				A	3		
P.2.21. Farmers in Artibonite and Centre receiving ag. inputs in support of ag. operations in the context of the Covid-19 pandemic	Farmer	0	2020	P	N/A <sup>59</sup>	N/A	M&E reports
				P(a)	26,000		
				A	6,128		

<sup>56</sup> Source: POD or Convergence for additional indicators added during execution.

<sup>57</sup> Where: P = Start-Up Plan (source: PMR "First period Jan-Jun 2014" in Convergence); P (a) = Revised Annual Target (source: last PMR in Convergence); A = Actual (source: last PMR in Convergence).

<sup>58</sup> Relative to P.

<sup>59</sup> This indicator was added in 2020.