

MEMORANDO

Fecha: 1 de octubre, 2026

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Asunto: **Haiti: Agricultural and Agroforestry Technological Innovation Program – PITAG (HA-L1107 / HA-G1038 / HA-G1041).** Aprobación final del Informe de Terminación de Proyecto (PCR).

De acuerdo con los lineamientos de las guías para preparación de PCRs, el PCR de la operación **Haiti: Agricultural and Agroforestry Technological Innovation Program – PITAG (HA-L1107 / HA-G1038 / HA-G1041)** ha cumplido con los procedimientos previstos para obtener su aprobación. Por tal motivo, adjunto para su conocimiento el Informe aprobado.

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Agricultural and Agroforestry Technological Innovation Program – PITAG

(HA-L1107 / HA-G1038 / HA-G1041)

Project Completion Report (PCR)

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PCR Team: Bruno Jacquet (PTI/ARD), Team Leader; Sardou Jean Denis (PTI/ARD), Olivia Siegl (PTI/ARD), Marisol Inurritegui (PTI/ARD), and Sébastien Gachot (Consultant); Marise Etienne Salnave (VPC/FMP), Angel Sanabira Antonio Ortega Serrano (VPC/FMP); Luis Stello (LEG/SGO).

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Electronic Links

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

Optional Electronic Links

1. [Ex-post Cost-Benefit Analysis Report](#)
2. [Impact Evaluation Report](#)

Acronyms and Abbreviations

AFD	French Development Agency
BAC	Communal Agricultural Office
BRH	Haitian Central Bank
CBA	Cost Benefit Analysis
CRF	Corporate Results Framework
DDA	Departmental Agricultural Directorate
EOP	End of Project
ESMP	Environmental and Social Management Plan
ESMR	Environmental and Social Management Report
FAMV	Faculty of Agronomy and Veterinary Medicine
FAO	Food and Agriculture Organization of the United Nations
FFS	Farmer Field Schools
FONRED	National Research Fund for Sustainable Development
GAFSP	Global Agriculture and Food Security Program
GDO	General Development Objective
GDP	Gross Domestic Product
GHI	Global Hunger Index
GVA	Gross Value Added
HH	Household
HDI	Human Development Index
IDB	Inter-American Development Bank
IDBG	Inter-American Development Bank Group
IE	Impact Evaluation
IFAD	International Fund for Agricultural Development
IHSI	Haitian Institute of Statistics and Informatics
IICA	Inter-American Institute for Cooperation on Agriculture
IPM	Integrated Pest Management
IRR	Internal Rate of Return
LAC	Latin America and the Caribbean
MARNDR	Ministry of Agriculture, Natural Resources and Rural Development
MUSO	Solidarity Savings Groups
M&E	Monitoring and Evaluation
NPV	Net Present Value
OPS	Service Provider Operators
PAPAIR	Rural Productivity and Connectivity Program with a Territorial Approach
PEU	Project Execution Unit
PITAG	Agricultural and Agroforestry Technological Innovation Program
PMDN	Natural Disaster Mitigation Program
PNSAN	National Food and Nutrition Security Plan
POD	Proposal for Operation Development
PREPOC	Post-COVID Economic Recovery Plan
PSNSSANH	National Policy and Strategy for Food Sovereignty, Food Security and Nutrition
PTTA	Technology Transfer to Small Farmers Program
RESEPAG	Agricultural Services Strengthening Program
RCT	Randomized Control Trial
R&D&I	Research, Development and Innovation
SDO	Specific Development Objective
SFD	Sector Framework Document
SIGI	Incentive Management System

SIST	Scientific and Technical Information System
SPR	Safeguard Performance Rating
SYSCOP	Accounting Information System
TAP	Plot Management Technician
UEP	Studies and Planning Unit
UIS	Updated Institutional Strategy
UNDP	United Nations Development Programme
UPMP	Public Procurement Unit
USAID	United States Agency for International Development

Basic Project Information

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Data Metrics - PCR Dashboard

^ HA-L1107 Agricultural and Agroforestry Technological Innovation Program - PITAG

Pipeline 2017-A	Project Number HA-L1107	Approval Number(s) 4359/GR-HA;	Overall Stage EXITED - Closed	Operation Type GRF (Grant Financing Product)	Operation Modality ESP (Specific Investment Operation)
Pari Passu	Cumulative Extension(Months)	Sector AG (AGRICULTURE AND RURAL DEVELOPMENT)	Sub-Sector AG-TEC (AGRICULTURAL TECHNOLOGY ADOPTION)	Loan Instrument Investment Loan	Borrower(s) MINISTERE DE L ECONOMIE ET DES FINANCES;
IDB Approved Amount (USD) 55,000,000.00 (original) 54,305,327.10 (current)	Percentage of Disbursement 99% (original) 100% (current)	Date of Board Approval Nov 01, 2017	Date of First Disbursement May 14, 2018	Date of Final Disbursement Mar 05, 2023 (original) Dec 31, 2024 (current)	Date of Closure (CO) Jul 01, 2025
Total Project Cost (USD) 76,164,631.10	Total Disbursement Amount (USD) 54,305,327.10	Months In Execution from Approval 92	Months In Execution from First Disbursement 86	Country Beneficiary  Haiti	Team Leader  Bruno Jacquet

^ 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

Year	PMR Date	PMR Cycle - Stage	Classification	Disbursement Percentage (As of Dec 31)
2018	May 15, 2019	Second period Jan-Dec 2018 - After Eligibility	Satisfactory	3%
2019	May 04, 2020	Second period Jan-Dec 2019 - After Eligibility	Satisfactory	14%
2020	May 16, 2021	Second period Jan-Dec 2020 - After Eligibility	Satisfactory	36%
2021	Apr 28, 2022	Second period Jan-Dec 2021 - After Eligibility	Satisfactory	66%
2022	Apr 20, 2023	Second period Jan-Dec 2022 - After Eligibility	Satisfactory	84%
2023	May 01, 2024	Second period Jan-Dec 2023 - After Eligibility	Satisfactory	91%
2024	Apr 21, 2025	Second period Jan-Dec 2024 - After project Reaches 95% of total disbursements	Satisfactory	0%

Bank Staff



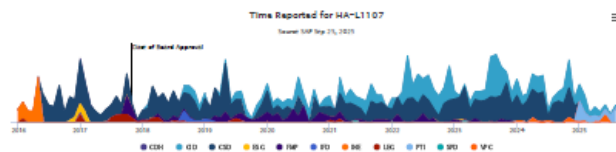
Positions	At PCR Jul 01, 2025	At Approval Nov 01, 2017
Vice-President VPS	Ibanez Londono, Ana Maria Vice President - VPS/VPS	Levy, Santiago Vice President - VPS/VPS
Vice-President VPC	Gonzalez, Anabel Vice President - VPC/VPC	Rosa, Alexandre Vice President - VPC/VPC
Country Manager CID	Bermudez, Tomas General Manager - CID/CID	Montiel, Gina General Manager - CID/CID
Sector Manager PTI	Operti, Fabrizio Sector Manager Product, Trade & Innov - PTI/PTI	
Division Chief ARD	Martel, Pedro V. Div Chief Agriculture & Rural Dev - PTI/ARD	
Country Rep Haiti	Cathala, Corinne Country Rep Haiti - CID/CHA	Echebarria, Luis Country Rep Haiti - CID/CHA
Project Team Leader	Jacquet, Bruno PTI/ARD	De Salvo, Carmine Paolo RND/CHA
PCR Team Leader		

Staff Time and Cost



Stage Project Cycle	# of Staff Weeks	# of Consultant Weeks	Admin Expenses in USD (Including Travel and Consultant Costs)
Preparation	67.1	18.1	218,336.01
Supervision	137.4	188.7	652,274.16
Total	204.5	206.9	870,610.17

Time



I. INTRODUCTION

1.1 The Agricultural and Agroforestry Technological Innovation Program (PITAG, for its French acronym) was designed in 2016. At the time, Haiti ranked among the poorest countries in the world, with a per capita Gross Domestic Product (GDP) of approximately US\$ 818 and 59% of the population living in poverty. In 2014, the United Nations Development Program (UNDP) ranked Haiti 163rd out of 188 countries in the Human Development Index (HDI). According to the World Bank, more than 80% of Haitians living in extreme poverty resided in rural areas. Food insecurity was also widespread: Haiti ranked 115th out of 118 countries in the 2016 Global Hunger Index (GHI) and approximately 47% of households were moderately or severely food insecure. Moreover, one in five children under five years of age was chronically malnourished.¹

1.2 In this context, the agricultural sector was considered strategic for raising rural household incomes and improving food security. At the time of project design, the sector accounted for about 25% of the country's GDP and provided 85% of employment in rural areas. However, productivity levels were very low compared to other countries in the region and per capita income in agriculture had stagnated at approximately US\$ 400 per year.²

1.3 Low productivity was driven by three main factors:

- **Limited investment and access to technologies.** Most Haitian farmers practiced subsistence agriculture using basic techniques and had limited access to quality seeds, soil conservation methods, inputs and equipment. Only 7% used machinery, 9% had experience with improved seeds and 22% were familiar with certified seeds. Haiti's agricultural technology market was characterized by significant market failures. On the demand side, smallholders lacked access to information on technologies, farming practices, markets and climate risks, and had limited financial and technical capacity to adopt productivity-enhancing technologies. In the North Department, furthermore, only 28% of farmers held a bank account and 19% had ever received an agricultural loan. On the supply side, few qualified providers were able to promote and deliver technologies adapted to Haiti's diverse agroecological conditions^{3 4}.
- **Weak agricultural research and extension systems.** For nearly three decades, Haiti lacked effective agricultural research and extension services. During this period, technical efficiency in the agricultural sector declined by an average of 1.8% per year. This deterioration reflected an outdated institutional framework, weak technology transfer systems, limited local expertise, poor training opportunities and low-quality academic programs. According to the Bank's Agrimonitor database, total public support to agriculture averaged annually 5.3% of GDP between 2006 and 2012, yet only 3.2% of these resources were allocated to public goods - the lowest share in Latin America and the Caribbean (LAC) - with funding for research virtually non-existent⁵.
- **High exposure to climate risks.** Haiti was among the countries most exposed to climate-related and natural disaster risks. High vulnerability to climatic hazards, combined with severe soil erosion and deforestation affecting about 50% of upper watersheds, constrained long-term agricultural productivity. Hurricane Matthew highlighted the sector's fragility, causing an estimated US\$ 1.9 billion in damages, including US\$ 433 million in

¹ [HA-L1107 Grant Proposal](#)

² Ibid

³ [HA-L1107 Ex Ante Economic Analysis](#)

⁴ [HA-L1107 Grant Proposal](#)

⁵ Ibid

perennial crops critical for food security and rural livelihoods. Farmers' limited access to improved technologies further weakened their resilience to environmental shocks⁶.

- 1.4 To address these challenges, the Bank approved on November 1st, 2017, a US\$ 55 million grant financed through its Grant Facility, to be executed over five years. The project was cofinanced by US\$ 10 million from the Global Agriculture and Food Security Program (GAFSP) and US\$ 10.86 million from the International Fund for Agricultural Development (IFAD). The local counterpart contributed US\$ 1 million to cover recurrent costs, bringing the total project budget to US\$ 76,859,305. The original disbursement period was 60 months and was subsequently extended for 22 additional months: (i) in May 2022, due to implementation delays caused by climatic shocks and the socio-political context in Haiti; and (ii) in June 2024, to complete outstanding activities and facilitate project closure without additional costs.
- 1.5 The project was designed to complement broader national and international efforts to enhance agricultural productivity and competitiveness in Haiti. It built on lessons from previously implemented projects financed by the Bank and other development partners (including the World Bank, United States Agency for International Development (USAID), French Development Agency (AFD), Food and Agriculture Organization of the United Nations (FAO), Inter-American Institute for Cooperation on Agriculture (IICA) and local universities) focusing on agricultural incentives, research and training. Between 2011 and 2016, for example, the Ministry of Agriculture, Natural Resources and Rural Development (MARNDR, for its French acronym) implemented the Technology Transfer to Small Farmers Program (PTTA – HA-L1059; 2562/GR-HA) and the Natural Disaster Mitigation Program (PMDN – HA-L1041; 2187/GR-HA), which showed positive results in the adoption of agroforestry technology packages, environmental externalities (reforestation) and income increases.⁷
- 1.6 The project also built on reforms supported by Bank policy-based grants (2731/GR-HA, Institutional Strengthening and Reform of the Agriculture Sector I and 2945/GR-HA, Institutional Strengthening and Reform of the Agriculture Sector II) aimed at strengthening agricultural productivity and competitiveness. These included (i) the development of a new research institutional framework and financing mechanism such as the National Research Fund for Sustainable Development (FONRED, for its French acronym), (ii) efforts to reduce supply-driven subsidized input distribution to avoid crowding out private suppliers and (iii) institutional reforms within MARNDR - such as the creation of the Public Procurement Unit (UPMP, for its French acronym) and the strengthening of the Studies and Planning Unit (UEP, for its French acronym) - to improve financial management and budget planning capacity.⁸
- 1.7 The project's intervention areas included the departments of North, North-East, Artibonite, South and Grand'Anse. Its general development objective (GDO) was to increase agricultural income and food security for smallholder farmers in selected areas of Haiti. Its specific development objective (SDO) was to increase agricultural productivity and improve the use of natural capital through the adoption of sustainable technologies. PITAG was structured around two components: (i) Applied Research and Training (Component 1; US\$ 14,600,000); and (ii) Promotion of Sustainable Agricultural Technologies (Component 2; US\$ 55,909,305).
- 1.8 The grant agreement (4359/GR-HA) was signed in January 2018. The project became eligible in April 2018, and the first disbursement took place in May of that year. The last disbursement

⁶ [HA-L1107 Grant Proposal](#)

⁷ Ibid

⁸ Ibid

date was December 31, 2024, and the closure date was July 1, 2025. Within MARNDR, the experienced technical and administrative team that had implemented the PTTA project - supported by the UPMP - was designated as the Project Execution Unit (PEU). At the time of design, MARNDR managed an active portfolio of approximately US\$ 140 million in Bank-financed operations⁹.

- 1.9 This PCR presents the results and achievements of the project, as well as the challenges encountered and the lessons learned during implementation. Overall, the PCR shows that PITAG largely achieved its specific development objective. Measured against a control group through a rigorous impact evaluation, the project increased the annual value of agricultural production by 12%, reduced severe food insecurity by 4.3 percentage points, increased agricultural income by 14% and improved agricultural profits by 12.8% - statistically significant effects, achieved in an exceptionally difficult context marked by COVID-19, a major earthquake, recurring natural disasters, and severe political instability and insecurity. At the same time, the project produced lasting contributions to Haiti's agricultural research landscape, including 69 developed technologies, 31 validated technical packages ready for dissemination, a strengthened national Innovation Directorate and a new generation of agricultural researchers trained under PITAG scholarships.

II. CORE CRITERIA. PROJECT PERFORMANCE

II.1 Relevance

a. Alignment with country development needs

- 2.1 At approval, the project supported several national development objectives. It aligned with the [Agricultural Development Policy 2010–2025](#), particularly its goals of improving food security, increasing farmers' incomes and adaptation to climate change. The project was also consistent with both the [2010–2016](#) and [2016–2021](#) National Agriculture Investment Plans, contributing to their priorities of feeding a growing urban population, preserving agricultural land, increasing land and labor productivity through innovation and producing higher-quality food. In addition, PITAG was aligned with the [2011–2016 Agricultural Extension Plan](#), which emphasized the adaptation and adoption of effective innovations, increased agricultural productivity and incomes, and improved food and nutrition security. The project also supported commitments under Haiti's [Intended Nationally Determined Contribution \(2015\)](#), including climate-adapted agricultural techniques, soil conservation, conservation of genetic resources and more efficient water use. PITAG further addressed key priorities of the [2010–2025 National Food and Nutrition Security Plan](#) (PNSAN, for its French acronym), notably increasing household agricultural production, strengthening support to producers and protecting watersheds.
- 2.2 During implementation, the project remained aligned with Haiti's most recent strategic frameworks, including the [post-COVID-19 Economic Relaunch Plan](#) (PREPOC, for its French acronym) 2020–2023, which prioritized modernization of agriculture and enhanced food security. PITAG supported these priorities by promoting more efficient production systems, strengthening research and extension services, and facilitating the adoption of innovative and climate-resilient technologies. The project was also consistent with the [First Updated Nationally Determined Contribution \(2021\)](#), particularly its adaptation measures related to conservation-oriented agricultural practices, agroforestry and climate-resilient crop varieties.

⁹ [HA-L1107 Grant Proposal](#)

In addition, it supported sectoral actions under Haiti's National Strategy on Nutrition and Food Sovereignty and Security (PSNSSANH, for its French acronym; Volumes [I](#) and [II](#)), notably investment in smallholder production, promotion of local markets and strengthening of applied research and technical training. Following the 2021 earthquake, the project remained consistent with the [Post-Disaster Needs Assessment \(PDNA, 2021\)](#) by contributing to recovery objectives such as restoring hydro-agricultural infrastructure, supporting seed and tool distribution, strengthening capacities in good agricultural and environmental practices, rehabilitating productive assets, and promoting agroforestry diversification.

- 2.3 At closure, the project continued to align with the [National Adaptation Plan to Climate Change \(2022–2033\)](#), the [updated Nationally Determined Contribution \(2021\)](#) and the [Adaptation Communication \(2022\)](#), particularly in relation to climate-smart agriculture, irrigation and water resource management, reforestation and agroforestry, watershed protection, and institutional capacity building. No subsequent strategic policy documents were developed or published after those listed above.

b. Strategic Alignment

- 2.4 At approval, the project was fully aligned with the Bank's Country Strategy with Haiti 2011–2015 (GN-2646), extended to December 2017 (GN-2646-2), which identified agriculture as a priority sector. The project was included in the 2017 Operational Program Report (GN-2884) and aligned with the Country Strategic Objective: "*Protect the environment, respond to climate change, and enhance food security*". It was also consistent with the Agriculture and Natural Resources Management Sector Framework Document (GN-2709-5), as it focused on the provision of public agricultural goods and the promotion of access to technology; with the Food Security Sector Framework (GN-2825-3), given its objective to increase agricultural productivity and food security; and with the Climate Change Sector Framework (GN-2835-3), as it strengthened the resilience of vulnerable farming communities through adaptation measures.
- 2.5 As stated in the grant proposal, the project was consistent with the Update to the Institutional Strategy (UIS) 2010–2020 (AB-3008) and aligned with the development challenges of productivity and innovation through the generation and dissemination of sustainable agricultural technologies. It also contributed to the cross-cutting themes of: (i) climate change and environmental sustainability, and (ii) gender equality and diversity, by promoting women's participation and reducing gender gaps.
- 2.6 During implementation, the project remained fully aligned with the [IDB Strategy for Haiti 2017–2021 \(GN-2904\)](#), extended through December 2024 (GN-2904-2 and GN-2904-3). Agriculture continued to be a priority sector and PITAG directly supported the strategic priority "*Improving the business climate to enhance productivity*", particularly under the sub-area "*Enabling conditions for increased agricultural productivity*". It contributed by: (i) improving irrigation and watershed management; (ii) strengthening MARNDR's capacity in research, technology transfer and innovation; and (iii) providing technical and financial support to farmers. PITAG was aligned with the Corporate Results Framework (CRF) 2016–2019 (GN-2727-6) through indicators such as "*beneficiaries of improved management and sustainable use of natural capital*", "*women beneficiaries of economic empowerment initiatives*", "*farmers with improved access to agricultural services and investments*" and "*beneficiaries of IDBG projects that contribute to at least one key dimension of food security*". It also aligned with the 2020–2023 CRF, including indicators on farmers' access to agricultural services and investments (2.11),

projects supporting productivity and innovation (3.2), and projects supporting agriculture, forestry, land use and coastal zone management (3.6.a).

- 2.7 At closure, PITAG remained aligned with the [Country Engagement Note for Haiti 2024–2026 \(GN-3199-2\)](#), particularly under the strategic axis “*Improving the business climate to enhance productivity*”. It also aligned with the [updated Agriculture Sector Framework Document \(SFD\) \(2024\)](#), notably under the challenges of improving food security and increasing agricultural income while addressing climate change. Specifically, the project supported SFD lines of action related to: (i) Strengthening national agricultural research, development and innovation (R&D&I) systems; (ii) Modernize rural advisory services; (iii) Provide smart subsidies that ease liquidity constraints for small producers; (iv) strengthening agricultural institutions; and (v) promoting scientific knowledge, technological innovation and the adoption of technology in agriculture.

c. Relevance of Design¹⁰

- 2.8 The project’s GDO was to increase agricultural income and food security for smallholder farmers in selected areas of Haiti, through the achievement of the following SDO: to increase agricultural productivity and to improve the use of natural capital through the adoption of sustainable technologies.
- 2.9 The following paragraphs describe how, at completion, the underlying assumptions of the project’s vertical logic made at design were confirmed with the achievement of the project’s SDO. **Figure 1** presents the project’s vertical logic at closure. **Table 1** presents the Results Matrix at approval, at the time of the Startup Plan (i.e., in the first PMR after eligibility: “Second period Jan–Dec 2018” in Convergence) and at completion (end of project, or EOP). No changes were made to output, outcome or impact indicators at any stage following project approval and the project’s original theory of change remained structurally unchanged throughout its implementation. For three monetary indicators (R.1.0, I.2.1 and I.2.2), however, baseline values were updated for this PCR to reflect actual data collected as part of the project’s impact evaluation, and EOP targets were adjusted accordingly by applying the original relative change to the measured baseline values.

SDO - Increase agricultural productivity and improve the use of natural capital through the adoption of sustainable technologies

- 2.10 To achieve this SDO, PITAG combined applied agricultural research and training (Component 1) to strengthen the generation and adaptation of sustainable technologies, with technical assistance and one-time financial incentives (Component 2) to promote the adoption of profitable, climate-smart and natural-capital-enhancing technologies, particularly agroforestry systems.
- 2.11 According to the project’s theory of change, the development of applied research projects (P.1.1) - including through the establishment of Farmer Field Schools (FFS), which served both as technology testing grounds and as platforms for farmers to learn about these technologies - together with the financing of scholarships to improve research and technology-transfer capacities in Haiti (P.1.2) and the institutional strengthening of MARNDR’s Innovation Directorate (P.1.3), were expected to increase the supply of locally adapted technologies (R.2.2) and strengthen agricultural innovation services (R.2.1). The strengthened Innovation

¹⁰ Indicators were numbered according to Convergence, unless specified otherwise.

Directorate played a key role in this causal chain by (i) supervising P.1.1, (ii) validating technical packages with farmer participation and (iii) ensuring that applied research results progressively informed the technology menu offered to farmers through Component 2's incentive mechanism. The implementation of the Scientific and Technical Information System (SIST, for its French acronym) further supported this function by making research outputs accessible to field technicians and farmers, while participatory methodologies - including FFS and local consultations - directly involved farmers in the research process, increasing the likelihood that proposed solutions would be tailored to their specific needs. Together, these mechanisms addressed a critical information constraint: by ensuring that locally adapted technologies were accessible and credible - both to field technicians and to farmers themselves - the strengthened Innovation Directorate increased the likelihood that the packages offered through Component 2's incentive mechanism would be adopted. In parallel, the provision of technical assistance (P.2.1) and the delivery of technological packages through matching grants, combined with the organization of decentralized technology marketplaces (or fairs) bringing together beneficiary farmers and authorized private suppliers (P.2.2), were expected to promote the adoption of sustainable technologies (R.2.3, R.2.4, R.3.1, R.3.2, R.3.3 and R.3.4) by reducing information, financial and risk-related constraints, including the adoption of climate-smart and natural-capital-enhancing technologies such as agroforestry systems (R.1.1, R.1.2 and R.1.3).

2.12 Indicators R.1.1 (Beneficiaries of improved management and sustainable use of natural capital) and R.3.4 (Women beneficiaries of economic empowerment initiatives) provide valuable information on the scale and reach of project-supported interventions. As they primarily capture the number of beneficiaries reached, they help demonstrate implementation progress and coverage. Their interpretation is further enriched through the impact indicators that capture the changes experienced by beneficiaries as a result of those interventions.¹¹

2.13 Traditional productivity indicators such as the value or volume of production per hectare were not included in the project's results matrix at the outcome level (although they were included in the impact evaluation) due to (i) the inherent heterogeneity of agroforestry systems and (ii) the fact that overall productivity improvements in such systems often take several years after an intervention to materialize. Unlike monoculture systems, agroforestry combines crops, trees and pasture with different biological cycles and economic functions, delivering environmental services alongside agricultural production. This complexity makes standard per-hectare productivity metrics less suitable. For example, a systematic review of agroforestry interventions found high variability in yield effects across system types and contexts, reflecting the diversity of these systems ([Castle et al., 2021](#)). Similarly, the literature notes that productivity assessments of agroforestry systems often focus primarily on crop yields, which are easier to estimate, while tree, livestock and broader system outputs are less frequently measured ([Köthke et al., 2022](#)). The time dimension further complicates measurement: trees may take several years - often beyond the typical duration of development projects - to mature and generate significant production, making productivity impacts difficult to capture within standard project timeframes ([Castle et al., 2019](#); [FAO & IPA, 2023](#)). In this context, the grant proposal mentioned that changes in productivity would be measured through a proxy: the annual value of agricultural production (R.1.0). The results matrix also included technology-adoption indicators at the outcome level. Although adoption does not directly measure productivity, the literature identifies it as a key intermediate result on the pathway toward productivity growth and income gains in smallholder systems, provided

¹¹Note that when the project was designed in 2016, the Bank explicitly requested for this CRF indicators to be included at the outcome level.

the technologies are productivity-enhancing and correctly implemented ([Mulugeta et al., 2023](#); [Kumar et al., 2025](#)). Given that the adoption targets were considered achievable within the project's timeframe, these indicators provided a complementary measure of progress toward the project's productivity objective.

- 2.14 The project's design logic was grounded in a solid evidence base. The literature reviewed at design indicated that: (i) matching grants combined with technical assistance - including FFS - can increase technology adoption ([Waddington et al., 2014](#); [Mullally and Maffioli, 2014](#)), including for natural-capital-enhancing technologies ([Bravo-Ureta et al., 2006](#)), with later studies confirming similar findings ([Schling and Pazos, 2022](#)); and (ii) agroforestry systems can generate positive environmental externalities, including improved soil conservation and fertility, water availability, reforestation, and climate resilience ([Young, 1989](#); [Conant, 2010](#); Bellande, 2016¹²; [Salazar et al., 2018](#)¹³).
- 2.15 At closure, results suggest that these assumptions largely held: adoption rates exceeded 94% for all technology categories (R.3.1 and R.3.2), agroforestry systems were applied to 23,406 additional hectares of land (R.1.3), 69 new technologies were developed through applied research projects (R.2.2) and the annual value of agricultural production increased by 12% (R.1.0).

GDO - Increase agricultural income and food security for smallholder farmers in selected areas of Haiti

- 2.16 The project's SDO contributed directly to the GDO by: (i) increasing the adoption of agricultural technologies and agroforestry systems, which raised agricultural productivity and improved natural capital management; and (ii) boosting agricultural income from crop sales, thereby enhancing households' access to food. At the same time, increased production improved food availability for home consumption, further contributing to food security.
- 2.17 Progress toward the GDO was measured through five impact indicators. Three indicators related to food security: the percentage of male-headed households that are severely food insecure (I.1.1), the percentage of female-headed households that are severely food insecure (I.1.2) and the number of beneficiaries of IDBG projects that contribute to at least one key dimension of food security (I.1.3). Two additional indicators captured changes in agricultural income: annual agricultural income (I.2.1), defined as the value of crop sales, and annual agricultural profits (I.2.2), defined as the total value of all agricultural outputs - regardless of whether sold, consumed, stocked or lost - minus input and transportation costs.
- 2.18 The causal pathways linking the project's outcomes to these impacts were supported by a strong evidence base. First, a substantial body of literature shows that environmentally sustainable technologies aimed at increasing agricultural productivity can increase farmers' incomes (Pattanayak and Mercer, 1996¹⁴; [Cocchi and Bravo-Ureta, 2007](#); [Bravo-Ureta et al., 2006](#), [Bravo-Ureta et al., 2010](#)). Second, empirical evidence demonstrates that combining technical assistance with financial incentives to facilitate technology adoption can significantly increase the incomes of smallholder farmers ([Salazar, 2015](#); [Mullally & Maffioli, 2014](#)). Third, investments in agricultural research, innovation, and technology transfer have consistently

¹² Alex Bellande (2016) - Proposition de paquets techniques durables pour le PTTA II et options pour le volet d'équipement des agriculteurs.

¹³ "Technology Transfer to Small Farmers Program in Haiti (PTTA) – Implementation, Evaluation and Lessons Learned", May 2018.

¹⁴ Pattanayak, S. and D. E. Mercer (1996). Valuing Soil Conservation Benefits on Agroforestry Practices.

been shown to generate high economic returns ([World Bank review \(2011\)](#); [Alston et al., 2014](#); [Jin and Huffman, 2015](#); [Anríquez et al., 2016](#)), a finding reinforced by more recent studies (Díaz-Bonilla et al., 2019 and IFPRI, 2022, both cited in the Bank's [2024 Agriculture SFD](#)). Evidence also shows that financial incentives for technology adoption can improve food security: voucher programs such as CRIAR in Bolivia increased the probability of food security among beneficiary households by 20–30% and reduced concerns about food shortages by 22% ([Salazar et. al \(2016\)](#)), while early results from PATCA II indicate a 27% increase in food security among participating farmers (Salazar et. al., 2017¹⁵). More broadly, empirical evidence from agricultural development programs shows that smart subsidies - combining conditional financial support with technical assistance - can increase technology adoption and raise farm incomes and food security of small producers. Documented examples of such impacts are found in Argentina, Bolivia, Nicaragua and Uruguay (Gonzalez Flores and Le Pommellec, 2019; Mullally and Maffioli, 2014; Rossi, 2013; Salazar et al., 2015; Salazar et al., 2016; Schling and Pazos, 2022; all cited in the Bank's [2024 Agriculture SFD](#)).

- 2.19 The project's impact evaluation (IE) confirmed these pathways, documenting significant effects on the reduction of food insecurity as well as on income from agricultural sales and agricultural profits.

PITAG addressed Haiti's most critical agricultural development challenges - low productivity, weak research systems and high climate vulnerability - with strong alignment to national policies and IDB strategy at approval, during implementation and at closure. The project's design correctly identified binding constraints and proposed appropriate demand-driven mechanisms. At completion, the assumptions underlying the project's design were confirmed, thereby validating the project's vertical logic. The project's objectives remained among the highest priorities for Haiti's development and its design lessons directly informed the successor PAPAIR program (Rural Productivity and Connectivity Program with a Territorial Approach – HA-J0002/HA-G1050). The project's relevance was thus rated as Excellent.

¹⁵ Aramburu, J., Maffioli, A., Salazar, L., 2017. Measuring spillovers in technological adoption programs: A two-stage randomized control trial in the Dominican Republic.

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

Indicators	At Approval			Startup Plan ¹⁶			At Project Completion (PCR)			Comments
	Units of measure	Baseline	EOP (P)	Units of measure	Baseline	EOP (P)	Units of measure	Baseline	EOP (A)	
SO1: Increase agricultural productivity and improve the use of natural capital through the adoption of sustainable technologies										
R.1.0: Annual value of agricultural production	US\$ / Household	347	478	US\$ / Household	347	478	US\$ / Household	449 ¹⁷	1,037 ¹⁸	Year of measurement: 2025 Data source: HH agricultural survey collected for project impact evaluation Means of verification: IE Report
R.1.1: Beneficiaries of improved management and sustainable use of natural capital.	#	0	61,224	#	0	61,224	# of beneficiaries	0	50,062	Year of measurement: 2025 Data source: Project monitoring records (administrative data) Means of verification: Final Evaluation Report
R1.2: Beneficiaries who adopted soil protection and restoration technologies	#	0	45,918	#	0	45,918	#	0	46,823	Year of measurement: 2025 Data source: - Project monitoring records (administrative data) - HH agricultural survey collected for project impact evaluation Means of verification: IE Report
R.1.3: Additional hectares of land applying agroforestry technologies	HAs	0	27,900	HAs	0	27,900	Hectares	0	23,406	Year of measurement: 2025 Data source: Project monitoring records (administrative data) Means of verification: Project Progress Reports
R.2.1: Research and development expenditure as percentage of Agricultural GDP	%	0.12	0.3	%	0.12	0.3	%	0.12	0.69	Year of measurement: 2024 Data source: - Ministry of Agriculture administrative records - National statistics (IHSI) Means of verification: Project Progress Reports

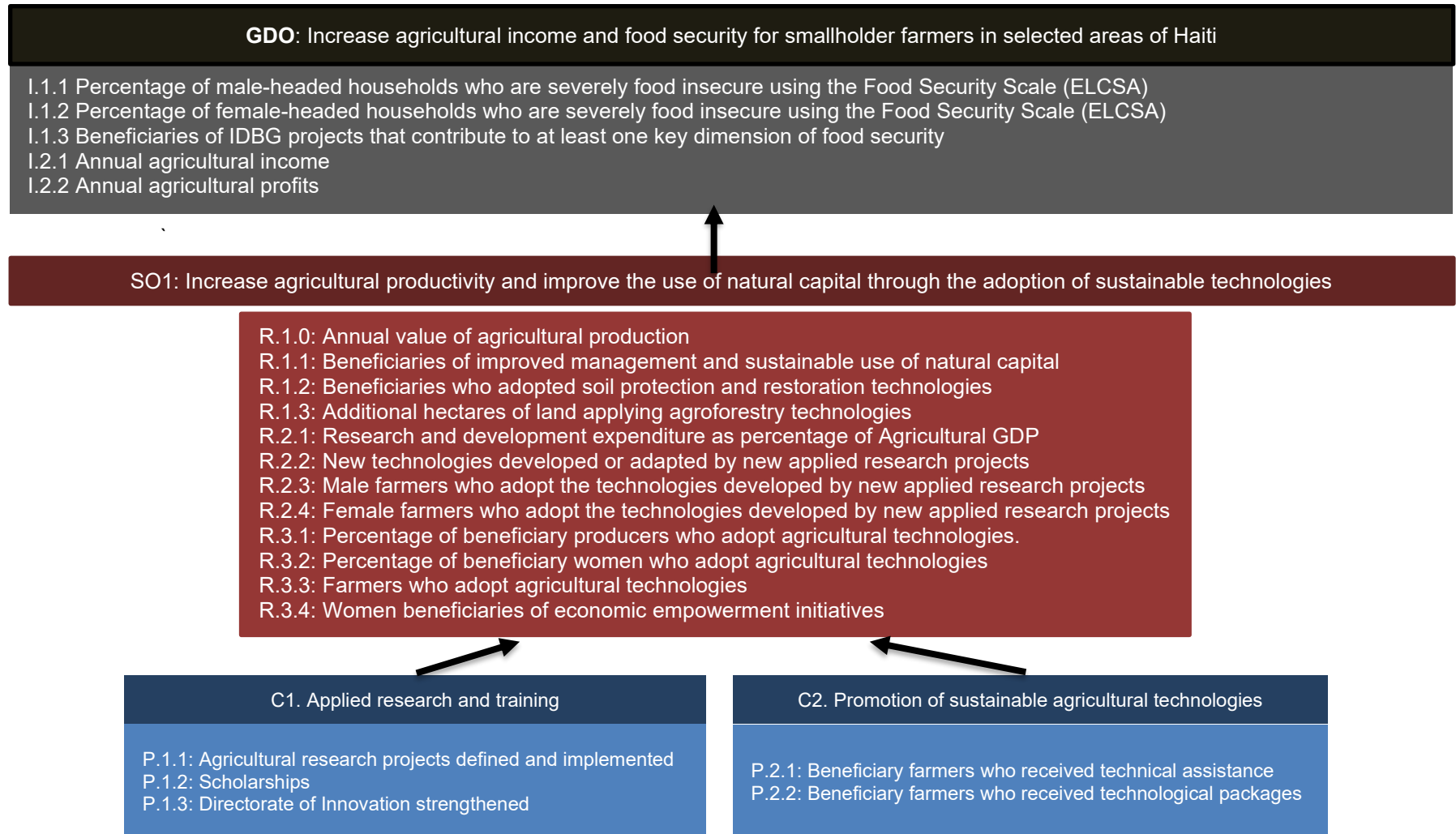
¹⁶ Startup plan corresponds to the PMR "Second period Jan–Dec 2018" in Convergence.

¹⁷ For this PCR, the indicator's baseline value was updated to reflect actual data collected as part of the project's impact evaluation. The EOP target was adjusted accordingly by applying the original relative change to the updated baseline value, yielding an adjusted target of US\$ 619. To ensure comparability with the baseline, nominal endline values were first deflated by the cumulative food price inflation observed in Haiti between December 2020 and December 2024 (+225.5%; [source](#): FAO) and then converted to US\$ using the average exchange rate prevailing in December 2020 (1 US\$ = 73.1 HTG). All values are therefore expressed in constant December 2020 US\$.

¹⁸ For reference, the nominal (non-deflated) endline value for the treatment group was approximately 177,580 HTG per household, equivalent to approximately US\$ 1,366 at the endline exchange rate of 1 US\$ = 130 HTG.

Indicators	At Approval			Startup Plan			At Project Completion (PCR)			Comments
	Units of measure	Baseline	EOP (P)	Units of measure	Baseline	EOP (P)	Units of measure	Baseline	EOP (A)	
R.2.2: New technologies developed or adapted by new applied research projects	#	0	8	#	0	8	#	0	69	Year of measurement: 2025 Data source: Project monitoring records (administrative data) Means of verification: Final Evaluation Report
R.2.3: Male farmers who adopt the technologies developed by new applied research projects.	#	0	1,800	#	0	1,800	#	0	813	Year of measurement: 2025 Data source: Project monitoring records (administrative data) Means of verification: Applied research project reports
R.2.4: Female farmers who adopt the technologies developed by new applied research projects.	#	0	1,200	#	0	1,200	#	0	365	Year of measurement: 2025 Data source: Project monitoring records (administrative data) Means of verification: Applied research project reports
R.3.1: Percentage of beneficiary producers who adopt agricultural technologies.	%	0	75	%	0	75	%	0	94	Year of measurement: 2025 Data source: HH agricultural survey collected for the project impact evaluation Means of verification: IE Report
R.3.2: Percentage of beneficiary women who adopt agricultural technologies	%	0	75	%	0	75	%	0	95	Year of measurement: 2025 Data source: HH agricultural survey collected for the project impact evaluation Means of verification: IE Report
R.3.3: Farmers who adopt agricultural technologies	#	0	48,786	#	0	48,786	#	0	57,410	Year of measurement: 2025 Data source: HH agricultural survey collected for the project impact evaluation Means of verification: IE Report
R.3.4: Women beneficiaries of economic empowerment initiatives	#	0	26,019	#	0	26,019	# of beneficiaries	0	26,987	Year of measurement: 2025 Data source: Project monitoring records (administrative data) Means of verification: Final Evaluation Report

Figure 1. Vertical Logic at Closure



II.2 Effectiveness

a. Statement of project development objectives.

- 2.20 The project's GDO was to increase agricultural income and food security for smallholder farmers in selected areas of Haiti, through the achievement of the following SDO: increase agricultural productivity and improve the use of natural capital through the adoption of sustainable technologies.

b. Results Achieved

- 2.21 **Table 2** presents the results achieved at the time of completion.

SDO - Increase agricultural productivity and improve the use of natural capital through the adoption of sustainable technologies

- 2.22 The outcome indicators capture four complementary dimensions of the SDO: (i) agricultural productivity, measured through the annual value of agricultural production (R.1.0); (ii) the reach, adoption and area covered by natural-capital-enhancing technologies, specifically agroforestry systems (R.1.1, R.1.2 and R.1.3); (iii) the strengthening of the agricultural research system (R.2.1), the development or adaptation of new technologies through applied research projects (R.2.2) and their subsequent adoption by male and female farmers (R.2.3 and R.2.4); and (iv) the reach and adoption of agricultural technologies (including agroforestry systems) promoted under Component 2 (R.3.1, R.3.2, R.3.3 and R.3.4). Although several indicators relate to technology adoption, they do not all measure the same dimension. R.3.1 and R.3.3 capture the same adoption result - the adoption of any agricultural technology promoted under Component 2 - expressed respectively as a percentage and an absolute number. The other indicators differ in terms of the technologies covered, the intervention pathway or the beneficiary population: R.1.2 focuses on the adoption of agroforestry systems; R.2.3 and R.2.4 measure the adoption, by male and female farmers respectively, of new technologies developed or adapted through applied research projects under Component 1; and R.3.2 measures the adoption rate for any agricultural technology promoted under Component 2 among female beneficiaries only.
- 2.23 At project closure, the annual value of agricultural production was US\$ 1,037 per beneficiary household (in constant December 2020 US\$), against an adjusted baseline of US\$ 449 and an adjusted target of US\$ 619 (R.1.0; more than 100% of the target achieved). However, this observed difference between baseline and EOP values substantially exceeds the project's causal contribution, as it also likely reflects incomplete capture of local price inflation (the FAO food price index of +225.5% used to deflate endline values is a national approximation that likely understates the actual price increases faced by farmers in rural Haiti given transport corridor blockages, local market failures and supply chain disruptions) rather than project-induced changes alone. The project's specific causal contribution to this indicator (estimated at +12% through the impact evaluation) is discussed in the Counterfactual Analysis section below.
- 2.24 The causal mechanisms behind this productivity increase are evidenced by the following achievements in output and outcome indicators. A total of 61,062 farmers received agricultural technology packages across five departments (P.2.2; 94% of the target achieved), with women representing 44% of beneficiaries (R.3.4; more than 100% of the target achieved),

and 37,495 of them also receiving advanced strategic technical assistance (P.2.1; more than 100% of the target achieved). Together, these interventions – described in more detail in the following paragraphs – led to high technology adoption rates: 57,410 farmers adopted the technologies (R.3.3; more than 100% of the target achieved), with adoption rates reaching 94% among all beneficiaries (R.3.1; more than 100% of the target achieved) and 95% among female beneficiaries (R.3.2; more than 100% of the target achieved), well above the 75% target. These high adoption rates, documented through the project's impact evaluation, provide strong evidence that the project's delivery model - combining one-time financial incentives with technical assistance - was effective in promoting technology uptake. These indicators were appropriate for assessing whether beneficiaries adopted and applied the technologies received. They also capture a key behavioral outcome along the pathway toward increased agricultural productivity. The overachievement of R.3.3 reflects both the broad delivery of technology packages under P.2.2 and an adoption rate that was substantially higher than the 75% assumption used to establish its target.

- 2.25 Of the 61,062 farmers who received agricultural technology packages across five departments under P.2.2, 50,062 received agroforestry packages (R.1.1; 82% of the target achieved), of whom 46,823 adopted the soil protection and restoration technologies promoted through those packages (R.1.2; more than 100% of the target achieved), which were applied over an estimated 23,406 hectares (R.1.3; 84% of the target achieved).
- 2.26 The distribution of technology packages under Component 2 evolved strategically over the project's implementation period. Approximately 82% of packages delivered consisted of agroforestry systems, structured around three primary models: coffee-based agroforestry, cocoa-based agroforestry, and yam-based agroforestry. These "Creole Gardens" (*Jardins Créoles*, in French) comprised various combinations of fruit tree seedlings (mango, avocado, citrus, breadfruit, soursop), timber and forest species (cedar, mahogany), cash crops (coffee and cocoa seedlings), and interannual crops (yam, banana, sugarcane, pineapple, pigeon peas). This integrated approach aimed to provide both immediate food and income while establishing long-term environmental benefits. In response to the COVID-19 pandemic and resulting food security pressures, the project introduced short-cycle annual crop packages (representing 17% of total packages), reaching 10,279 beneficiaries with seed and planting material combinations including maize, cassava, sweet potato, cowpea, pigeon peas, spinach, and rice. Additional specialized packages addressed irrigation (motor pumps and pipes for 479 beneficiaries, plus 28 solar-powered pumps installed in the Artibonite plain serving approximately 2,600 hectares), post-harvest infrastructure (drying floors for coffee, cocoa, and cereals distributed to 210 beneficiaries in Grand'Anse), and mechanization through animal traction (plows and oxen pairs for 32 beneficiaries). This diversification of package types allowed the project to respond adaptively to acute food security needs while maintaining its core focus on sustainable, natural-capital-enhancing technologies.
- 2.27 The project used a matching grant mechanism under which it covered 90% of technology costs, while beneficiary farmers contributed the remaining 10%, either in cash (for equipment such as pumps and plows) or in kind (primarily labor for agroforestry packages, including soil preparation, planting, and maintenance). When the contribution was required in cash, farmers were required to pay it to a participating financial institution before receiving their technology package. Due to the severe decapitalization of farms caused by Hurricane Matthew in 2016, the co-financing requirement was waived for the South and Grand'Anse departments (representing approximately 54% of beneficiaries, or 32,995 farmers). This requirement was also waived for beneficiaries of short-cycle annual crop packages distributed under the

COVID-19 emergency support, as well as for the installation of post-harvest drying infrastructure, although farmers provided labor for site preparation.

- 2.28 The PEU developed an innovative system of decentralized agricultural fairs to distribute agricultural inputs and services through a regulated and transparent marketplace, replacing an earlier open-market approach. These fairs brought together pre-registered beneficiary farmers, approved suppliers, and supervisory actors - Communal Agricultural Offices (BACs, for its French acronym), Departmental Agricultural Directorates (DDAs, for its French acronym) and Service Provider Operators (OPS, for its French acronym) - in a controlled environment to facilitate the transfer of technology packages. A quota system assigned indicative market shares to suppliers and standardized package prices, shifting competition from price to input quality while preserving farmer choice. Transactions were conducted through vouchers covering the matching grant subsidy. This mechanism effectively addressed thin market conditions in remote areas, strengthened quality control and contributed to reducing the risk of fraud and collusion observed under previous approaches.
- 2.29 Technical assistance played a critical role in achieving high adoption rates of sustainable technologies. All beneficiaries who received agricultural technology packages benefited from basic support for plot management and approximately 61% of them – 37,495 farmers (P.2.1; more than 100% of the target achieved) - received more advanced "strategic" assistance covering technology selection, farm management and commercialization strategies. Technical assistance was designed to complement the demand-driven incentive mechanism: beneficiaries selected packages from competing suppliers at decentralized agricultural fairs, while field technicians provided on-farm support to ensure proper application of the technologies. In the earlier stages of implementation, technical assistance was delivered primarily through OPS. However, the Final Evaluation Report noted that this support could have benefited from greater intensity and closer follow-up in some areas, reflecting both (i) low technician-to-farmer ratios and (ii) remuneration structures based primarily on the volume of incentives distributed. Similarly, the 1,200 model farmers ("Paysans Relais") mobilized to support peer-to-peer diffusion faced capacity constraints in supporting the relatively large groups assigned to them. These limitations, along with the "single incentive per farmer" approach, are particularly relevant for agroforestry systems, which require behavioral change and where meaningful results materialize only over several years. After the Midterm Evaluation, the project adapted its approach and deployed plot management technicians (TAPs, for its French acronym). This adjustment proved particularly effective, with TAPs providing essential on-farm support widely credited by stakeholders with improving implementation quality and adoption outcomes across all five departments, while also strengthening the technical capacity of model farmers. This combination of farmer choice, supplier competition and adaptive technical assistance proved effective in overcoming information, financial, and risk-related constraints to adoption.
- 2.30 Training provided under Component 2 by the IICA-CATIE consortium constituted a key pillar of the project's implementation model, aimed at professionalizing the private network of agricultural input and service suppliers. The training sought to transform suppliers from simple vendors into technical service providers capable of delivering quality inputs and advisory support to farmers, thereby partially addressing gaps in public extension services. It combined business management modules, quality standards for agricultural inputs, and specialized technical training (e.g.: production of healthy planting material, grafting and pruning techniques, composting, and equipment maintenance). In total, 106 training sessions were delivered, and participation was often a prerequisite for suppliers to remain eligible for the agricultural fairs. According to the Final Evaluation Report, this capacity-building effort

contributed to increased production capacity and turnover among participating firms, while supporting the emergence of a more structured private market capable of continuing to supply technology packages beyond the project's completion.

- 2.31 Component 1 contributed substantially to the achievement of the SDO through both its research outputs and its capacity-building activities. Eight agricultural research projects were defined and implemented (P.1.1; 53% of the target achieved), including five research sub-programs covering Haiti's main agricultural systems (coffee-based agroforestry, cocoa-based agroforestry, legume-cereal systems, roots and tubers, and rice systems), plus three special research projects addressing cross-cutting themes (small-scale mechanization; soil fertility under low-input conditions; and identification and management of agricultural pests and diseases). The final number of research projects implemented was influenced by implementation realities and evolving priorities during execution. Budget reallocations during implementation reduced available funding for research contracting; several procurement processes were declared unsuccessful and had to be relaunched, consuming time and resources; the socio-political and security context complicated the recruitment of international research providers and deterred participation by some institutions; and the remaining project timeframe was ultimately too short to guarantee scientifically valid results for certain planned projects. Despite achieving only 53% of the target number of projects, the research programs generated substantial scientific results: (i) 69 technologies developed or adapted (R.2.2; more than 100% of the target achieved), (ii) 38 technical packages tested under field conditions of which 31 were validated, (iii) more than 24 technical data sheets prepared, (iv) 8 agrosocioeconomic diagnostic studies covering 2,452 farmers, (v) 9 weather stations installed, and (vi) 1 in vitro laboratory strengthened. Furthermore, over 160 scientific presentations were delivered across three national Scientific Day events, and 20 scientific articles were published in peer-reviewed journals. R.2.2 was appropriate for measuring the project's contribution to the generation of locally adapted agricultural technologies. However, the original target of eight implicitly assumed approximately one technology per major research line, whereas each research sub-program ultimately addressed multiple crops, varieties, production systems and technical themes, thereby generating several crop-, variety-, and theme-specific technologies and recommendations. The achievement of 69 technologies therefore reflects both substantial research production and a target that did not fully account for the breadth and complexity of the research sub-programs.
- 2.32 Delays in research sub-programs – primarily due to procurement difficulties and a limited number of qualified research consortia – meant that the technical packages generated by Component 1 were only finalized at the very end of the project and were therefore not yet available for distribution through Component 2's standard incentive mechanism during the implementation period. In response, and consistent with the project's original design, technology transfer continued through the participatory research pathway: farmers engaged directly as collaborators in applied research projects, including through FFS, were trained on experimental plots and encouraged to replicate technologies on their own farms, functioning as early adopters and demonstration points for peer-to-peer diffusion. It should be noted that participatory research approaches such as FFS were relatively new to Haiti's agricultural research landscape at the time of project design, making it inherently difficult to set realistic targets for indicators R.2.3 and R.2.4, which measured the adoption, by male and female farmers respectively, of technologies specifically generated through Component 1's applied research projects. This participatory pathway enabled technology dissemination from Component 1 and allowed 813 male farmers (R.2.3; 45% of the target achieved) and 365 female farmers (R.2.4; 30% of the target achieved) to adopt technologies generated through the applied research projects. These achievement rates reflect the narrower reach of the

participatory research pathway and the delayed availability of the research results, rather than the overall level of technology adoption under PITAG. Moreover, R.2.3 and R.2.4 are absolute gender-disaggregated counts rather than adoption rates. The difference between 813 male adopters and 365 female adopters appears to reflect primarily the lower participation of women in the applied research activities, rather than necessarily a lower propensity among participating women to adopt the technologies. The indicators were appropriate for measuring the adoption of technologies generated through Component 1. Adoption was concentrated among farmers directly engaged in the participatory research pathway, reflecting the fact that the technical packages were finalized near project completion and are expected to reach a broader audience through the successor PAPAIR operation. The nine technical packages currently promoted under the successor PAPAIR program (HA-J0002/HA-G1050) - covering coffee, cocoa, rice, sweet potato, groundnut, yam, cassava, bean and animal traction systems - are drawn from or have been strengthened by PITAG's applied research, confirming that Component 1's research results are being operationalized at scale through the next generation of agricultural support programming in Haiti.

- 2.33 Component 1 also strengthened Haiti's agricultural innovation system through targeted capacity-building investments. Ten scholarships were awarded (P.1.2; 100% of the target achieved), enabling young Haitian professionals to pursue graduate studies in agriculture-related fields at institutions in North America and Europe, with thematic focus on climate resilience, extension services, and soil science. By project completion, nine scholarship recipients had obtained master's degrees and four were continuing toward doctoral studies. The research sub-programs additionally supported the completion of five doctoral theses and 35 undergraduate theses. The project also strengthened MARNDR's Innovation Directorate (P.1.3; 100% of the target achieved) through the provision of 11 technical staff seconded to supervise research sub-programs, an administrative assistant, essential equipment and materials, and the development of the Scientific and Technical Information System (SIST, for its French acronym). Taken together, these investments in human and institutional capital - combined with the broader financial resources mobilized under Component 1 for applied research activities - contributed to a measurable expansion of Haiti's agricultural research effort. R.2.1, which tracks research and development expenditure as a percentage of agricultural GDP, captures this aggregate contribution: the indicator increased from 0.12% at baseline to 0.69% at project closure (R.2.1; more than 100% of the target achieved).

Table 2. Results Achieved Matrix

Specific Objectives/Indicator	Unit of Measure	Baseline value	Baseline year	Targets and actual achievement ^{19 20}		% Achieved	Means of verification
GDO: Increase agricultural income and food security for smallholder farmers in selected areas of Haiti							
I.1.1. Percentage of male-headed households who are severely food insecure using the Food Security Scale (ELCSA)	%	36	2021	P P(a) A	18 39	0%	Impact Evaluation Report
I.1.2 Percentage of female-headed households who are severely food insecure using the Food Security Scale (ELCSA)	%	45	2021	P P(a) A	26 46	0%	Impact Evaluation Report
I.1.3. Beneficiaries of IDBG projects that contribute to at least one key dimension of food security	#	0	2017	P P(a) A	65,048 61,062	94%	Project Progress Reports
I.2.1. Annual agricultural income ²¹	US\$/Household	189	2021	P P(a) A	298 736	502%	Impact Evaluation Report
- for female-headed HH		130		P A	205 582	603%	
- for male-headed HH		205		P A	322 772	485%	
I.2.2. Annual agricultural profits ²²	US\$/Household	356	2021	P P(a) A	581 882	234%	Impact Evaluation Report
- for female-headed HH		260		P A	424 733	288%	
- for male-headed HH		379		P A	618 916	225%	

¹⁹ Data source: Convergence

²⁰ Where: P = Startup Plan (source: PMR "Second period Jan–Dec 2018" in Convergence); P (a) = Revised Annual Target (source: last PMR in Convergence); A = Actual (source: last PMR in Convergence)

²¹ Values for this indicator are expressed in constant December 2020 US\$. To ensure comparability with the baseline, the nominal endline value was first deflated by the cumulative food price inflation observed in Haiti between December 2020 and December 2024 (+225.5%; source: FAO) and then converted to US\$ using the average exchange rate prevailing in December 2020 (1 US\$ = 73.1 HTG). For reference, the nominal (non-deflated) endline value for the treatment group was approximately 128,440 HTG per household, equivalent to approximately US\$ 988 at the endline exchange rate of 1 US\$ = 130 HTG.

²² Values for this indicator are expressed in constant December 2020 US\$. To ensure comparability with the baseline, the nominal endline value was first deflated by the cumulative food price inflation observed in Haiti between December 2020 and December 2024 (+225.5%; source: FAO) and then converted to US\$ using the average exchange rate prevailing in December 2020 (1 US\$ = 73.1 HTG). For reference, the nominal (non-deflated) endline value for the treatment group was approximately 151,580 HTG per household, equivalent to approximately US\$ 1,166 at the endline exchange rate of 1 US\$ = 130 HTG.

Specific Objectives/Indicator	Unit of Measure	Baseline value	Baseline year	Targets and Actual achievement		% Achieved	Means of verification
SO1: Increase agricultural productivity and improve the use of natural capital through the adoption of sustainable technologies							
R.1.0. Annual value of agricultural production	US\$ / Household	449	2021	P P(a) A	619 1,037	346% ²³	Impact Evaluation Report
R.1.1. Beneficiaries of improved management and sustainable use of natural capital	# of beneficiaries	0	2017	P P(a) A	61,224 50,062	82%	Final Evaluation Report
- Male				P A	27,342		
- Female				P A	22,720		
- Afro descendant				P A	50,062		
R.1.2 Beneficiaries who adopted soil protection and restoration technologies	#	0	2017	P P(a) A	45,918 46,823	102%	Impact Evaluation Report
R.1.3. Additional hectares of land applying agroforestry technologies	Hectares	0	2017	P P(a) A	27,900 23,406	84%	Project Progress Reports
R.2.1 Research and development expenditure as percentage of Agricultural GDP	%	0.12	2017	P P(a) A	0.3 0.69	317%	Project Progress Reports
R.2.2. New technologies developed or adapted by new applied research projects	#	0	2017	P P(a) A	8 69	863%	Final Evaluation Report
R.2.3. Male farmers who adopt the technologies developed by new applied research projects	#	0	2017	P P(a) A	1,800 813	45%	Applied research project reports
R.2.4. Female farmers who adopt the technologies developed by new applied research projects	#	0	2017	P P(a) A	1,200 365	30%	Applied research project reports
R.3.1. Percentage of beneficiary producers who adopt agricultural technologies	%	0	2017	P P(a) A	75 94	125%	Impact Evaluation Report

²³ The 346% achievement rate reflects the comparison of observed and target values under the Results Matrix and should not be interpreted as the project's attributable impact. The project's causal contribution, estimated through the randomized impact evaluation, was a statistically significant 12% increase in the annual value of agricultural production relative to the control group. See paragraph 2.23, counterfactual analysis and impact evaluation for details on the interpretation and attribution of this indicator.

R.3.2. Percentage of beneficiary women who adopt agricultural technologies	%	0	2017	P P(a) A	75 95	127%	Impact Evaluation Report
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Specific Objectives/Indicator	Unit of Measure	Baseline value	Baseline year	Targets and Actual achievement		% Achieved	Means of verification
SO1: Increase agricultural productivity and improve the use of natural capital through the adoption of sustainable technologies							
R.3.3. Farmers who adopt agricultural technologies	#	0	2017	P P(a) A	48,786 57,410	118%	Impact Evaluation Report
R.3.4. Women beneficiaries of economic empowerment initiatives	# of beneficiaries	0	2017	P P(a) A	26,019 26,987	104%	Final Evaluation Report
- Female				P A	26,987		
- Afro descendant				P A	26,987		

Outputs ²⁴	Unit of Measure	Baseline value	Baseline year	Targets and Actual achievement		% Achieved	Means of verification
Component #1: Applied Research and Training (84% achieved)							
P.1.1. Agricultural research projects defined and implemented	Project	0	2017	P	15	53%	Final Evaluation Report
				P(a)			
				A	8		
P.1.2. Scholarships	Scholarship	0	2017	P	10	100%	Final Evaluation Report
				P(a)			
				A	10		
P.1.3. Directorate of Innovation strengthened	Directorate	0	2017	P	1	100%	Final Evaluation Report
				P(a)			
				A	1		
Component #2: Promotion of Sustainable Agricultural Technologies (97% achieved)							
P.2.1. Beneficiary farmers who received technical assistance	#	0	2017	P	33,000	114%	Final Evaluation Report
				P(a)			
				A	37,495		
	#	0	2017	P	65,047	94%	Final Evaluation Report

²⁴ Note: In Convergence, the PMR reports output indicators only in French. These correspond to the same indicators presented in the POD (with identical baselines and targets), although the French wording is simplified compared with the original English indicator names.

P.2.2. Beneficiary farmers who received technological packages				P(a)			
				A	61,062		

c. Counterfactual Analysis

SDO - Increase agricultural productivity and improve the use of natural capital through the adoption of sustainable technologies

- 2.34 Different attribution methodologies were used for the SDO indicators. The annual value of agricultural production was evaluated through the project's experimental impact evaluation. By contrast, the Component 2 adoption indicators were calculated using self-reported information collected from project beneficiaries through the impact evaluation survey but were not themselves assessed through a counterfactual comparison. The Component 1 adoption indicators were assessed through a reflexive before-after approach based primarily on project and MARNDR records. Attribution for these adoption indicators therefore relies primarily on a theory-based assessment of the relationship between project outputs, the expected causal pathways, the outcomes observed and plausible alternative explanations.
- 2.35 For Component 2, PITAG distributed agricultural technology packages to 61,062 farmers under P.2.2. All recipients received basic plot-management support, while 37,495 of them also received advanced technical assistance under P.2.1. These interventions addressed the financial, informational and technical constraints identified at design by reducing the cost and risk of acquiring technologies, facilitating access to inputs and suppliers, and supporting their proper application. Technologies promoted by the project were subsequently adopted by 57,410 of these beneficiaries, equivalent to 94% of all beneficiaries and 95% of female beneficiaries. Among the 61,062 beneficiaries, 50,062 received agroforestry packages, of whom 46,823 adopted the soil-protection and restoration technologies promoted through them, covering an estimated 23,406 hectares.
- 2.36 The close correspondence between the technologies financed and promoted by PITAG, the beneficiaries reached and the technologies subsequently reported as adopted provides credible evidence that the project was the main driver of these results. The causal pathway is also consistent with evidence from similar programs showing that matching grants combined with technical assistance, including FFS, can increase the adoption of agricultural and natural-capital-enhancing technologies ([Waddington et al., 2014](#); [Mullally and Maffioli, 2014](#); [Bravo-Ureta et al., 2006](#); [Schling and Pazos, 2022](#)).
- 2.37 However, the impact evaluation did not estimate Component 2's causal effect on technology adoption. Establishing causal attribution would have required collecting comparable, detailed information from the control group on the technologies and practices adopted over the same period. As this information was not available, the reported adoption rates should be interpreted as descriptive measures among project beneficiaries. Adoption of the same technologies among farmers from the control group was likely limited because they did not receive the matching grants, packages or associated technical assistance and therefore continued to face the financial, informational and technical constraints addressed by PITAG.
- 2.38 Other contextual factors, including changes in agricultural prices, climatic conditions, access to markets and inputs, and complementary interventions, may also have influenced adoption. However, the main shocks experienced during implementation (including COVID-19, the 2021 earthquake, political instability, insecurity and economic deterioration) were more likely to constrain technology delivery and adoption than to generate the high adoption rates observed. Attribution of the Component 2 adoption indicators therefore rests on a strong theory-based analysis.

- 2.39 For Component 1, R.2.3 and R.2.4 were designed to document progress in MARNDR's capacity to generate and diffuse technologies through a reflexive before-after methodology rather than an experimental counterfactual. The causal chain is directly traceable: applied research projects were financed under P.1.1; participating farmers were trained through experimental plots and participatory research activities such as FFS; and 813 male and 365 female farmers subsequently adopted technologies generated through these projects. Because these indicators were limited to technologies specifically developed or adapted through PITAG and recorded in the applied research project reports, the project can reasonably be considered the main driver of the adoption observed.
- 2.40 The relatively low achievement rates for R.2.3 and R.2.4 are consistent with the implementation reality. The research technologies were finalized only at project closure and could not be disseminated through Component 2's large-scale incentive mechanism. Adoption was therefore largely limited to farmers participating directly in the applied research and FFS pathway.
- 2.41 R.2.2 is more directly attributable to PITAG, since the 69 technologies recorded under this indicator were developed or adapted through the project-financed research portfolio. Similarly, PITAG was the main documented contributor to the increase in agricultural research and development expenditure as a percentage of Agricultural GDP under R.2.1: PITAG research expenditures in 2024 alone represented 54% of Haiti's total agricultural research and development expenditure.
- 2.42 The annual value of agricultural production (R.1.0), used as the project's proxy for agricultural productivity, was assessed through the experimental impact evaluation. Treatment and control households were randomly selected from the same pool of project applicants (Component 2). The treatment group comprised 968 households who received technology packages, while the control group consisted of 944 similar applicant households who did not participate in the project. Because the two groups were not fully balanced at baseline, the evaluation controlled for baseline imbalances through regression analysis to isolate the causal effect of project interventions. The evaluation found that, relative to the control group, PITAG increased the annual value of agricultural production by 12% for beneficiaries, with the effect statistically significant at the 5% level. Although the value of production per hectare was not included in the project's Results Matrix, the impact evaluation also measured this more conventional indicator of land productivity by dividing the value of agricultural production by the total area cultivated. The evaluation found that, compared with the control group, PITAG increased the value of production per hectare by 10.5% overall, including increases of 10.2% among male-headed households and 11.7% among female-headed households, with all effects statistically significant at the 5% level. These findings therefore provide causal evidence that PITAG increased agricultural production value and land productivity.

GDO - Increase agricultural income and food security for smallholder farmers in selected areas of Haiti

- 2.43 Using the same randomized evaluation design described above, the impact evaluation documented statistically significant positive effects on food security, agricultural income and agricultural profits.
- 2.44 The project reduced severe food insecurity by 4.3 percentage points among participating households - a 9.7% relative reduction compared to the control group - an effect that was

statistically significant at the 5% level (I.1.1 and I.1.2). This impact is particularly noteworthy given that absolute levels of severe food insecurity worsened across the entire study region during the evaluation period, increasing from 36.8% to 40.2% among treatment households and from 38.9% to 44.6% in the control group. The positive treatment effect therefore indicates that the project mitigated a deterioration that would otherwise have been greater.

- 2.45 The evaluation also documented statistically significant increases (at the 5% level) in annual agricultural income from crop sales (+14%; I.2.1) and annual agricultural profits (+12.8%; I.2.2).
- 2.46 Indicator I.1.3 (94% of the target achieved), which measures the absolute number of beneficiaries contributing to food security, was not designed for counterfactual assessment, as it is directly attributable to a specific project intervention (P.2.2). Although it measures project reach rather than a causal change in food security, the impact evaluation findings provide complementary evidence that participation in PITAG generated measurable improvements in household food-security outcomes.

d. Unanticipated outcomes

- 2.47 No unanticipated outcomes were documented.

In summary, the project achieved its SDO. It also generated significant impacts on income and food security. The observed outcomes and impacts were attributable to project interventions. The project's effectiveness is therefore rated as Satisfactory.

II.3 Efficiency

- 2.48 At project design, an [ex-ante cost-benefit analysis](#) (CBA) was conducted. It evaluated the project's viability over a 12-year horizon (starting in 2017) using a 12% discount rate. Estimated benefits were driven primarily by increases in Gross Value Added (GVA) across two main channels: (i) productivity gains from the adoption of sustainable technology packages under Component 2, and (ii) scientific knowledge generation and capacity building under Component 1. The analysis modeled profitability along two key dimensions: (i) the magnitude of GVA increases, benchmarked against previous impact evaluations of the PTTA project in Haiti and international meta-analyses showing an average 42% annual return on agricultural research; and (ii) a technology adoption rate estimated at 75% for the 65,048 targeted smallholder households. Under this base scenario, the project was expected to generate a total net present value (NPV) of US\$ 28.1 million and an internal rate of return (IRR) of 27.18%. Sensitivity analysis demonstrated the project's robustness, showing that it would remain economically viable provided the technology adoption rate did not fall below a break-even point of 45.7%.
- 2.49 The [ex-post CBA](#) differed from the ex-ante analysis because it used actual implementation costs and evidence available at completion rather than assumptions made at design. It considered the project costs necessary to generate the quantified benefits and the corresponding benefit flows over a 26-year period, covering the seven-year implementation period (2018-2024) and a 19-year post-project period (2025-2043). This horizon was based on MARNDR's estimate that coffee and cocoa - the main sources of the long-term agricultural

benefits included in the analysis - have an economic productive life of approximately 20 years after planting. The productive life of the packages delivered in the final implementation year therefore extends through 2043. Carbon accumulation may continue for 40 years or more, depending on the species composition of the agroforestry systems, but carbon benefits accruing after 2043 were excluded. The selected horizon therefore captures the expected productive life of the main agricultural investments while conservatively excluding part of the longer-term carbon benefits.

- 2.50 The project's incremental benefits corresponded to: (i) an increase in annual net agricultural profits resulting from the adoption of agroforestry technologies; and (ii) carbon sequestration generated through the rehabilitation and expansion of agroforestry systems over 23,406 hectares.
- 2.51 Annual agricultural profit was defined as the total value of all agricultural outputs - regardless of whether sold, consumed, stocked or lost - minus production-related expenditures, including inputs and transportation. According to the project's impact evaluation, this benefit increased by an estimated 12.8%, equivalent to a treatment effect of US\$ 56.5 per beneficiary household, expressed in food price-deflated terms at the endline exchange rate of 130 HTG/US\$. This treatment effect was converted to nominal values for each year of the project implementation period. It was estimated across all treatment households, including farmers who did not fully adopt the agroforestry packages and those whose seedlings experienced partial or complete mortality, and can consequently be interpreted as a conservative average effect.
- 2.52 To obtain annual net agricultural profit, incremental external labor costs associated with the adoption of agroforestry packages were then deducted from this benefit. These costs were not estimated in the project's impact evaluation. Instead, the present analysis relies on estimates from the project's ex-ante economic analysis, which estimated an incremental external labor cost of US\$ 12.66 per farm in 2017 prices. This figure was similarly updated to nominal values for each year of the analysis, and then deducted from annual agricultural profit nominal estimates (yielding a net agricultural profit benefit ranging from approximately US\$ 53 per beneficiary household in 2019 to US\$ 145 in 2024).
- 2.53 Because the components of the agroforestry packages mature at different rates, the ex-post CBA assumed that this benefit materialized progressively: 25% in the year the package was received, 50% in the following year, 75% in the second subsequent year, and 100% from the third subsequent year onward. This schedule reflects the early contribution of annual intercrops, followed by the progressive production of coffee, cocoa and fruit trees.
- 2.54 Regarding carbon sequestration, the areas supported by PITAG were not bare forests but existing, aging and degraded agroforestry plots in which tree densities and natural capital had declined over time. The rehabilitated systems comprised varying combinations of coffee and cocoa; fruit trees such as mango, avocado, citrus, breadfruit and soursop; timber and forest species such as cedar and mahogany; and annual intercrops such as yam, banana, pineapple and pigeon peas. Because plot-level biomass measurements and a species-weighted inventory were unavailable, carbon benefits were estimated using an average mature agroforestry system biomass stock for Haiti rather than package-specific carbon coefficients.
- 2.55 Evidence from Zomer et al. (2016) (quoted in [Ordóñez, 2025](#)), estimates the average biomass carbon content of mature Haitian agroforestry systems at 49.1 tons of carbon per hectare, equivalent to approximately 180 tons of CO₂ per hectare. The without-project scenario did not

assume that the intervention plots contained no biomass carbon. Instead, it assumed that their stocks would have remained at approximately 50% of the mature-system benchmark (24.55 tC/ha) in the absence of PITAG. This 50% value was selected as a midpoint representation of the documented degraded condition and low plant density of the plots: coffee plots generally contained only 400-600 plants/ha, while cocoa plots frequently contained approximately 300 trees/ha (Jeanniton and Germain, 2024; Mertilus et al., 2023). According to MARNDR and the project's OPS, the rehabilitation packages at least doubled tree density, with cocoa packages, for example, targeting approximately 900 plants/ha.

- 2.56 The with-project scenario assumes that, as systems are rehabilitated and tree density increases through project interventions, these plots progressively reach their full carbon potential over a 40-year accumulation horizon, consistent with evidence on carbon equilibrium in multi-species agroforestry systems ([Ma et al., 2020](#)). More specifically, the model assumes that approximately 33% of the maximum biomass carbon stock is accumulated during the first ten years and that the remaining 67% is accumulated over the following 30 years. Only the carbon accumulated within the 2018–2043 analysis period was monetized.
- 2.57 The estimates are conservative because several benefit categories were excluded. These include the institutional strengthening and knowledge generation benefits of Component 1, which could not be reliably quantified and attributed; environmental co-benefits of agroforestry, including improved soil and water conservation, reduced deforestation, biodiversity gains and enhanced agrobiodiversity; and the benefits of Component 2 interventions not covered by the impact evaluation, namely short-cycle crop packages (10,279 beneficiaries), irrigation systems (479 beneficiaries), post-harvest infrastructure (210 beneficiaries) and mechanization support (32 beneficiaries). The impact evaluation focused exclusively on agroforestry package beneficiaries. The estimated net agricultural profit effect therefore relates specifically to the combination of perennial crops and annual intercrops included in those packages. Annual intercrops contributed to the benefits observed during the early years, while the longer-term sustainability of the benefit stream depends mainly on coffee, cocoa, fruit trees and timber species.
- 2.58 To monetize carbon benefits, the analysis adopted a conservative carbon price based on the levels recommended by the High-Level Commission on Carbon Prices (2017; quoted in [World Bank, 2023](#))²⁵, converted into 2024 US dollars (US\$ 86.41 per ton of CO₂eq). This value is lower than alternative estimates such as the US Environmental Protection Agency's updated social cost of carbon (US\$ 120)²⁶ or the US\$ 185 estimate proposed by Rennert et al. (2022)²⁷.
- 2.59 Incremental costs included all relevant project expenditures required to generate the two quantified benefit streams. Expenditures were converted from financial to economic values by removing taxes that represent transfers within the Haitian economy (the 10% value-added tax on goods and equipment and the 15% income tax applied to relevant service expenditures). The resulting economic project costs amounted to US\$ 50,339,052, equivalent to approximately 68% of the project's total executed amount (for a detailed breakdown of costs and underlying assumptions, see the ex-post CBA report). The remaining 32% related primarily to the interventions whose benefits were excluded from the analysis, as described

²⁵ World Bank, 2023. [Carbon Pricing Leadership Report 2022/23](#). World Bank, Washington, DC.

²⁶ [EPA Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances. Supplementary Material](#) (2023).

²⁷ Rennert, K., Errickson, F., Prest, B.C. *et al.* Comprehensive evidence implies a higher social cost of CO₂. *Nature* **610**, 687–692 (2022). <https://doi.org/10.1038/s41586-022-05224-9>

above, as well as to the project's M&E system. This ensured consistency between the scope of the included costs and that of the quantified benefits.

- 2.60 Recurrent costs associated with maintaining agroforestry systems were not added separately to the cost stream, because the estimated impact on annual agricultural profits was already net of the input, replanting, and transportation expenditures reported by farmers at endline. Since the endline survey was administered approximately four to five years after package delivery, it captured recurring input use and, for crops with short replacement cycles, at least part of the related replanting costs. Yam and pineapple, for example, generally require replanting approximately every three years, while banana has an estimated five-year replacement cycle. Adding these expenditures again as a separate cost stream would therefore risk double counting. Similarly, the incremental external hired labor costs associated with the annual maintenance of agroforestry systems are already reflected in the annual net agricultural profit estimates described above and are therefore not added separately to the cost stream. In addition to project and recurrent costs, the analysis includes agroforestry plot establishment labor costs borne by beneficiary farmers, estimated at US\$ 45 per beneficiary plot (0.5 hectare) in 2017 prices, applied once per beneficiary at the time of package distribution. Once the benefit had fully materialized, the model assumed that real net incremental profit remained constant, implying that any subsequent increase in maintenance costs would be offset by the additional production generated as the perennial components matured. This assumption was tested through the sensitivity analysis presented below.
- 2.61 The ex-post CBA estimated an NPV of US\$ 23,339,711, an IRR of 23.1%, and a benefit-cost ratio of 1.74, using a 12% discount rate. Sensitivity analysis confirmed the robustness of these results: the project remained economically viable as long as the share of tree density attributable to the project (assumed at 50% in the main analysis) did not fall below 10.22% (Scenario 1), and as long as annual net agricultural profits did not decrease by more than 67% relative to the main analysis (Scenario 2). Applying a lower discount rate of 8%, more appropriate for long-term environmental benefits, increased the NPV to US\$ 46,588,060 (Scenario 3). Full results and assumptions are presented in the ex-post CBA Report and its annexes.

In summary, the project demonstrated clear economic viability. The ex-post CBA indicated a positive NPV of US\$ 23,339,711 and an IRR of 23.1%, confirming that the project generated meaningful returns even under conservative assumptions. The adaptive management approach - including budget revisions (frequent reallocations across components to respond to evolving field needs), the introduction of annual crop packages during COVID-19, and the deployment of TAPs - helped mitigate implementation delays and contributed to the achievement of strong output and outcome results. The project's efficiency was rated as Excellent.

Table 3. Costs of the Project

Component 1: Applied Research and Training							Component Revised Cost		11,763,996.04
Output Definition		2018	2019	2020	2021	2022	2023	2024	Cost
P.1.1. Agricultural research projects defined and implemented	P	309,400.00	1,594,800.00	3,237,000.00	3,534,400.00	3,284,400.00	238,000.00		12,198,000.00
	P(a)	309,400.00	594,800.00	1,000,000.00	1,532,312.00	2,324,529.49	2,500,000.00	3,046,327.00	7,265,749.18
	A	37,094.00	200,378.00	672,472.00	1,010,389.00	878,736.61	1,525,437.37	2,941,242.20	7,265,749.18
P.1.2. Scholarships	P		72,000.00	108,000.00	108,000.00	72,000.00			360,000.00
	P(a)	0.00	72,000.00	54,000.00	193,880.00	156,950.00	34,500.00	0.00	474,766.00
	A	0.00	191.00	54,896.00	214,227.00	165,897.00	39,955.00	0.00	474,766.00
P.1.3. Directorate of Innovation strengthened	P	250,000.00	379,500.00	409,500.00	364,500.00	364,500.00	274,000.00		2,042,000.00
	P(a)	250,000.00	79,500.00	409,500.00	633,861.00	1,164,387.00	1,102,836.00	790,390.00	4,023,480.86
	A	48,776.00	353,992.00	490,887.00	718,309.00	617,425.11	741,993.00	1,052,098.75	4,023,480.86
Component 2: Promotion of Sustainable Agricultural Technologies							Component Revised Cost		58,242,304.28
Output Definition		2018	2019	2020	2021	2022	2023	2024	Cost
P.2.1. Beneficiary farmers who received technical assistance	P	150,000.00	600,000.00	1,500,000.00	1,800,000.00	1,800,000.00	150,000.00		6,000,000.00
	P(a)	150,000.00	400,000.00	1,000,000.00	2,500,000.00	1,194,403.56	0.00	0.00	8,245,948.80
	A	0.00	142,576.35	2,646,362.85	2,844,740.25	1,403,789.40	981,857.55	226,622.40	8,245,948.80
P.2.2. Beneficiary farmers who received technological packages	P	850,000.00	5,383,931.00	14,381,337.00	14,684,792.00	12,636,781.00	1,972,464.00		49,909,305.00
	P(a)	850,000.00	3,383,931.00	8,000,000.00	15,124,762.00	10,749,632.06	6,000,000.00	22,544,335.00	49,996,355.48
	A	244,016.41	1,772,081.65	14,996,055.99	16,110,329.20	7,966,074.78	5,563,860.67	3,343,936.78	49,996,355.48
Other Cost		2018	2019	2020	2021	2022	2023	2024	Cost
Management	P		1,000,000.00	1,000,000.00	1,000,000.00	1,000,000.00	1,000,000.00		5,000,000.00
	P(a)	0.00	1,000,000.00	930,000.00	538,050.00	1,322,370.54	417,000.00	250,430.00	3,519,659.02
	A	385,461.56	404,768.00	525,622.00	516,436.24	535,149.94	384,524.20	767,697.08	3,519,659.02
Audits	P		30,000.00	30,000.00	30,000.00	30,000.00	30,000.00		150,000.00
	P(a)	0.00	30,000.00	30,000.00	20,000.00	30,000.00	30,000.00	32,000.00	150,171.00
	A	0.00	966.00	19,588.00	24,516.00	16,575.00	16,022.00	72,504.00	150,171.00
M&E	P		100,000.00	150,000.00	150,000.00	150,000.00	150,000.00		700,000.00
	P(a)	0.00	100,000.00	150,000.00	200,000.00	404,806.77	78,120.00	14,950.00	869,552.41
	A	138,709.99	85,681.00	215,701.00	154,082.00	220,918.33	44,995.00	9,465.09	869,552.41
Contingences	P						500,000.00		500,000.00
	P(a)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		2018	2019	2020	2021	2022	2023	2024	Cost
Total Cost	P	1,559,400.00	9,160,231.00	20,815,837.00	21,671,692.00	19,337,681.00	4,314,464.00		76,859,305.00
	P(a)	1,559,400.00	5,660,231.00	11,573,500.00	20,742,865.00	17,347,079.42	10,162,456.00	26,678,432.00	74,545,682.75
	A	854,057.96	2,960,634.00	19,621,384.84	21,593,028.69	11,804,366.17	9,298,644.79	8,413,566.30	74,545,682.75

II.4 Sustainability

a. General Sustainability Aspects

2.62 This sustainability assessment focused on the project's key results and impacts expected to endure beyond its lifetime, using the same 26-year time horizon as the ex-post CBA. These results, along with the analysis of their sustainability, are presented in **Table A**.

Table A. Sustainability Analysis

Result	Risks	Risk classif	Impact	Features that will contribute to sustainability
R.1.1. Beneficiaries of improved management and sustainable use of natural capital	Insufficient resources and follow-up (technical assistance and extension) for farmers to maintain and replicate packages without external support. Absence of rural finance may constrain farmers' capacity to self-finance the maintenance and replication of technical packages. Weakening of input, technical-service, and agricultural product markets after project support ends, reducing access to inputs and services and lowering the profitability of promoted technologies.	Low	Farmers may reduce the maintenance and replication of practices requiring recurrent inputs, labour, technical support, or long maturation periods, while prioritizing short-cycle crops with faster returns.	<u>Supplier capacity</u>: The incentive mechanism trained and certified a network of agricultural input and service suppliers in the five departments, expanding the private market for agricultural technology delivery. Training provided by IICA-CATIE specifically aimed to build supplier capacity for continued operations. The successor PAPAIR program will continue with similar supplier training and certification. <u>Community organization</u>: The project established 90 FFS in the South Department (reaching 2,385 participants, including 40% women and 24% young people), some of which self-organized into Solidarity Savings Groups (MUSO, for its French acronym) that allow members to access funds for agricultural inputs (seeds, fertilizers) and labor services (plowing, weeding) beyond the project's lifetime. Several FFS also developed autonomous income streams (selling phytosanitary services to non-members), providing a model for self-sustaining community agricultural organizations. The project also helped revitalize traditional Haitian labor-sharing customs such as the "Konbit" and the "Escouade," which help farmers overcome labor shortages and high costs. In addition, the project trained 1,200 model farmers ("Paysans Relais") to ensure that technical knowledge remains embedded within the communities, as these farmers serve as permanent local reference points for their neighbors.
R.1.2 Beneficiaries who adopted soil protection and restoration technologies				
R.1.3. Additional hectares of land applying agroforestry technologies				
R.3.1. Percentage of beneficiary producers who adopt agricultural technologies				
R.3.2. Percentage of beneficiary women who adopt agricultural technologies				
R.3.3. Farmers who adopt agricultural technologies				
R.3.4. Women beneficiaries of economic empowerment initiatives				
R.2.1 Research and development expenditure as percentage of Agricultural GDP	Packages / technologies not yet mainstreamed into MARNDR extension system; risk of institutional memory loss. Lack of national funding for agricultural R&D; instability of MARNDR staffing.	Low	The project's positive effects on R.2.3 and R.2.4 dissipate.	<u>Research and knowledge capital</u>: The 69 technologies developed, 31 validated technical packages, and associated knowledge products (technical data sheets, scientific articles, training materials) constitute a durable public good. These outputs are available for dissemination through future programs, including PAPAIR, and represent a significant expansion of Haiti's applied agricultural knowledge base. The open-access publication of research outputs on the French CNRS HAL platform ensures international visibility and longevity. Similarly, the strengthened SIST at MARNDR's Innovation Directorate provides institutional
R.2.2. New technologies developed or adapted by new applied research projects				
R.2.3. Male farmers who adopt the technologies				

developed by new applied research projects	Lack of qualified staff at the DDA level.			memory and information management capacity.
R.2.4. Female farmers who adopt the technologies developed by new applied research projects				<u>Human capital:</u> 9 scholarship recipients obtained master's degrees in agricultural research fields (with 4 pursuing doctoral studies), joining MARNDR and research institutions. An additional 35 undergraduate theses and 5 doctoral theses were completed through the research sub-programs, contributing to a new generation of Haitian agricultural researchers. <u>Institutional anchoring and national ownership:</u> The project was implemented through MARNDR's own institutional structures: the Innovation Directorate, the Departmental Agricultural Directorates (DDA, for its French acronym), and the Communal Agricultural Offices (BAC, for its French acronym). MARNDR field staff acquired skills and experience in managing agricultural research programs and incentive mechanisms. In addition, the Innovation Directorate is now equipped and operational, with its SIST in place, and is expected to continue receiving support under the PAPAIR program.

2.63 Overall, the sustainability of the project's results appears relatively robust. Several strong enabling factors support sustainability, including clear economic incentives for farmers to maintain agroforestry systems, the professionalization of private input and service suppliers, the emergence of community-based organizations (FFS, MUSO and model farmers), and a substantial accumulation of research, human, and institutional capital within MARNDR. While some constraints remain – particularly the challenging socio-political and security context and limited access to rural finance – their impact is expected to be moderate and context-specific. Most adoption and land-use results are expected to be sustained through farmers' own incentives, acquired know-how, established agroforestry systems, community organizations, and the network of trained suppliers. The main residual risk concerns the pace of further replication rather than the maintenance of technologies already adopted.

2.64 The knowledge generated under PITAG (technologies, technical packages, data, publications, and trained human capital) constitutes durable and available outcomes and public goods. However, the continuation of research activities, operation of the Innovation Directorate and SIST, and large-scale dissemination of technologies require continued institutional commitment and funding. PAPAIR and other donors support these functions in the short term, while their longer-term sustainability depends on their progressive integration into MARNDR's regular structures and budgets. Despite an adverse implementation context marked by growing insecurity, political instability, and economic deterioration, the project has established a solid foundation for sustained results and impacts. The overall risk classification is considered low because most expected benefits relate to technologies already adopted, agroforestry systems already established, knowledge already generated, and capacities already developed. The principal residual risks concern the continuation of research, extension, and technology dissemination efforts rather than the persistence of the results already achieved. While the knowledge assets generated by PITAG are durable, future research activities, operation of the Innovation Directorate and SIST, and large-scale dissemination of technologies require continued institutional commitment and funding.

b. Environmental and Social Safeguards

- 2.65 Based on the Environmental and Safeguards Compliance Policy (OP-703), the project was classified as environmental and social risk category “B”, indicating moderate expected negative environmental and social impacts. This classification was appropriate given the nature of the agricultural activities financed - primarily agroforestry, soil conservation, and small-scale equipment - which are generally environmentally benign and generate positive environmental externalities.
- 2.66 At design, an [Environmental and Social Management Report \(ESMR\)](#), an Environmental Analysis and an Environmental and Social Management Plan (ESMP) were prepared. The main environmental measures had been integrated into the technical packages delivered to farmers (e.g.: planting distances and contour lines) and continued to be applied at field level. Compliance was monitored through semi-annual progress reports, and the project maintained a “Satisfactory” Safeguard Performance Rating (SPR) throughout implementation.
- 2.67 Environmental outcomes were largely positive. The promotion of agroforestry systems over 23,406 hectares generated multiple co-benefits, including soil conservation, improved water infiltration, carbon sequestration, and biodiversity conservation. The installation of 28 solar-powered irrigation pumps in the Artibonite plain reduced reliance on electric pumping, promoting more sustainable irrigation solutions. In addition, the project promoted responsible input use and integrated pest management (IPM) approaches, particularly through FFS, with no significant pesticide-related incidents reported during implementation. No major negative environmental impacts were reported over the six-year implementation period, although minor localized issues (e.g.: disposal of polybags) were identified and addressed.
- 2.68 Social outcomes were also positive. The project effectively mainstreamed gender, with women representing 44% of beneficiaries of technology packages and no significant gender differences observed in adoption rates, indicating equitable access to project benefits. Youth inclusion was also notable, with young people accounting for 24% of FFS participants and continued investment in human capital through advanced academic training of scholarship recipients. In addition, the establishment of a grievance mechanism, based on a toll-free hotline in partnership with DIGICEL and NATCOM, helped mitigate risks of fraud in supplier selection and input distribution, contributing to greater transparency and accountability in the incentive mechanism. While some limitations were noted in the application of sanctions for irregularities, the mechanism nonetheless strengthened oversight and control. No cases were escalated to the MICI, and beneficiary feedback collected during the final evaluation indicated a high level of satisfaction with project interventions.

At EOP, residual risks to the sustainability of the project’s results have been mitigated. Moreover, safeguards performance throughout implementation was satisfactory. Accordingly, the project’s sustainability was rated as Satisfactory.

III. NON-CORE CRITERIA

III.1 Bank Performance

- 3.1 The Bank’s performance at design is assessed as satisfactory. The project was grounded in a solid analytical base, drawing on lessons from previous Bank-financed operations in Haiti (PTTA, in particular) regarding the design of demand-driven incentive mechanisms, as well

as rigorous evidence on the effectiveness (and limitations) of technology packages. The design correctly identified the main constraints on technology adoption (limited information, financial constraints and risk aversion) and proposed mechanisms to address each.

- 3.2 One design aspect that proved challenging in implementation was the tight articulation between Component 1 (research) and Component 2 (technology promotion), which assumed that research results would be available in time to inform the technology packages distributed - an assumption that proved overly optimistic given the timeline of research activities and the implementation context.
- 3.3 The Bank's supervision performance is also assessed as satisfactory:
- Disbursement and no-objection processing: The Bank processed disbursement requests and no-objection requests within acceptable timeframes throughout implementation. The PEU consistently noted that the Bank's responsiveness to disbursement requests was timely, and that the Bank provided adequate financial support whenever requested.
 - Supervision missions: From 2018 to early 2020, the Bank conducted regular in-person supervision missions with field visits. After COVID-19 and the subsequent deterioration of the security situation, supervision shifted to remote modalities, while maintaining the same frequency. This adaptation was necessary and appropriate given the context.
 - Mid-term evaluation: The Bank commissioned mid-term evaluation (2022), whose recommendations were acted upon by the PEU. The mid-term evaluation led to adjustments in implementation strategy, including the deployment of TAPs.
 - Final evaluation and impact evaluation: The Bank commissioned an external final evaluation, as well as an impact evaluation with baseline and endline surveys, generating relevant lessons to inform the design of future operations.
 - Adaptive management: The Bank approved two project extensions allowing the project to continue despite major implementation challenges. This flexibility was essential and is credited with enabling the project to achieve its output and outcome targets. The Bank also approved budget revisions that allowed the PEU to respond to COVID-19 food security needs through the introduction of annual crop packages.
 - Guidance and recommendations: Bank supervision reports provided constructive recommendations that helped improve implementation. Particular attention was paid to the challenges in Component 1 (research program delays) and supplier performance management in Component 2.
- 3.4 Remote supervision was supported by a combination of sources that allowed the Bank to maintain operational visibility despite restricted access to the field. Project progress reports, technical audits, consultants, procurement and financial management documentation, georeferenced implementation data, regular virtual meetings with the PEU and MARNDR, and information generated through the project's monitoring and evaluation system were used to verify implementation progress and identify emerging issues. Continued engagement with DDAs, BACs, service providers and project beneficiaries provided additional field-level feedback. These supervision mechanisms informed several corrective actions during implementation, including adjustments to Component 2 in response to COVID-19, the deployment of TAPs following the Midterm Evaluation, modifications to supplier-management arrangements, budget reallocations, and project extensions that enabled the completion of key activities despite the deteriorating security context.

III.2 Beneficiary Performance

3.5 The Beneficiary's performance is assessed as satisfactory. Several factors contributed positively to implementation performance:

- Effective PEU management: The PEU fulfilled its responsibilities in an effective and participatory manner throughout the project's life. The PEU maintained a stable, experienced team with deep knowledge of Haiti's agricultural sector, drawing on the human capital built through previous Bank operations (particularly PTTA).
- DDA/BAC engagement: Active participation by the Departmental Agricultural Directorates (DDAs) and Communal Agricultural Offices (BACs) in implementation decisions ensured strong national ownership and local adaptation. This engagement also strengthens the institutional foundation for continued post-project support.
- Procurement management: Procurement management under PITAG was carried out by the Ministry of Agriculture's Procurement Unit (UPMP), which demonstrated strong capacity to manage procurement activities in accordance with IDB policies and procedures. Bank procurement supervision missions consistently found that procurement processes were properly conducted and supported by adequate documentation. The UPMP also demonstrated effective contract management; for example, when the performance of a major service provider proved unsatisfactory, the PEU took decisive action to terminate the contract and engage a higher-performing operator, strengthening implementation in the South Department. PITAG additionally served as a pilot for the beta version of the Bank's Procurement Fiduciary Interface, contributing to the testing of new fiduciary management tools. The project's IFAD co-financing required additional procurement reporting and coordination efforts. Overall, procurement performance was satisfactory and contributed to the successful implementation of the operation.
- Financial management: Annual financial audits were conducted throughout the project by independent external auditors. All audits were completed on time and resulted in unqualified opinions, except for the audit covering the year ended September 30, 2024, which initially received a qualified opinion due to the unavailability of supporting documentation for expenditures incurred between October 1, 2023, and February 29, 2024, following acts of vandalism at the PEU offices on February 29 and March 1, 2024. Subsequently, scanned copies of the supporting documents previously submitted to the Bank were made available to the auditors, who performed additional audit procedures and issued a revised unqualified opinion. Audit recommendations were fully implemented, and financial management was assessed as satisfactory based on the Bank's supervision missions.
- Adaptive technology delivery mechanism: The PEU developed a system of decentralized agricultural fairs that brought together farmers, approved suppliers, and supervisors in a regulated marketplace with standardized prices and quota-based allocation, improving quality control, addressing thin market conditions in remote areas and significantly reducing risks of fraud and collusion compared to previous approaches.

3.6 At the same time, some areas could have been strengthened:

- Technical assistance targeting: The broad coverage approach of Component 2 successfully reached a large number of beneficiaries. As is often the case in large-scale programs, the scale of implementation influenced the intensity of technical assistance and monitoring that could be provided to individual farmers. The "single incentive per farmer" design and the extensive geographical coverage entrusted to OPS required prioritizing outreach while maintaining adequate technical support. In addition, the dual implementation and monitoring role assigned to OPS reduced opportunities for independent technical verification in the field

- Information systems: The project's M&E system was functional at the central level but could have been strengthened at the departmental level. The parallel existence of two information systems - the information system used for the management of incentives (SIGI, for its French acronym) and the project's own M&E system - created some redundancy.
- Payment delays: Input and service suppliers (or technology providers) frequently experienced payment delays, reflecting the multiple administrative steps required to process payment requests - spanning OPS verification, MARNDR counter-verification, national coordination, Bank no-objection and final execution by the Haitian Central Bank (BRH, for its French acronym) - compounded by the limited functionality of the SIGI system for payment processing.

IV. FINDINGS AND RECOMMENDATIONS

IV.1 Dimensions 1 to 5

Table 4
Findings and Recommendations

Findings	Recommendations
Dimension 1: Technical-sectorial	
Delays in research sub-programs – primarily due to procurement difficulties and a limited number of qualified research consortia – meant that the technical packages generated by Component 1 were only finalized at the very end of the project and were therefore not yet available for distribution through Component 2's standard incentive mechanism during the implementation period.	Future programs that include both a research component and a technology dissemination component should explicitly plan for the sequencing and timing dependencies between the two. Specifically, applied research activities should be designed to generate validated technical packages well before the planned start of the dissemination phase, with sufficient buffer to account for procurement delays and the complexity of multi-institutional research partnerships. Where this sequencing cannot be guaranteed within a single project cycle, the research component should be designed as a standalone preparatory operation whose outputs feed into the design of a subsequent technology dissemination program, rather than being executed in parallel with it.
In the earlier stages of implementation, technical assistance was delivered primarily through OPS. However, the Final Evaluation Report noted that this support was often limited in depth, reflecting both (i) low technician-to-farmer ratios and (ii) remuneration structures based primarily on the volume of incentives distributed. Similarly, the 1,200 model farmers ("Paysans Relais") mobilized to support peer-to-peer diffusion faced capacity constraints in supporting the relatively large groups assigned to them. These limitations, along with the "single incentive per farmer" approach, are particularly relevant for agroforestry systems, which require behavioral change and where meaningful results materialize only over several years. After the Midterm Evaluation, the project adapted its approach and deployed plot management technicians (TAPs, for its French acronym). This adjustment proved particularly effective, with TAPs providing essential on-farm support widely credited by stakeholders with improving implementation quality and adoption outcomes across all five departments, while also strengthening the technical capacity of model farmers. This combination of farmer choice,	Future designs should delineate the scope of responsibilities assigned to OPS. Combining incentive distribution and technical assistance delivery under a single provider can be operationally coherent and efficient, provided that remuneration structures incentivize quality of support rather than volume of distribution. However, monitoring and verification functions should be assigned to a separate actor (combining implementation and monitoring within the same provider creates a conflict of interest that undermines independent oversight and data reliability). Dedicated plot management technicians (such as TAPs) should be integrated from project launch, with technician-to-farmer ratios calibrated to ensure sufficient support for the technologies being promoted (particularly for agroforestry systems requiring multi-year behavioral change). Include in monitoring or add to monitoring a regular quality control of providers and technical assistance. Limit the geographic scope or number of mandates assigned to a single OPS to maintain quality control. While the available data do not allow specification of an optimal

supplier competition and adaptive technical assistance proved effective in overcoming information, financial, and risk-related constraints to adoption. The dual role assigned to OPS (covering both implementation and monitoring functions) reduced the scope for independent technical oversight of field operations.	geographical scope, future designs should establish a threshold per OPS based on the number of beneficiaries to be served, the intensity of technical assistance required and local accessibility conditions.
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Findings	Recommendations
Dimension 1: Technical-sectorial	
These limitations, along with the “single incentive per farmer” approach, are particularly relevant for agroforestry systems, which require behavioral change and where meaningful results materialize only over several years.	Design incentive mechanisms that provide at least 2 cycles of agroforestry incentives (or multi-year packages), with at least 2 years of post-incentive technical follow-up.
Dimension 2: Organizational and managerial	
During implementation, the combination of COVID-19 restrictions and the deterioration of the security situation limited the Bank’s ability to conduct in-person supervision missions. Maintaining effective oversight required a greater reliance on remote supervision arrangements, project monitoring systems, decentralized institutional actors, and administrative verification mechanisms.	Future operations implemented in fragile, disaster-prone, or security-constrained contexts should establish, from project design, contingency supervision arrangements for periods when physical access is restricted. These should include structured remote-review protocols, independent field-verification mechanisms, clear escalation procedures, and business-continuity measures to support implementation and fiduciary oversight. Whenever possible, responsibilities for implementation and verification should remain institutionally separated to preserve the independence and reliability of monitoring and supervision functions.
Dimension 3: Public processes or actors	
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Dimension 4: Fiduciary	
The establishment of a grievance mechanism, based on a toll-free hotline in partnership with DIGICEL and NATCOM, helped mitigate risks of fraud in supplier selection and input distribution, contributing to greater transparency and accountability in the incentive mechanism. While some limitations were noted in the application of sanctions for irregularities, the mechanism nonetheless strengthened oversight and control.	- Apply formal sanctioning for actors responsible for irregularities (suppliers, farmers). Clearly establish the responsibilities, procedures and sanctions and put in place an effective mechanism.
The parallel existence of two information systems - the information system used for the management of incentives (SIGI, for its French acronym) and the project’s own M&E system - created some redundancy and confusion. The SIGI was also not fully operational for all intended functions such as the direct payment of suppliers.	- Fully integrate SIGI functionality from program start, ensuring it can process payments and serve as the primary data management tool.
Input and service suppliers (or technology providers) frequently experienced payment delays exceeding four months. These delays were systemic, reflecting the multiple administrative steps required to process payment requests - spanning OPS verification, MARNDR counter-verification, national coordination, Bank no-objection and final execution by the Haitian Central Bank (BRH, for its French acronym) - compounded by the limited	- Future operations should establish streamlined and time-bound payment cycles for suppliers, including by simplifying the verification chain and ensuring that the incentive management system is fully operational for payment processing from project launch. Reducing payment delays would help retain qualified suppliers and

functionality of the SIGI system for payment processing. Because most suppliers relied on bank loans or cooperative credit to purchase inputs, Payment delays created cash-flow constraints for some suppliers, particularly smaller firms relying on external financing for input acquisition.	prevent the financial attrition that deterred participation, particularly among smaller and more remote providers.
Dimension 5: Risk management	
The adaptive management approach - including budget revisions (frequent reallocations across components to respond to evolving field needs), the introduction of annual crop packages during COVID-19, and the deployment of TAPs - helped mitigate implementation delays and contributed to the achievement of strong output and outcome results.	- Haiti operations could consider incorporating reasonable budget contingencies and adaptive implementation arrangements at the design stage to facilitate project execution under evolving conditions.