Ministry of Agriculture, Natural Resources,
and Rural Development (MARNDR)
RÉPUBLIQUE D'HAITI

Technology Transfer Program for Small Farmers II (HA-L1107)

Environmental Analysis

Inter-American Development Bank

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Contents

Acronyms

ANAP	L'Agence Nationale des Aires Protégées
BNEE	Bureau National d'Evaluation Environnementale
CIME	Inter-Ministerial Committee on the Environment
COP	Conference of Parties
DDA	Direction Départementale Agricole
EIA	environmental impact assessment
ESG	Environmental Safeguards Unit
ESS	Environmental and Social Strategy
ESMP	environmental and social management plan
GAFSP	Global Agriculture and Food Security Program
GDP	gross domestic product
GHG	greenhouse gas
IBA	Important Bird Area
IDB	Inter-American Development Bank
IHSI	Institut Haïtien de Statistique et d'Informatique
ISPAN	Institute for the Protection of National Heritage
KBA	Key Biodiversity Areas
NDC	Nationally Determined Contribution
MARNDR	Ministry of Agriculture, Natural Resources, and Rural Development
MDE	Ministry of Environment
MTPTC	Ministry of Public Works, Transport and Communication
NAPA	National Adaptation Programme of Action
PMDN	Programme de Mitigation des Désastres Naturels
PMP	Pesticide Management Plan
PN3B	Parc National des Trios Baies
POP	Persistent Organic Pollutants
PSDH	Plan Stratégique de Développement d'Haïti
RESEPAG	Renforcement des Services Publics Agricoles
UTES	Sectorial Environmental Technical Units
UN	United Nations
UNDP	United Nations Development Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change

1. INTRODUCTION

1.1. Context

The low productivity of agriculture in Haiti and its weak competitiveness with imports has resulted in low agriculture revenues and chronic food insecurity in almost all regions of the country. It also has translated into increased pressure on finite natural resources (trees, rich and fertile soil, water), deteriorating essential ecosystem services, further increasing the country's vulnerability to natural disasters (landslides, flooding, etc.) and contributing to rural poverty. Compared to other countries in the region, yields of the major crops in Haiti are significantly lagging behind (see Table 1 below).

Table 1: Yields for Haiti's main crops compared to other countries in the region

Yields for crops in the region (Hg/Ha)				
	Bananas	Cassava	Coffee Green	Maize
Dominican Republic	410,838	74,585	2,142	15,764
Guyana	57,422	109,286	7,368	12,500
Haiti	51,923	25,812	2,400	8,545
Honduras	384,279	70,588	9,905	15,811
Jamaica	73,293	187,795	8,730	11,951
Nicaragua	473,328	78,931	7,768	16,452

Source: IDB (2016). Project-Profile: HA-L1107.

Haiti's low agricultural productivity can be explained by two major factors: On one hand, there is low-level of investment and adoption in improved agricultural inputs and technologies, particularly by smallholder farmers and often as a result of financial constraints and asymmetrical information. Haitian smallholder farmers are unable to access these improved agricultural technologies as the prices are high and more than 85% of rural households live below the poverty line, but they also often lack the information on the existence of improved technologies and techniques in the first place. On the other hand, low productivity can also be attributed to a lack of agricultural innovation, as agricultural research in Haiti has essential been equal to zero over the past three decades. Yet agriculture plays a major role in the Haitian economy, contributing to 25% of gross domestic product (GDP) and 71% of employment in rural areas.[1] To escape the vicious cycle of poverty and address

[1] BID (2016). Project Profile: HA-L1107.

weak agricultural productivity, the Ministry of Agriculture, Natural Resources, and Rural Development (MARNDR) of Haiti has solicited financing and support to increase agricultural productivity for small farmers in selected areas of the Nord, Nord-Est, Sud, Grande Anse, and Artibonite departments.

1.2. Objectives of the Analysis

The objective of this analysis is to analyze the potential social and environmental impacts identified in the safeguard screening process of the **Technology Transfer Program for Small Farmers II - HA-L1107** project in Haiti. The purpose of the environmental analysis is to provide an overview of the proposed project, its environmental and social setting, and the likely environmental and social impacts and risks that will be produced from the project. From this information, the analysis can recommend an environmental and social management plan that contains the necessary mitigation and monitoring measures to manage these impacts and risks for the life of the project.

2. PROJECT DESCRIPTION

In an effort to promote the adoption of agricultural technologies, MARNDR has implemented an innovative incentive mechanism with financial support from the Inter-American Development Bank (IDB) (henceforth referred to as the Bank), the World Bank and the Global Agriculture and Food Security Program (GAFSP). The Technology Transfer Program for Small Farmers (HA-L1059), also referred to as PTTA I, has delivered some such incentives to smallholder farmers in northern Haiti, specifically in the Nord and Nord-Est departments. PTTA I (grant 2562/GR-HA, US$ 40 million) supported around 25,000 farmers in the Nord and Nord-Est departments to date in the adoption of new techniques in rice, horticulture, coffee, cocoa and agroforestry crop systems. PTTA I is closely linked with the *Renforcement des Services Publics Agricoles* (RESEPAG) program put in place by MARNDR to restructure certain basic agricultural services as well as the Programme de Mitigation des Desastres Naturels (PMDN), financed by the Bank.

Based on lessons learned from PTTA I, the Government of Haiti and the Bank have agreed on enacting a similar operation, the Technology Transfer Program for Small Farmers II (HA-L1107) or PTTA II, with the objective of contributing to improved sustainable agricultural income and food security. The executing agency will be the MARNDR, particularly through the PTTA/RESEPAG executing unit, given that this will be a second phase of PTTA I. The project will be financed by both

Bank and local funds (US$ 40,000,000 by the IDB; US$ 1,000,000 local). PTTA II is comprised of two main components, (i) applied research and training for the development and adoption of sustainable agriculture technologies, and (ii) the promotion of the use of sustainable agriculture technologies by smallholder farmers in Haiti. There are to be an estimated 55,000 beneficiaries.

Being a continuation of PTTA I, component two of PTTA II will offer some of the technological packets that were financed in PTTA I, along with others to promote agroforestry and perennial crops. Specifically, PTTA II will offer seven technological packets: *jardin créole* packet (agroforestry with avocado, coconut, mango, cashew, fuelwood, yam, banana, pineapple crops); cocoa packet; fruit tree packet (including off-season mango and avocado varieties); sugar cane packet (for artisanal sugar and syrup production); pineapple cane packet; fuel wood packet; fodder/feed packet. The zones of intervention will be located in over thirty communes situated in four departments: The Nord, Nord-Est, Artibonite (St-Michel and Marmelade), Grande Anse and Sud (Camp-Perrin and Maniche) departments. Other vouchers and equipment such as water pumps for irrigational purposes will also be provided to some of the communes in the intervention zones. Table 2 lists the technological packets by intended intervention zone.

Table 2: Paquets techniques et zones potentielles

Paquet technique	**Zones**
Jardin créole	Nord-Est, Nord, Sud
Cacao	Nord, Camp-Perrin, Maniche
Parcelle fruitière clôturée	St-Michel (partie Nord), St-Raphaël (partie nord), La Victoire, Monbin, Bahon
Canne var. Madan Mevs	St-Michel, St-Raphaël, Pignon, Thomonde
Canne de bouche	Marmelade, Borgne, Port-Margot, Limbé, Plaisance
Bois énergie/bois d'oeuvre	Nord-Est, Nord, Sud
Fourrage	Cayes, Camp-Perrin, Maniche

3. SCOPE OF ENVIRONMENTAL ANALYSIS

In accordance with the Bank's Environmental Safeguard Policies (OP-703 and OP-76), this environmental analysis examines the areas of concern that were raised by the Safeguard Screening Form, specifically: the generation of solid waste (which is documented as being "moderate" in volume); negative impacts from the production, procurement and/or disposal of hazardous materials

(specifically toxic pesticides); and water resources (as the project activities may moderately impact water quality, quantity, or availability). Other concerns identified in the Safeguard Screening Form also include moderate disaster risk and climate risk. The analysis will also assess the potential risk of physical overlap between project and protected areas, as well the possible introduction of invasive species.

This analysis will:

- Evaluate the legal and regulatory framework applicable to the project, including the Bank's requirements;
- Assess the current environmental and social context and analyze the possible environmental and social impacts of the project, including the concerns raised by the Safeguard Screening Form;
- Propose possible measures that are technically feasible, economically viable and socially acceptable that will limit or mitigate potential negative impacts, presented in the form of an environmental and social management plan (ESMP).

4. LEGAL AND REGULATORY FRAMEWORK

4.1. National Frameworks

The national environmental regulatory framework in Haiti is weak and basically not applied. Although some legislation exists, many are not implemented or enforced.

Haiti's Constitution of 1987 considers the environment as being "trans-sectorial." The Constitution has seven articles that are related to the environment, addressing the exploitation of soil and land, natural sites, vegetation coverage, energy development, and toxic waste. The Decree of 12 November 1987 on the Management of Dangerous Products established which phytosanitary products were of concern, yet as of date no further enforcement has been put in place for the management of such products. The Decree of 3 March 1981 outlines the need for proper management and elimination of waste, yet implementation of this decree has been largely lacking. The Decree of 12 April 1983 established a site to be used for the PAP metropolitan region to discharge its waste. Chapter V of the Labor Code (1984 Decree updating the 1961 Code) requires that employers take all measures necessary to ensure occupational health and safety in the work place. Specific provisions are provided for waste disposal, air quality, noise and toxic substances. This code will be applied.

The Ministry of Agriculture's Direction de Santé Animale is finalizing four laws related to development projects, including those relating to animal and vegetation quarantine as well as pesticides, yet as it is incomplete, this will not yet be applied.

The main agency for environmental protection at the national level in Haiti is the Ministry of the Environment (MDE). The MDE was created in January 1995 in response to concerns of the absence of national leadership regarding sustainable development and environmental management. A decree on environmental management by the MDE obliges all persons, private or public, that plan on undertaking any project or work that may cause changes to the state of the environment to complete an environmental impact assessment (EIA) before the execution of such activities. In addition, the MDE is the executive secretary of the Inter-Ministerial Committee on the Environment (CIME), created in November 1996, which works with the Ministry of Agriculture (MARNDR) and the Ministry of Public Works, Transport and Communication (MTPTC) to define priorities in the environmental domain. In 2000 the Ministry of the Environment produced guidelines for construction and infrastructure projects, particularly related to roads and other public infrastructure, in order to adjust for the EIA procedures.

Haiti's institutional arrangements regarding environmental assessments are mostly framed around the 12 October 2005 Decree on Environmental Management and Regulation, of which the MDE is responsible. The decree, through articles 56, 57, 58, and 59, requires all programs to be subjected to an environmental impact study to determine any possible negative environmental impacts. The 2005 Decree also establishes general principles related to: (i) Agricultural inputs use (article 99), (ii) Exploitation of water (aquifers, rivers, etc.), including for agriculture (articles 110 to 125), (iii) Pollution of water (articles 121 to 125), (iv) Disposal of hazardous and toxic materials (articles 143 to 147), however no norm has been defined related to any of these issues.

Sectorial Environmental Technical Units (UTES) are supposed to be in place in each line ministry to conduct such evaluation processes. The capacities and processes to operate the UTES have not yet been developed. in 2015, the MDE created the National Environmental Evaluation Office (Bureau National d'Evaluation Environnementale, BNEE) with the support of the United Nations Development Program (UNDP). BNEE will serve as a technical office under the MDE to ensure and promote the national system of environmental evaluation, particularly through environmental impact

studies, strategic environmental evaluations, environmental audits and public participation. [2] BNEE will offer methodological guides to help in preparing environmental evaluations, however as the bureau is not yet officially recognized as an autonomous body and lacks staff and financial resources, the bureau's guide will not be applied.

4.2. International Frameworks

Haiti's national legislation and policies relating to the environment are informed and adjusted by the country's participation in international agreements. Haiti is signatory to numerous international accords, conventions (around 50) and treaties, that contribute to national environmental law. The most relevant international conventions include:

1. UN Convention on the Law of the Sea (1982)
2. UN Convention on Biological Diversity (1992)
3. UN Convention to Combat Desertification (1994)
4. Rotterdam Convention on Hazardous Chemical Substances and Pesticides (1998)
5. Stockholm Convention on Persistent Organic Pollutants (2001)
6. UN Framework Convention on Climate Change (UNFCCC) as well as the Paris Agreement (2015)

Regarding environmental impact studies, Haiti has adopted the Rio Declaration of 1992 which, in principle 17, states that environmental impact assessments (EIA), as a national instrument, "shall be undertaken for proposed activities that are likely to have a significant adverse impact on the environment and are subject to a decision of a competent national authority."

In regard to pesticides and chemical products, Haiti is a signatory to the Rotterdam Convention of 1998 on Hazardous Chemical Substances and Pesticides and the 2001 Stockholm Convention on Persistent Organic Pollutants (POPs), however the Haitian parliament has not yet ratified these agreements. The Rotterdam Convention addresses the international distribution, utilization, and management of pesticides and chemical substances, while the Stockholm convention outlines a dozen pesticides and chemical substances that have dangerous negative effects on human health.

[2] PNUD et MDE (2015). Cadre juridique et institutionnel de l'évaluation environnementale en Haïti.

The government of Haiti submitted its Nationally Determined Contributions (NDC) to the UNFCCC prior to the Conference of Parties (COP21) in Paris in 2015. The document outlines Haiti's plan for climate mitigation and adaptation, presenting the country's Plan Stratégique de Développement d'Haïti (PSDH) and National Adaptation Programme of Action (NAPA). In terms of reducing GHG emissions, Haiti sets two possible scenarios of mitigation, a conditional (reduce 26% of 2000 levels by 2030) and unconditional (reduce 5% of 2000 levels by 2030) target. Priority plans for adaptation include (i) the integrated management of water resources and watersheds; (ii) integrated management of coastal zones and the rehabilitation of coastal infrastructures; the preservation and reinforcement of food security; and (iii) information, education and awareness. As such, the NDC states that from now until 2030, Haiti will work to (i) integrate climate change and its impacts into sectoral strategies; (ii) prepare and manage the 15 most strategic and vulnerable watersheds to be able to deal with extreme climate events; (iii) protect the coastal areas from climate change impacts; and (iv) develop the bio-economy, climate smart agriculture.[3] The proposed project will aid in the achievement of these goals, specifically the management of water resources and watersheds, food security, and climate-smart agriculture.

4.3. IDB Safeguard Policies

The Bank's Environment Policy (OP-703) was adopted in 1979 and requires that the Bank's operations and financed projects follow certain prescriptions in order to ensure environmental quality. The IDB's environmental and social Policy Directives fall into two groups of guidelines:

1. The Environmental Mainstreaming directives (A.1 to A.7) which refer to the mainstreaming and internalizing of environmental dimensions throughout the project cycle;
2. The Environmental Safeguards guidelines (B.1 to B.17) which directs the Bank in adopting the most effective and efficient risk management approaches to ensure the environmental sustainability of all Bank-financed operations.

All operations financed by the IDB must be pre-evaluated and classified according to their potential environmental impacts (which constitutes directive B1-B3 of the IDB's safeguard directives). In

[3] MDE (2015). Contribution Prévue Déterminée au niveau National.

accordance with the IDB's environmental safeguard policy (OP-703), this project has been classified as a Category "B", for which an ESMP is necessary. Category "B" operations are likely to cause mostly local and short-term negative environmental and associated social impacts for which effective mitigation measures are readily available. Category B operations do not require the preparation of Environmental Impact Statements or Strategic Environmental Assessments but do require the analysis of socio-environmental impacts and risks that focus on the specific issues identified in the safeguards screening process, as well as an ESMP. According to the Screening Safeguard Process, this operation (HA-L1107), was classified as Category B based on the use of hazardous materials; solid waste management; possible impact on water quality, quantity or availability; and moderate risk of natural disasters, including climate risks. Other concerns raised (yet not included in the screening process) include conflict between project intervention zones and protected areas, as well as invasive species use.

The Bank policies and guidelines that are triggered by this project are OP-703, B.2 *Country Laws and Regulations*, B.3 *Screening and Classification*, B.4 *Other Risk Factors* (primarily relating to climate risks and closing the "adaptation deficit"), B.9 *Natural Habitats and Cultural Sites*, B.10 *Hazardous Materials*, B.12, *Project Under Construction* (as the project is already being executed) and B.17 *Procurement* (ensuring environmentally responsible procurement). Other Bank policies that arose in the operation's safeguard policy filter include OP-102 *Availability of Documents to the Public*, OP-704 *Management of Risks of Natural Disasters*, OP-761 *Gender Equality*.

According Policy Directive B.9 of the Bank's safeguard policies, the Bank will "not support operations that, in its opinion, significantly convert or degrade critical natural habitats or that damage critical cultural sites."[4] When possible, the Bank's financed operations and activities will be sited on lands already converted. The Bank defines critical natural habitats as (i) existing protected areas, areas officially proposed by governments for protection or sites that maintain conditions that are vital for the viability of the aforementioned areas; and (ii) unprotected areas of known high conservation value. Furthermore, areas of known high conservation value are defined as sites that may be: "(a) highly suitable for biodiversity conservation; (b) crucial for critically endangered,

[4] BID (2007). Policy Directive B.9, Implementation Guidelines for the Environment and Safeguards Compliance Policy.

endangered, vulnerable or near threatened species listed as such in the IUCN Red List of Endangered Species; or (c) critical for the viability of migratory routes of migratory species."[5]

Policy Directive B.10 on hazardous materials requires that operations "avoid adverse impacts to the environment and human health and safety occurring from the production, procurement, use and disposal of hazardous materials, including organic and inorganic toxic substances, pesticides and POPs" and that "the production, procurement, use and disposal of hazardous material and substances should be avoided whenever possible, and minimized in other cases."[6] The Bank policy states that the use of harmful pesticides should be avoided, but where this is not possible, the least toxic pesticides should be used, and pesticide use, storage, and disposal practices should at a minimum follow the International Code of Conduct on Pesticide Management[7] or the Rotterdam and Stockholm Conventions.

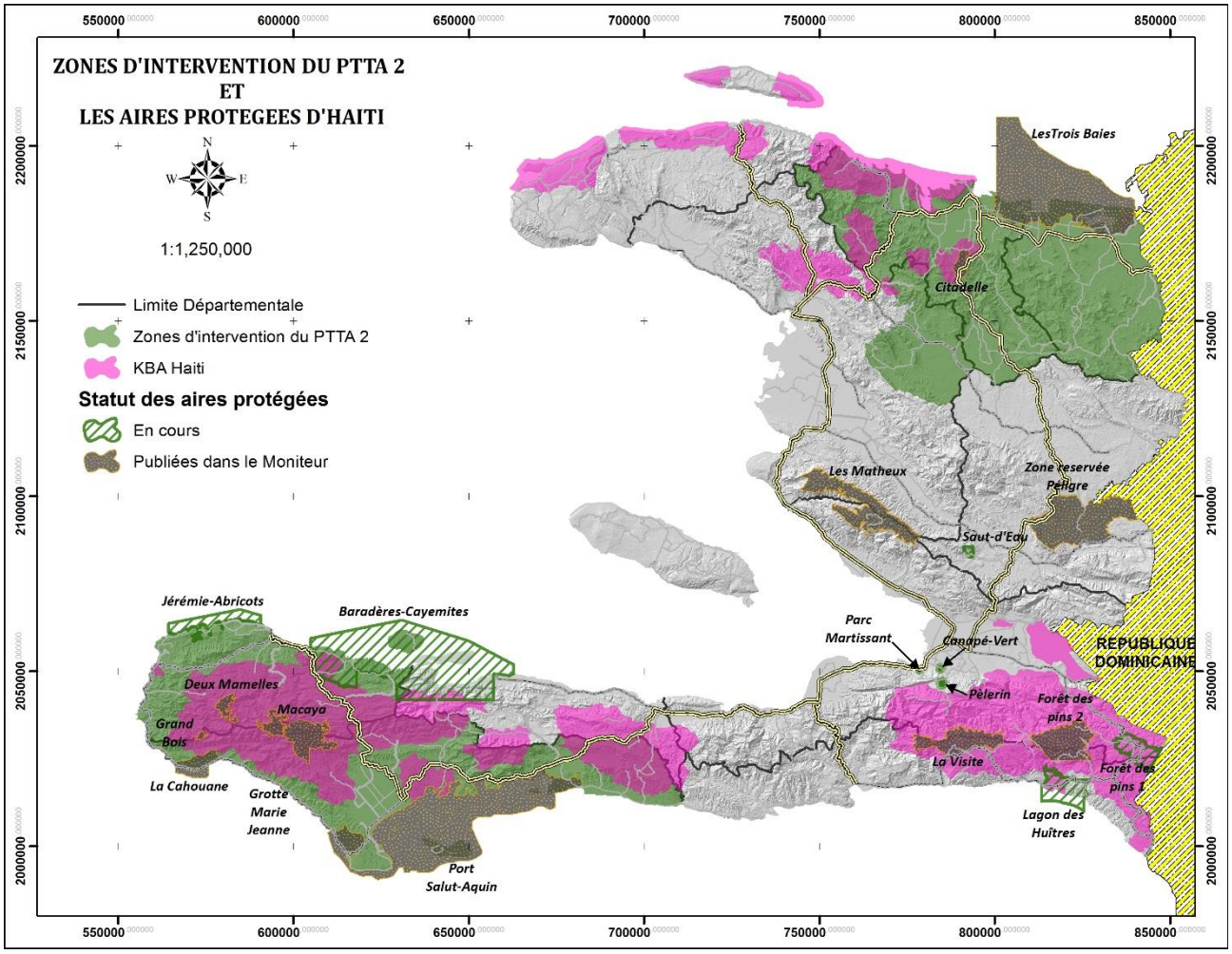
The Bank's policies on invasive species concludes that no invasive species will be introduced in Banks supported projects (B.9, OP-703). Where an invasive species is already established in the project area of influence, the Bank's policies states that "the client should take precautions to avoid its introduction beyond the area of influence, including instituting management and monitoring plans to control or eradicate the species. Any such plans should be developed with specialists in invasive species management for the protection of biodiversity" (B.19).[8] In addition, B.20 continues stating that "for invasive species being used for agricultural purposes, the client should demonstrate that containment is feasible during cultivation, transportation, and processing and that eradication of the species is feasible when the project terminates. The management plan for an invasive agricultural species should include cultivation practices that minimize risks of escape, along with monitoring and emergency response actions in case of escape beyond the area of influence."[9]

[5] Ibid.
[6] BID (2007). Policy Directive B.10, Implementation Guidelines for the Environment and Safeguards Compliance Policy.
[7] FAO et WHO (2014). International Code of Conduct on Pesticide Management.
[8] BID (2007). Policy Directive B.19, Implementation Guidelines for the Environment and Safeguards Compliance Policy.
[9] BID (2007). Implementation Guidelines for the Environment and Safeguards Compliance Policy.

5. ENVIRONMENTAL AND SOCIAL SETTING

PTTA II interventions will take place in four departments: Nord, Nord-Est, Artibonite, Sud, and Grande Anse departments. The departments have quite diverse geographical, geological, and climatic characteristics, varying from dry plains with annual rainfall averaging 900 mm., to humid mountain ranges where annual rainfall can reach over 2.000 mm.[10]

Figure 1: *PTTA 2 Intervention Zones, Protected Areas, and Key Biodiversity Areas in Haiti*



Source: CIAT (2017)

[10] Alex Bellande (2016). Proposition de Paquets Techniques Durables Pour le PTTA II. IDB/MARNDR.

5.1. Nord and Nord-Est Departments

5.1.1. Environmental Setting

The northern region covers an area of about 3800 km^2, and the topography of the Nord and Nord-Est departments is characterized by both plains and mountain ranges, with the Massif du Nord mountain range that traverses the island of Hispaniola. The highest points of the Massif du Nord in the northern region of Haiti are found in the mountains of Marmelade, Pilate and Limbé with 1200, 1195, and 1136 meters of altitude, respectively. Three main terrains exist in the northern region:[11]

- A dry plateau zone, that includes the communes of St-Raphael (which is irrigated), Pignon, La Victoire, Mombun Crochu and Ranquitte. Dry-climate crops such as manioc, pees, and industrial sugar cane are largely produced. This area is situated in the Haut Plateau Central at about 300 to 500 meters of altitude, and extends to St-Michel de l'Atalaye in the west to Mombin Crochu in the east.
- A humid, mountainous zone, with high elevation. This zone characterized by the Massif du Nord mountain chain. In the west, the mountains of Plaisance, Pilate, Borgne and Marmelade can be found; in the center, the mountains of Limbé and Bonnet (Dondon, Milot); and to the east, the Vallières mountains, a humid plateau. The Massif du Nord is the headwaters to the principal watersheds in the region. Coffee, yam, beans, corn, citrus, and bananas are the dominant crops. The northern part of the zone can receive between 1200 and 1500 mm of rainfall a year, while the southern region receives between 1000 and 1300 mm a year.
- The coastal plains area which contains both dry and wet zones. In the wetter areas include a part of the commune of Limbé, Bas-Limbé, a part of l'Acul du nord and Plaine du nord, as well as Cap-Haitien, Quartier Morin, Limonade and Trou du nord. The drier zone of the coastal plains includes the communes of Terrier rouge, Caracol, Perches, Fort-Liberté, and Ferrier, and correspondents with the Dauphine and Madras plains.

The majority of this department is prone to weak and irregular rain, besides some coastal and mountainous regions. Surface water resources in the Nord and Nord-Est departments are limited outside of the Grand-Rivière river area. The southeast corner of the Nord department on the other hand receives 1300-1600 mm of rain a year and has fertile soil. The Nord and Nord-Est departments experience dry and wet seasons twice a year: the first wet season between April and

[11] MARNDR (2011). Etude environnementale et sociale du Projet HA-L1059.

June; the first dry season between July and August, the second wet season from September to October, and the second dry season from November to March. This region is exposed to the path of hurricanes, although it is more protected by the Massif du Nord mountain chain.

5.1.2. Social Setting

The Nord department consists of seven (7) *arrondissements*, 19 communes, 10 quartiers, and 82 *sections communales*, while the Nord-Est department consists of four (4) *arrondissements* and 13 communes, five (5) quartiers and 36 *sections communales*. According to the *Institut Haïtien de Statistique et d'Informatique (*IHSI), in 2015[12] the total population of the Nord department was 1,067,177 with 528,302 people living in rural areas (265,201 males and 263,101 females). Youth (under the age of 18) accounted for 252,515 or 48% of the rural population. Rural areas in the Nord department cover about 2,059 km^2, 97% of total area. In the Nord-Est department, the total population in 2015 was equal to 393,967, with 51% of the population (203,041 people) living in rural areas. Of this rural population, males made up 51% of the population (103,273) and youth (under 18) made up 47% (96,879 people) of the rural population. Rural areas cover 98% of total area in the department (1,600.6 km2).

According to data from RESEPAG on eight communes in the Nord and Nord-Est departments, average household annual revenue is around 50,000 and 190,000 gourdes (US$ 1,000 and 3,800). The average revenue from strictly agricultural activities are at the lowest end of this range. Table 3 shows the average revenue of agricultural and non-agricultural households in the Nord and Nord-Est departments.

[12] All demographic information is based on the 2015 *Institut Haïtien de Statistique et d'Informatique (*IHSI) social demographic census

Table 3: Niveau de revenu moyen par exploitation pour huit communes du Nord et Nord-Est

zone	Revenu moyen agricole (Gdes)	Revenu non agricole (Gdes)	Revenu total (Gdes)	% revenu agricole
Bahon	121,790	54,170	175,960	69
Borgne	157,222	32,342	189,564	83
Grison-Garde	67,799	40,470	108,269	63
Saint-Raphaël	103,031	57421	160452	64
Carice	66,042	22,045	88087	75
Bas-Maribahoux	30,007	23182	53189	56
Haut-Maribahoux	30,262	46,480	76442	39
Mont-Organisé	27,644	44,992	72636	38

Source: Agroconsult (2015).

5.2. Artibonite Department

5.2.1. Environmental Setting

The PTTA II intervention zones in Artibonite will be localized in the communes of Marmelade and Saint-Michel de l'Attalaye. The Artibonite watershed is the largest hydrographic basin in Haiti and the Artibonite River is the first source of hydroelectric power and irrigation water in the country. The Péligre dam was constructed in 1956 and supports irrigation of the Artibonite Valley, which is considered one of Haiti's principal agricultural region. Upstream of Péligre dam, agriculture, livestock farming and charcoal production are the main sources of income for approximately 150,000 rural households. The department of Artibonite is made up of upstream basin (bassin amont de l'Artibonite or BAMA) and the downstream bassin (basin aval de l'Artibonite or BAVA). The BAMA region receives between 1000 and 2300 mm of annual precipitation, while the BAVA region gets between 900 and 2000 mm of annual rainfall. The region has a long wet and dry season (April to June and November to March, respectively), and two shorter wet and dry seasons.

The main biomes that can be found in the Artibonite department include:[13]

- Tropical/Subtropical moist forest (500 to 1000 meters altitude)
- Low altitude mountain moist forest (800 to 2000 meters altitude)
- Tropical/Subtropical dry forest

[13] MARNDR (2013). PMDN- Evaluation Intégrée des Alternatives de Développement du Bassin Versant de l'Artibonite, Focalisée sur les usages multiples de l'eau

5.2.2. Social Setting

The Artibonite department is home to five (5) *arrondissements*, 15 communes, seven (7) quartiers, and 63 *section communales*. The Artibonite department is the second largest department geographically in Haiti and the total population of Artibonite is equal to 1,727,524, with the rural population making up 987,737 or 57% of total population. Men make up 50.3% of this rural population (497,365) while women make up 49.6% (490,372); youth (under the age of 18) compose 40% of the rural population (393,667 people). The rural area is 99% of the department's total area (4,823.2 km^2 of a total area of 4,886.9 km^2). In the Artibonite Valley, 70,000 rural families depend on the 30,000 hectares of the irrigation district to cultivate rice (80% of the national production). According to the Survey of Living Condition in Haiti, in 2001 the average agricultural income per household in rural areas of the Artibonite department was 3,865 Haitian gourdes (with a standard deviation of 6,948 gourdes).[14]

5.3. Sud and Grande Anse Departments

5.3.1. Environmental Setting

The Sud and Grande Anse departments are home to the Massif de la Hotte mountain range. In these humid mountainous regions, annual rainfall is at an order of between 1400 and 2000 mm. Agroforestry systems are extensively used, where the production of mango, bread fruit, avocado, citrus, cashew nuts can be found in the same plot as forestry trees. Banana, yam, and beans are often cultivated under tree coverage in the lower levels of these plots. Tree cover and scrubland cover more than 50% of the total river basins around the Ravine du Sud and Cavaillon rivers.

The area of the project that takes place in the plains of Les Cayes and Cavaillon in the Sud department covers more than 5,000 hectares of land. The irrigated areas of the intervention zone are located around two water sources: The Cavaillon river (to the east) and the Ravine du Sud (to the west). Cereals, corn and sorghum are the most common irrigated crops in the area. In wetter areas, where rainfall varies between 1300 and 1600 mm a year, corn sorghum and peas (Cajanus) is common.

Production of wood to be sold in Les Cayes and Port-au-Prince (in the form of wood boards and poles, and charcoal) is significant in the communes of Cavaillon, Maniche and Camp-Perrin. Forestry trees

[14] Institut Haïtien de Statistique et d'Informatique (IHSI) (2001). *Survey of Living Condition in Haiti* (ECVH)

that are typically used for these purposes include cassia, acacia, Honduras oak, and ash trees. Annual crops in humid regions principally include corn, beans, sweet potato, while manioc and peas (Cajanus) are more common in the drier areas.

5.3.2. Social Setting

There are five (5) *arrondissements*, 18 communes, eight (8) quartiers, and 69 *sections communales* in the Sud department. The total population of the Sud department is 774,976, with a rural population of 598,491 (77% of total population). The rural population is composed of 313,878 men and 284,613 women, and youth make up 40% of the rural population (237, 825). The Sud department is 98% rural with 2,610.3 km^2 being rural land. Three (3) *arrondissements*, 12 communes, five (5) quartiers, and 46 *sections communales* are found in Grande Anse. The total population of the department is 468,301, with 357,813 of the population living in rural areas (76%). Out of the total 1.911.97 km^2, 1,895.3 km^2 of the Grande Anse department is rural.

5.4.Protected Areas and Critical Natural Habitats

They are 9 protected areas and 11 KBAs in the intervention zones. The project will only intervene in 3 PAs and 6 KBAs. The three protected areas are Parc Macaya, Parc National des Trois Baies, and Parc National Historique and the six Key Biodiversity Areas are : Cavaillon, Lagons-aux-Boeufs, Lagon du Nord Est, Citadelle, Saint Michel de l'Atalaye, and Massif de la Hotte.[15] The Zone du lac Péligre in Artibonite is considered a strategic interest zone, while Cerca-La-Source-Los Posos, Chutes de Saut d'Eau and Bassin Zim in the Artibonite department are under consideration of becoming a protected area.[16]

The Parc National des Trois Baies (or PN3B) is a marine and coastal terrestrial protected area situated in the Nord-Est department of Haiti and is operated by MDE and Haiti's National Agency for Protected Areas (ANAP). The protected area covers 75,618 ha and encompasses three bays: The Baie of Limonade, the Baie of Caracol and the Baie of Fort-Liberté, as well as one of the largest inland brackish water lagoons and an Important Bird Area (IBA), the Lagon aux Boeufs. Six watersheds are emptied into PN3B and the area contains one of the largest intact stands of mangrove forest and

[15] Société Audubon (2011). Les zones clés de la biodiversité d'Haïti.
[16] MARNDR (2013). PMDN- Evaluation Intégrée des Alternatives de Développement du Bassin Versant de l'Artibonite, Focalisée sur les usages multiples de l'eau

coastal wetlands in the country of Haiti. Surveys of the coastal land areas documented 95 species of birds, 4 species of amphibians, and 11 species of reptiles (many of which were not native). In regard to marine life, 301 different species of marine sessile- and motile-benthic organisms were identified within the Park (including 149 species of sponges, 51 species of hard coral, 43 species of octocorals, and 21 species of echinoderms), as well as 183 different species of fish, including 1 endemic serranidae (Hypoplectrus) found only in Fort Liberté.[17] The natural capital found in the park supports the livelihoods of the local population. Mangroves and coral reefs protect coastal infrastructure against storms and hurricanes while the marine life off the coast provides a major form of income to many of the local residents.

The second protected area, Parc National Naturel de Macaya is located in the upper part of the Massif de la Hotte mountain range in the Sud (and Grande Anse) department. The Sud department is home to 9,091 hectares (68%) of the park, located in the communes of Coteaux, Port-a-Piment, Chardonnieres, Les Anglais, Chantal, Torbeck, and Camp-Perrin. The Macaya region acts as the headwaters for seven watersheds in the area. The region is known to be a biodiversity "hotspot," with claim to being one of few nesting spots of the black capped petrel, a threatened Caribbean seabird. The flora biodiversity in Parc Macaya is extensive: its estimated that there are more than 900 species of vascular plants. Moreover, 73 species of bird can be found in the park (14 of which are native to Haiti), 43 species of terrestrial mollusks native to Haiti (26 that are native to the park), 17 species of butterflies, 22 native species of reptiles, 35 species of amphibians (all native to Haiti), 28 of which are on the IUCN Red List of Threatened Species. [18] The Macaya region is one of Haiti's last primary forests and as such has been declared a National Biosphere Reserve.

Parc National Historique is located in the Nord department and covers a total of 2,500 hectares. The area contains historical monuments including the Citadelle, Sans Souci Palace and Ramiers, architecture that dates from the beginning of the 19th century. The park is situated between the coastal plains and the mountainous interior of the region, specifically located in the central zone of the Massif du Nord. UNESCO began supporting the integrity of the historic monuments in 1979, and since 2013,

[17] MDE (ANAP)/IDB/TNC (Octobre 2016) : Inventaire écologique de référence pour le Parc National des Trois Baies, en Haïti.
[18] MDE (2015). Plan de gestion Parc National Naturel Macaya.

the Institute for the Protection of National Heritage (ISPAN) has maintained them. A management plan for the historical park has also been developed by ISPAN.[19]

5.5. Climate Change

These regions, and Haiti in general, is at great risk from the impacts of climate change. More frequent and intense hurricanes and tropical storms, variable rainfall, flooding, drought, and landslides are all aspects of the manifestation of climate change that are already affecting the country. The Sud department was the center of Hurricane Matthew in October 2016, one of the strongest hurricanes to hit the region in a decade. As a result, crops and homes were lost at high levels. Crops and livelihoods are also impacted by climate variability, facing irregular rainfall that can result in both drought and floods and that negatively affect agricultural yields and food security. Many ecosystem services that can protect against climate change's impacts are severely deteriorated in the country; for instance, deforestation in Haiti has led to poor soil health and erosion, two major factors that worsen flooding and landslides.

6. ENVIRONMENTAL, SOCIAL, HEALTH AND SAFETY ASSESSMENT

The project is expected to have positive environmental benefits including improved critical ecosystem services, (such as soil and water retention capacities of the watersheds) that prevent flooding and losses of soil fertility. Through the development of agroforestry systems, PTTA II and its technological packets will promote reforestation of watersheds, contributing to healthy ecosystem services as well as carbon sequestration to combat climate change. The project is intended to also have positive socio-economic impacts on rural populations including improved food security and incomes as a result of improved agricultural productivity and income/crop diversification.

In addition to evaluating the key issues and concerns identified by the operations safeguard screening process (management and storage of hazardous materials/pesticides; solid waste management; water quality and quantity; and disaster risk), this analysis also assesses the risk of an introduction to invasive species and the possible physical overlap of intervention zones and protected areas.

[19] UNESCO (2015). *National History Park – Citadel, Sans Souci, Ramiers.* http://whc.unesco.org/en/list/180/

6.1. Improper Use, Management and Storage of Hazardous Materials (Pesticides)

The improper use, management, and storage of chemical substances and pesticides due to PTTA II's technological packets is an area of concern. As the management and overseeing of the use of these inputs is particularly difficult, PTTA II will not finance pesticides. The impacts associated with improper use/application, management, and storage of chemical substances include:

- *Soil and water contamination.* Run-off of pesticides and non-organic fertilizer can have negative impacts on surrounding soil and water. Excess nitrogen from inorganic fertilizer use can cause dead zones when entering water by way of eutrophication, killing marine life. Soil can also be polluted due to improper management and storage of such inputs.
- *Human health issues as a result of exposure.* Humans that are exposed to pesticides and chemical substances are at greater risk of health problems associated with the handling and exposure to these products, particularly with improper use and storage. Some such health problems include a deterioration of the immune and nervous systems; cancer; reproductive and infant developmental risks.
- *Animal health issues as a result of exposure.* Similar to human health, animal health can also be threatened by exposure to agricultural chemical inputs and pesticides.
- *Pesticide residue in foods/crops.* Excessive use of chemical inputs can leave residues on crops, which as a result can negatively impact human health when ingested.
- *Disequilibrium of natural flora and fauna.*
- *Loss of biodiversity*
- *Overuse (which can lead to ecological and financial inefficiencies).* In addition to being costly to the consumer, overuse of these products can also lead to ecological inefficiencies.

6.2. Solid Waste Management

The major issue raised by the Screening Safeguard Form relating to solid waste management is the disposal of the jugs, containers, and bottles that hold the pesticide/chemical substances. Similar to the management of these products, their improper disposal can lead to a wide range of negative social and environmental impacts including: (i) soil and water contamination; (ii) human health problems; (iii) animal health problems; (iv) disequilibrium of natural flora and fauna; and (v) biodiversity loss. PTTA II will not provide vouchers for pesticides, and thus this concern is not applicable.

6.3. Water Quality, Quantity, and Availability

The provision of water pumps for irrigation pose a risk to the water quantity and availability, as these pumps could allow for overuse and exploitation. Climate change and rain variability further present threats to the water supplies, which can then be exacerbated by the use of water pumps, if not monitored or addressed appropriately. As many livelihoods and activities outside of agricultural use depend on these water sources, overuse can have extreme and far reaching effects. However, the provision of these water pumps for irrigation will be limited (450 pumps total).

6.4. Moderate Disaster Risk and Climate Risk

The Safeguard Screening process identified that the project will be located in areas that are prone to moderate disaster risks, specifically earthquakes, inland flooding, hurricanes, and landslides. The screening process also indicated that the project may be at risk of climate impacts. However, the specific objectives and activities that will be carried out by the project will indirectly address these risks in the medium to long term: In regard to climate change adaptation, the crop systems promoted by PTTA can aid in climate change adaptation. For instance, more diverse varieties of crops translates into less climate risks such as irregular rainfall; reforestation prevents soil erosion and improves soil health, preventing severe flooding and landslides.

6.5. Overlap with Critical Natural Habitats and Protected Areas

The physical overlap between project areas and critical natural habitats, KBAs, and protected areas presents a concern, as some PTTA II zones of intervention are in protected areas (particularly PN3B, Parc Macaya, and Parc National Historique). The principal risk is that this will promote activities incompatible with the protected area management plan objectives, especially protection of biodiversity. For this reason, PTTA II intervention zones will only take place where management plans exist and only in the areas designated by the Management Plan as being appropriate for agriculture or agroforestry.

Conflicting activities in protected areas, and disequilibrium of natural flora and fauna are the main risks associated with this potential overlap, yet other risks are also present. For instance, these protected areas do not only provide a place for conservation efforts, but they also support Haiti in achieving some of the goals it presented in its NAPA and NDC related to climate adaptation (i.e. the integrated management of water resources/watersheds and of coastal zones and infrastructures). Care

should be taken to ensure that these protected areas are not disturbed by project operations and respect protected area management plans' objectives, zoning and regulations.

7. ENVIRONMENTAL AND SOCIAL AUDIT OF EXISTING OPERATIONS

7.1. Pesticides and Chemical Substances Use in PTTA I

PTTA I offered vouchers for the purchase of chemical substances, particularly pesticides, insecticides and fertilizer. A study from PTTA I revealed that beneficiaries were inaccurately using and applying pesticides: many beneficiaries were untrained and mixing/applying pesticides on their own without support from technicians. Moreover, although many understood that safety equipment was necessary for the application of pesticides, lack of access to such equipment (gloves, masks, etc.), prevented them from safely using and applying these substances.[20]

Most of the products came from the Dominican Republic (as suppliers said it was simpler, cheaper, and more convenient than purchasing from stores in Haiti) and although many beneficiaries stated that they knew how to mix such products with help from the instructions on the bottle, often these instructions were in Spanish. For beneficiaries that are not literate or do not know Spanish, this poses a problem.

There was also a lack of trust between beneficiaries and technicians, and although technicians can provide useful support to the beneficiaries, this advantage disappears without trust. Many beneficiaries stated that they applied pesticides independently instead of having the technicians apply it for them because of reasons relating to trust, as well as confidence in their own capabilities. As previously mentioned, as a result of the difficulties in managing and monitoring pesticide use, PTTA II will not finance pesticide use.

7.2. Critical Natural Habitats and Protected Areas

The intended intervention zones of PTTA II include two national protected areas which the Bank has supported (PN3B and Parc Macaya). PTTA II will not affect Parc National-Citadelle. The exact intervention zones have yet to be defined. Yet, if it is determined that PTTA II intervention zones will

[20] IDB/MARNDR (2014). Suivi de la diffusion et de l'utilisation des produits agro-phytosanitaires dans le cadre du programme. November.

occur in protected areas, it will be limited to those areas with approved management plans and then only in zones where agriculture and agroforestry are permitted activities).

PN3B fits into a larger project, specifically the Caracol Industrial Park (PIC) in the Nord and Nord-Est departments. Financed by the Bank and co-financed by the United States government, a part of the PIC project includes funding for the creation of a management plan of PN3B to protect the bays, mangroves, swamps and coral reefs in the Three Bays area. The PN3B protected area was established in February 2014 by the government of Haiti and is managed by MDE. With support from the Bank and The Nature Conservancy, a biodiversity inventory of PN3B has been established, taking stock of the marine and coastal resources in the park and establishing an elaborate baseline of the biodiversity found. In addition, a management plan for the PN3B protected area is currently being drafted and should be referred to by the PTTA execution team. The PN3B project also includes a community engagement and environmental awareness campaign regarding natural resource use in the PN3B area, particularly in communities in Caracol, Madrasse, Jaquezy, Limonade Phaéton, Fort Liberté, Derac, and the Bord De Mer de Limonade communes. Community members will be trained in environmental monitoring of the local coral reef.

The Sustainable Management of Upper Watersheds of South Western Haiti- Macaya National Park project (HA-X1002) which comes to an end in October 2017, was a project supported by the Bank, financed by GEF and local resources, and executed by MDE through ANAP. The Parc Macaya was originally established in 1983 by the Decree of April 4, although physical boundaries for the park were only created in 2013, allowing for conservation activities to begin. Along with demarcating the Park's physical boundaries, the objectives of HA-X1002 included protecting the watershed and promoting sustainable land management in the park's buffer zone in order to allow agricultural producers that had become restricted from exploiting the park's resources to diversify their source of income in a sustainable way. Furthermore, the park's management plan was approved in 2015.[21] One such sustainable land management practice promoted by HA-X1002 was agroforestry crop systems.

Although PTTA II does not have a direct objective of conservation, it can contribute to protect and encourage conservation of protected areas by promoting sustainable land management and crop

[21] MDE (2015). Plan de gestion Parc National Naturel Macaya.

systems such as agroforestry. Although agroforestry does provide clear benefits and advantages for sustainable land management, climate mitigation and adaptation, and food security, a clear separation between agroforestry and forestry will be needed to prevent deforestation of virgin/native forests for agroforestry systems particularly in buffer zones and the interior of the protected areas (but also for all intended PTTA II intervention zones.)

8. PUBLIC/STAKEHOLDER ENGAGEMENT AND CONSULTATIONS

The Government of Haiti will carry out public consultations of the ESMP in order to engage stakeholders and receive relevant feedback. This consultation will allow for different stakeholders to become familiar with proposed mitigation measures and provide their advice and inputs. Stakeholders involved in the consultations will include: relevant officials from the Ministry of Agriculture (DDA, UEP, technical directors, etc.), representatives from the private sector that are involved in the provision of goods and services related to the project, as well as representatives of potential beneficiaries. In the Nord and Nord-Est, these public consultations Public consultations took place on February 9th and 10th, 2017. Consultations in the Artibonite and South will take place by the end February before the approval of the project.

As such, the preliminary draft of the environmental assessment and ESMP was posted on the IDB site on January 13, 2017 for public review, as well as the Ministry of Agriculture's site (www.agriculture.gouv.ht). The final version was posted on February 16th prior to QRR. After receiving recommendations and feedback from the public, the ESMP will be revised accordingly, to be finalized by February 15th, 2017.

9. ENVRONMENTAL AND SOCIAL MANAGEMENT AND MITIGATION MEASURES (ESMP)

In addition to the mitigation steps recommended below, it is also recommended that the execution team hire an environmental technical expert to follow PTTA II operations to ensure that the environmental concerns raised in this EA are addressed and mitigated, as well as other potential concerns that may arise.

9.1. Improper Use, Management, and Storage of Chemical Substances

PTTA II will not finance the use of pesticides, and thus mitigation plans do not apply to the project.

9.2. Solid Waste Management

Solid waste management related to the use of pesticides is not relevant or applicable to PTTA II as the project will not provide financing for the use of pesticides.

9.3. Water Quality, Quantity, and Availability

Although the number of water pumps disbursed will be limited to a total of up to 450 pumps spread across the zones of intervention. The location of water pumps and planned irrigation to be installed will need to avoid the risk of overexploitation of water resources. In order to ensure that there are no adverse impacts on the quality, quantity and availability of water resources, a targeted Water Resources Assessment should be undertaken before the execution of the project, followed by an assessment done one year into the project. This assessment would assign a risk classification for the proposed activities and provide a baseline to determine the health and quality of the water resources in proposed intervention zones. This would allow for monitoring of the water sources as well as an analysis of where the water pumps should be distributed, according to availability. Technical experts could determine sustainable levels of water (and water use), which can then be included as benchmarks and thresholds for water use. Information dissemination regarding adequate water pump use is also recommended.

9.4. Moderate Disaster Risk and Climate Risk

A Disaster Risk Management Summary will be prepared by the executing agency (MARNDR) before program's eligibility. This will include an assessment and management plan of potential natural disasters. This Disaster Risk Management Summary will outline the specific moderate disaster and climate risks associated with the project, which includes the fact that (i) the project is located in an area prone to earthquakes, hurricanes and other tropical storms, inland flooding, drought, and landslides and the likely severity of the impacts to the project is moderate; and (ii) that a natural hazard is likely to occur or be exacerbated due to climate-related changes and the likely severity of the impacts to the project is moderate. Proposed risk management measures should also be included in this Disaster Risk Management Summary. As the proposed project will indeed address some of these likely risks (such as reforestation that will reduce flooding and landslides), these aspects should

be mentioned in this summary. The project team and technical experts should review the summary to plan accordingly.

9.5. Overlap with Critical Natural Habitats and Protected Areas

PTTA II intervention should only occur inside protected areas that have management plans. Moreover, intervention should only occur in those zones that have been designated in the management plan as appropriate for agriculture or agroforestry. Parc Macaya, for instance, has a management plan outlining a buffer zone for approved agricultural activities. The Sustainable Management of Upper Watersheds of South Western Haiti- Macaya National Park project (HA-X1002) mentioned above can provide lessons of this type of management between project and protected areas, with the clear difference being that the executing agency of the protected area and the project area were the same (MDE), and that conservation of the area (delineating the park's boundaries) and sustainable land management were both objectives of the same project. A management plan for PN3B is currently being drafted. It includes zones within the protected area where agriculture and agroforestry are permitted. Thus, the executing agency should determine whether proposed intervention zones fall within or near protected areas or critical natural habitats and review the management plans if so.

In order to implement and achieve these mitigation recommendations, certain institutional measures are needed. Coordination between the executing agency and the agency responsible for the management of the protected areas (ANAP, MDE) is obligatory and highly necessary. Proper consultation and coordination with the park management authority and respect for the zoning should eliminate these risks. Integrated approaches to managing both projects in conjunction can provide many advantageous in their operations. Data can also be shared to monitor PTTA II beneficiaries in protected areas as well as to ensure that the project will not intervene in protected areas without management plans, or in zones within protected areas not designated for agriculture or agroforestry in their management plans. No forest cover loss will result from the project. Agricultural activity in the buffer zones should be coherent with the management plans of these protected areas. Indicators to monitor and track this include: number of households located within protected areas that are given vouchers (and which vouchers are given); and number of households practicing agriculture and agroforestry within approved zones of protected areas; and expansion of tree cover. More indicators should be developed to better measure tree cover. This could not only aid in PTTA II but in the country's capacity of monitoring deforestation, reforestation, and carbon storage.

9.6. Introduction of Invasive Species

For the first year of the project's execution, the energy forest packet will not be included as a part of PTTA II. During this year, more research will be done to investigate invasive species and find native or at least, non-invasive alternatives for energy purposes. The operation will under no circumstance, introduce an invasive species that is not already established in Haiti. If the results of the research do not identify viable alternatives to invasive species that are already present a risk analysis, a rigorous management plan and a monitoring plan relating to the proposed invasive species will be prepared and approved by ESG prior to implementation. The plan will include precautions to avoid its introduction outside of the designated energy forests, including instituting management and monitoring plans to control or eradicate the species. Any such plans should be developed with specialists in invasive species management for the protection of biodiversity. The client should demonstrate that containment is feasible during cultivation, transportation, and processing and that eradication of the species is feasible when the project terminates. The management plan for an invasive agricultural species should include cultivation practices that minimize risks of escape, along with monitoring and emergency response actions in case of escape beyond the area of influence.

The Bank's policies on invasive species shall be observed and applied in PTTA II. No invasive species will be introduced to areas where they are not already present. For invasive species that are already present in the region, a management and monitoring plan will be required prior to their use and restricted to the beneficiary's farm.

9.7. Consultations and Completed ESMP

Finally, pubic consultations and stakeholder engagement shall be completed to review and receive feedback on this environmental analysis and ESMP. Once this has been completed the findings will be integrated into the final ESMP by February 15, 2017. Other steps that will be taken include a review of the Environmental and Social Strategy (ESS) as well as the preparation of the ESMR.

See Annex 1 for a ESMP table on potential impacts and mitigation measures.

10. CONCLUSIONS

This analysis examines the main concerns of the Technology Transfer program for Small Farmers II project in Haiti (HA-L1077 or PTTA II) identified in the Safeguard Screening Process, namely, the management of hazardous materials (i.e. pesticides and other agricultural chemical inputs); disposal of waste, particularly the containers of these products; and the risk of impacted water quality, quantity, and availability as a result of water pumps and increased irrigation. Other issues that have been addressed are the potential overlap of protected areas/critical natural habitats and project areas, as well aspects of the energy forests, specifically use of invasive species and carbon neutrality. It has been determined, however, that pesticides will not be financed by the project. Furthermore, during the first year of the project's execution, there will be no provision of energy forests packets. Research will be carried out in the first year to identify non-invasive species for bioenergy forests.

If no alternatives to possible invasive species can be found, a management and monitoring plan will be required that ESG will need to approve prior to advancing. In addition, a technical environmental expert is recommended to monitor the PTTA II operations. The project contains two components:(i) applied research and training for the development and adoption of sustainable agriculture technologies, and (ii) the promotion of the use of sustainable agriculture technologies by smallholder farmers in Haiti.

Specifically, the main environmental (and social) concerns (and their mitigation measures) include:

(1) Management of hazardous materials (pesticides and other chemical substances)

a. Related Activities: Without proper mitigation measures, pesticides and other agricultural chemical inputs used in the PTTA II project may result in inappropriate management of these substances. Overuse, improper mixing of chemicals and application on crops, as well as inadequate storage may occur and may lead various negative environmental and social impacts. For these reasons the project will not finance pesticide use.

b. Potential Impacts: Soil and water contamination; Human health issues as a result of exposure; Animal health issues as a result of exposure; Pesticide residue in foods; disequilibrium of natural fauna and flora; Loss of biodiversity; Over use which can lead to ecological and financial inefficiencies.

c. Mitigation Measures: As PTTA II will not finance pesticide use, there are no mitigation measures that can be applied. However, the promotion of agricultural

practices that require low-levels or no pesticide and inorganic fertilizer use, alongside awareness that these techniques require little or no pesticide use is recommended.

(2) Solid waste management (disposal of containers of chemical substances)

a. Related Activities: The generation of solid (hazardous) waste in the form of empty pesticide and chemical substance containers related to pesticide use was flagged as a possible concern with the project. If not mitigated, the management and disposal of these containers could result in negative impacts.

b. Potential Impacts: Soil and water contamination; Health issues as a result of exposure; Animal health issues as a result of exposure; Loss of biodiversity; Disequilibrium of natural fauna and flora.

c. Mitigation Measures: PTTA II will not provide or finance pesticide use and thus will not directly generate any solid waste.

(3) Water quality and availability

a. Related Activities: A total of up 450 pumps water pumps for irrigation purposes will be provided in the PTTA II project.

b. Potential Impacts: Overuse and exploitation of water sources that impact the quantity, quality or availability of water resources

c. Mitigation Measures: Prepare a Water Resources Assessment to determine water sources; Monitor water resources based on baseline from the assessment; Limit how many water pumps are disbursed; Information dissemination on adequate water pump use.

(4) Overlap of protected and project areas

a. Related Activities: PTTA II zones of intervention include several protected areas. To avoid conflicts PTTA II will only intervene inside protected areas that have management plans. Moreover, intervention should only occur in those zones that have been designated in the management plan as appropriate for agriculture or agroforestry.

b. Potential Impacts: Conflict with protected areas; Detriment to conservation efforts; Loss of biodiversity; Disequilibrium of natural flora and fauna.

c. Mitigation Measures: Protected area zoning limits and buffer zones must be respected; Design PTTA II to ensure that no intervention is executed within a protected area that does not have a management plan; In protected areas with a management land, ensure intervention area is only within agriculture approved zone (i.e. buffer zones);

Monitoring to ensure zero deforestation (both inside and outside of protected areas); Proper consultation and coordination between PTTA II executing agency and park management authority vital.

(5) Introduction of invasive species

a. Related Activities: There is a concern that the energy forest packet will promote the use of invasive species.

b. Potential Impacts: Disequilibrium of flora and fauna; Loss of biodiversity; Disruption of ecosystem services and other natural capital including water supply; Economic costs associated with eradication/removal of invasive species.

c. Mitigation Measures: In the first year of the project, the energy forest packets will not be provided to beneficiaries. During this period, more research will be done to determine the impact and find other plants that can be introduced as a substitute to possible invasive species. If no substitutes are found, a management plan will be implemented that will follow the Bank's safeguard policies related to invasive species. As such, a risk analysis, management plan and monitoring plan will be prepared relating to the invasive species will be produced and approved by ESG prior to implementation.

(6) Emissions associated with energy forests

a. Related Activities: Release of carbon dioxide emission from cutting down trees for fuel purposes

b. Potential Impact: Release of GHGs particularly carbon dioxide, contributing to climate change, as well as potential adverse human health impacts related to the burning of this biomass (charcoal, etc.)

c. Mitigation Measures: For the first year of the PTTA II project, energy forest packets will not be offered. Rather, during this time more research will be completed to determine the emissions (particularly of carbon dioxide and black carbon) that may be released due to energy forests. This research will examine the relationship between carbon emissions and sequestration, and the possible contribution to climate change, as well as potential human health impacts from burning biomass (in the form of charcoal or fuelwood).

The analysis concludes that the issues raised in the Safeguard Screening Form have only a risk of impacts if appropriate mitigation measures are not applied. However, given the implementation of such mitigation measures by the executing agency, these risks can be significantly reduced.

Annex

Annex 1: ESMP Table: Key Activities, Potential Impacts and Mitigation Measures

Activity	**Potential Impacts**	**Mitigation Measures**	**Indicators**	**Period/ Frequency**
Improper storage and management of inputs (fertilizer, pesticides) included in technology packets promoted	• Soil and water contamination • Human health issues due to exposure • Animal health issues due to exposure • Pesticide residue in foods/crops • Disequilibrium of natural fauna and flora • Loss of biodiversity • Overuse (which can lead to ecological and financial inefficiencies)	No pesticides will be financed by PTTA II and thus this will not present an issue.	N/A	
Improper solid waste management (principally the disposal of pesticide and chemical substance containers)	• Soil and water contamination • Human health issues due to exposure • Animal health issues due to exposure • Disequilibrium of natural fauna and flora	As no pesticides will be financed by PTTA II, the concerns related to waste generation do not apply.	N/A	
Provision of 450 water pumps for irrigation purposes	• Overuse and exploitation of water sources that impact the quantity, quality or availability of water resources	• Water Resources Assessment must be prepared to determine water resources • Monitoring of water resources based on baseline from assessment • Limit how many water pumps are disbursed	• Health of water source (quantity and availability) • # of water pumps used • # of households using water pumps • Use of water pumps (how often, how long)	Design, and execution of project

		• Information dissemination on adequate water pump use		
Physical overlap between project area and critical natural habitats/protected areas	• Conflicting activities in protected areas between protected area management plan objectives and project objectives • Loss of biodiversity • Detriment to conservation efforts • Disequilibrium of natural flora and fauna	• Respect of protected area zoning • Ensure that no intervention is executed within protected area without a management plan • In protected areas with a management plan, ensure intervention area is only within agriculture approved zone (i.e. buffer zones) • Consultation and coordination between executing agency and ANAP (or other protected area management agency) is vital	• # households practicing agriculture (and agroforestry) within protected areas • # households located within protected areas that are given vouchers, as well as types of vouchers given • Expansion of tree cover (How many trees planted, increase in tree canape cover).	Design, execution and operation of project
Introduction of invasive (exotic) species without adequate control	• Disequilibrium of natural fauna and flora • Loss of biodiversity • Disruption of ecosystem services and other natural capital (such as water supply) • Economic costs associated with eradication/removal of invasive species	• For the first year of the project, the energy forest packets will not be offered by PTTA II. In this time period, a study will be completed to determine the status of invasive species and to find possibly substitutes • If no non-invasive alternatives are identified by the study, a management and monitoring plan following the Bank's safeguard policies and guidance on invasive species will be produced and approved by ESG prior to implementation.	• # of acacia (or substitute) distributed through vouchers	Design, execution and operation of project

Use of energy forests	• CO_2 emitted, contributing to climate change and conflicting with country's NDC • Negative health effects related to black carbon emissions	• Energy forest packet will not be introduced in the first year of PTTA II. Rather, more research will be done to determine the carbon emissions associated with energy forest to determine which types of species to use in the project	• Tree cover indicators (How many trees planted per year, annual increase in tree canopy cover).	
Stakeholder engagement and public consultations.	• Lack of integration of beneficiaries needs and comments • Gender inequality	• In the Nord and Nord-Est, public consultations took place on February 9 and 10, 2017. Consultations in the Artibonite and South will take place by the end February before the approval of the project. • After consultations, participants can contact a designated staff of the project team for further comments / recommendations.	• # of public consultations and participants	Design

Annex 2 : Suivi de la diffusion et de l'utilisation des produits agro-phytosanitaires dans le cadre du programme. IDB/MARDNR (November 2014).

Un meilleur accompagnement des producteurs bénéficiaires lors de l'utilisation et de l'application des produits agro-phytosanitaires semble nécessaire. Cet accompagnement pourrait être mis en œuvre de deux manières :

1. Un accompagnement individualisé des bénéficiaires sur le terrain : c'est l'accompagnement idéal et celui-ci est déjà prévu dans le cadre du projet. Cependant il requiert deux choses : 1) s'assurer que les fournisseurs disposent d'un nombre suffisant de techniciens agricoles (face au nombre toujours grandissant de bénéficiaires du projet) et 2) vérifier que le niveau de connaissance de ces techniciens est suffisant.
2. Un accompagnement « en boutique » lors du choix des produits agro-phytosanitaires : c'est une alternative moins coûteuse que l'accompagnement individualisé, mais aussi moins rigoureuse. Cependant, il s'agit peut-être du seul accompagnement possible dans les situations où les producteurs bénéficiaires préfèrent mélanger et appliquer les produits eux-mêmes. L'objectif pour les fournisseurs est de s'assurer lors de la vente des produits agro-phytosanitaires que les producteurs bénéficiaires disposent de suffisamment de connaissances et d'équipements pour pouvoir utiliser et appliquer ces produits eux-mêmes dans les meilleures conditions (la liste de vérification ci-dessous pourrait être utilisée au moment de la vente comme une check liste par le fournisseur).

A travers ces deux formes d'accompagnement, le fournisseur devra s'assurer que :

- Le choix des produits agro-phytosanitaires fait par le producteur bénéficiaire est approprié et justifié au regard de la nature et de l'ampleur du problème auquel il fait face
- Les informations de base concernant les produits choisis sont transmises oralement aux producteurs bénéficiaires. Ces informations de base concernent notamment :
    - La concentration de chaque produit
    - Les mélanges possibles entre produits et les dosages à respecter
    - Le calendrier d'application des produits (par rapport, notamment, à la date prévue de récolte)
    - Les techniques et les règles de base concernant l'application de ces produits : faire l'application lorsqu'il ne fait pas trop chaud, dans le sens du vent et avec les équipements/vêtements appropriés
    - La manière de stocker ces produits lorsqu'ils n'ont pas encore été utilisés (à l'ombre) et d'en disposer une fois qu'ils sont vides

- Le producteur bénéficiaire dispose de vêtements de protection (des gants, des bottes, un masque de protection et des lunettes protectrices) et de l'équipement nécessaire pour l'application (généralement un pulvérisateur).

Annex 3: List of POPs identified as toxic by the Stockholm Convention[22]

- Aldrin
- Alpha hexachlorocyclohexane
- Beta hexachlorocyclohexane
- Chlordane
- Chlordecone
- DDT
- Dieldrin
- Endrin
- Heptachlor
- Hexabromobiphenyl
- Hexabromocyclododecane (HBCD)
- Hexabromodiphenyl ether and heptabromidophenyl ether
- Hexachlorobenzene (HCB)
- Hexaclorobutadiene
- Lindane
- Mirex
- Pentachlorobenzene
- Pentachlorophenol and its salts and esters
- Perfluorooctane, sulfonic acid, its salts and perfluorooctane sulfonyl fluoride
- Polychlorinated biphenyls (PCB)
- Polychlorinated naphthalenes
- Polychlorinated dibenzo-o-dioxins (PCDD)
- Polychlorinated dibenzofurans (PCDF)
- Technical endosulfan and its related isomers
- Tetrabromodiphenyl ether and pentabromodiphenyl ether
- Toxaphene

Other chemicals that are under review:

- Decabromodiphenyl ether (commercial mixture, c-decaBDE)
- Dicofol
- Short-chained chlorinated paraffins
- Pentadecafluorooctanoic acid (perfluorooctanoic acid), its salts and PFOA-related compounds

[22] Stockholm Convention (2016). List of POPs

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