

Evaluation report

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Endline Evaluation of the project “Payment for Ecosystem Services (PES) to Protect Mangroves in Bondeau, Nippes, Haiti.”

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**Executive Summary**

J/P Haitian Relief Organization has implemented a project entitled “Payment for Ecosystem Services (PES) to Protect Mangroves in Bondeau, Nippes, Haiti”. According to the project document, its general objective was to “protect mangrove ecosystems in Bondeau, Nippes, Haiti through concrete support to improve fishing and agricultural livelihoods, local capacity building, and a dynamic environmental stewardship campaign”. The project strategy was an integrated approach from ridge to reef to address climate risks, to improve farming techniques in Paillant which has a direct effect on the mangrove and fish population in the seaside. This approach assumes that with support to improve climate-adapted fishing and agricultural livelihoods, and the mobilization of youth in an environmental stewardship campaign, coastal mangroves in Bondeau that are critical to marine ecosystems and climate resilience should be protected.

Here are the outcomes that were expected by the end of the project:

1. Improved governance and natural resource management.
2. Local actors have taken on the role of environmental stewardship.
3. Livelihoods of fishers and farmers in Bondeau are improved by the end of the project.

This report presents the findings of the endline evaluation of the project.

***Objective of the Evaluation***

The general objective of this study was to evaluate the impact of the project by measuring the core outcome indicators that aimed to capture behavioral changes that the project sought to induce among its beneficiaries.

The evaluation followed the Knowledge, Attitude and Practice (KAP) methodology. Thus, it showcased the variation in Knowledge, Attitude and Practices of its beneficiaries around the concept of environment from the baseline and the endline.

**Knowledge:**

* % of local governance stakeholders who demonstrated understanding of improved governance and management of natural resources.
* % of project beneficiaries (farmers, fishers, and school aged youths) demonstrated understanding of mangrove ecosystems protection practices.

**Attitudes:**

* % of local governance stakeholders with positive attitudes towards improved governance and management of natural resources.
* % of project beneficiaries (farmers, fishers, and school aged youths) with positive attitudes towards mangrove ecosystems protection actions.

**Practices:**

* # of activities undertaken by local governance stakeholders towards improved management of Bondeau’s natural resources.
* # of community led mangrove protection activities carried out.

***Methodology***

The evaluation methodology is based on a qualitative and quantitative approach. By the qualitative approach we obtained qualitative information such as understanding of local authorities of problems related to managing Bondeau mangroves and their willingness to improve the governance and management of natural resources of the area. Thus, had in-depth interviews with local authorities via Key Performance Interviews (KIIs). The quantitative approach focused on measuring knowledge, attitudes and practices of the targeted students, fishers, and farmers about Bondeau mangroves, mountain soil management and environment protection. The survey was carried out using multi choice test questionnaires. The results of the tests related to knowledge attitudes and practices of the beneficiaries are aggregated to report the core outcome indicators.

***Findings***

This study used a mixt methodological approach, quantitative and qualitative. 312 people, direct beneficiaries of the project participated in the baseline study and 146 (>45% of the beneficiaries) responded to the endline survey that led to the quantitative measures. Twenty-seven 27 local authorities and leaders participated in the baseline study as Key Informant. Therefore, they were asked open-ended questions in which they were expected to elaborate more and share their understanding of the underlying problems the project addressed.

The in both phase of the evaluation, baseline and endline, the male respondents are most common: 62.82% of males in the baseline against 58.2% at the endline. The female counted for 36.86% at the baseline and 39.04% at the endline. The categories of fishers and farmers are dominated by men. The data showed that 4.6% of fishers’ respondent were female at the baseline against 2.4% at the endline, thus a negative variation of 2.2-point percentage. While for the farmers’ category, females were represented at 18.9% at the baseline and increased to 36.5% at the endline. Thus, a positive variation of 17.6 points percentage. The category of the students counted more females both at the baseline and the endline, respectively 58.6% and 71.2% (+12.6 points).

* Knowledge

All categories demonstrated lack of knowledge about the topics they were tested for. The students have the lowest score. As a matter of fact, only 27.4% of the students demonstrated understanding of the knowledge questions. According to the gender, 30.77% of the males’ students shown understanding where 25% of the females’ students were able to demonstrate knowledge.

Overall, 48.65% of the farmers demonstrated understanding of the questions. The females’ farmers outperformed the males’ farmers as 52.38% of the females understood the question where 48.31% of the males’ farmers did.

Although they represented a low percent of all the respondents, the fishers represent the category in which most respondents demonstrated understanding of the environment and mangroves related questions. 63.64% of the farmers responded accurately. Among them the males were overly represented. 64.29% of the male fishers understood the question where only 50% of the females did.

Table 1: % of respondents demonstrated understanding of mangrove ecosystems protection.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Male** | **n1** | **Female** | **n2** | **% total** | **N** |
| Students | 30.77% | 65 | 25% | 92 | **27.39%** | 157 |
| Farmers | 48.31% | 89 | 52.38% | 21 | **48.65%** | 110 |
| Fishers | 64.29% | 42 | 50% | 2 | **63.64%** | 44 |

Attitudes

In terms of attitudes, we tried to understand if whether the beneficiaries and local authorities wanted to do what it takes to protect their natural resources’ including mangroves.

The students represent the category where most efforts need to be put on. In comparison to the other categories which almost at a 100% demonstrated their willingness to be trained and to the necessary to protect their watershed natural resources’, only 88.5% of the students expressed the right attitudes.

Table 2: % of students with positive attitudes towards environment protection actions.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Male** | **n1** | **Female** | **n2** | **% Total** | **N** |
| Students | 90.77% | 65 | 86.96% | 92 | **88.54%** | 157 |
| Farmers | 98.88% | 89 | 100.0% | 21 | **98.2%** | 110 |
| Fishers | 100% | 42 | 100% | 2 | **100%** | 44 |

Among the authorities and community leaders, a 100% expressed their willingness to do the necessary to improve local governance of the mangroves.

Practices

A total of 7 different activities were identified as being undertaken by the authorities and community leaders to protect the Bondeau’s natural resources’ including the mangrove. Among the most common activities we found “plant trees” and “prevent cutting trees”, about 30% of the responses mentioned them. The second largest activity carried out by the authorities and leaders is “Soil conservation”, 15% of the responses mentioned it. “prevent slash and burn” is the third activity we identified in the responses; it was mentioned in 10% of the responses. The other ones were “prevent cutting mangroves for charcoal”, “prevent construction in the mangrove” and “sensitization of the population on the importance of the mangroves” where mentioned in only 5% of the responses.

# Introduction and problem statement

J/P Haitian Relief Organization (J/P HRO) through the Haiti Take Roots (HTR) initiative has implemented the project titled: Payment for Ecosystem Services (PES) to Protect Mangroves in Bondeau, Nippes, Haiti, for the last 24 months. Funded by Caribbean Biodiversity Fund in the context of the Ecosystem-Based Adaptation (EbA) Program, the project aimed to “protect mangrove ecosystems in Bondeau, Nippes through concrete support to improve fishing and agricultural livelihoods, local capacity building, and a dynamic environmental stewardship campaign”.

It was established that more than 70% of the tropical coastline is covered by mangrove forests (Raven et al., 2009). In the Tropical and Subtropical region, mangrove areas are used for salt marshes, and they are home for many species such as Pelicans, Herons, Crabs, Egret and so on. They serve as nurseries for different species thriving in the sea and feed them when needed. They are good nesting sites for birds. In addition, mangrove ecosystems play an important role in protecting coastline against erosion and inundation (MARIO et al. 2015). They help stabilize and protect the coastline against natural hazards such as Tsunami. Mangroves ecosystems help filtering water going down into the deep sea and stop the pollutants from going further. By providing food, materials, and protection to humans through its numerous ecosystem services the importance of mangroves seems undeniable. However, its global coverage is seriously decreasing in the last decades.

Human activities such as farming in the adjacent mountain of watershed environments are among the most common factors that cause continuous degradation of downstream mangrove ecosystems. Adding to those factors, climate change is making things even worse. That is the situation of most mangrove ecosystems in Haiti where mangrove forests are destroyed for charcoal production, usage of wood as energy source, salt pans construction, beach, and urbanization projects, etc. The Bondeau mangroves is part of a watershed where the effects of bad use of land upstream combined with climate change effects are evident for decades. Due to uncontrolled erosion reducing soil productivity and causing continual decrease in harvests, the population of Surrounding Mountain of Bondeau move down to the sea level to find economic opportunities increasing pressure on the existing yet limited resources of the area. On the other hand, fishers are facing challenges as uncontrolled sedimentation chokes mangroves, changing the coastal ecosystem etc.

The most important factor to take into consideration in managing mountain lands is the human element. Therefore, many experiences have proven that “mechanical structures, reforestation, and other conservation practices will not achieve many benefits unless the inhabitants of these upland catchment areas are persuaded and given incentives to change from their present ecologically destructive practices such as shifting cultivation to more suitable land use” (Joshi, n.d.). Thus, the Payment for Ecosystems Services (PES) programs are incentive-based that compensate individuals or communities for undertaking actions that increase the provision of ecosystems services. Therefore, the PES to Protect Mangroves in Bondeau had articulated its intervention on an integrated approach from ridge to reef to address climate risks, to improve farming techniques in Paillant which has a direct effect on the mangrove and fish population in the seaside. This approach assumed that with support to improve climate-adapted fishing and agricultural livelihoods, and the mobilization of youth in an environmental stewardship campaign, coastal mangroves in Bondeau that are critical to marine ecosystems and climate resilience would be protected.

This document reports on the endline evaluation conducted at the project end-term. It provides comparative values for the project outcome indicators such that its impact can be appreciated.

# project background and context

## BONDEAU WATERSHED Description

The Paillant-Bondeau watershed originates at an elevation of 1,932 feet and includes several subbasins spanning high and mid-altitude areas on the mountain as well coastal plains. At the level of the sub-watershed of Bondeau, there are serious land degradation issues caused by uncontrolled exploitation of wood resources and devastating hurricane events impacting the region (in recent years alone, hurricanes: Hazel, Flora, Ines, and Matthew). While this project will intervene throughout the watershed, the primary ecosystem being targeted is the Bondeau coastal system.

Bondeau is located on the coastal plain in the commune of Petite Riviere de Nippes and is

limited to the North by the Gulf of La Gonâve, to the West by the communal section of Bezin II, to the East by the communal section of Petite Rivière de Nippes, and to the South by the first section of Salagnac de Bondeau. During the last census in 2015, Bondeau included 1,560 households. The mangroves in this area are contiguous with fishing grounds and residences where the river delta of Paillant empties into the bay. This is a flat coastal zone with gentle slopes adjoining a shallow sea surrounded by mudflats, ribbons of dunes and dense stands of mangroves.

Figure : Administrative boundaries of Bondeau watershed

## BONDeau PES Project framework and approach

In Haiti, any integrated strategy to build the climate resilience of communities and ecosystems must include a watershed-level analysis. The rapid disappearance of Bondeau’s mangrove system over the last several decades was directly linked to deforestation and erosion at the top of the Paillant-Bondeau watershed, as well as pressures from the local sea-level population who exploit the mangroves to supplement their income as necessary. Project activities to protect the mangrove coastal system directly contributed to the community’s resilience to the impacts of climate change.

**First, activities to strengthen agriculture and fishing livelihoods were implemented from ridge to reef.** The mountain ecosystems were reinforced through a Payment for Ecosystem Services (PES) program focused on reforesting the most vulnerable lands along existing ravines. Farmers received moringa seedlings and technical support to create a living greenbelt that stretched along the largest ravine from Paillant to Bondeau. This should have the dual impact of reducing sedimentation of the mangroves below while supplementing income for farmers in the long run. At the coastal level, fishers have benefited from practical support to establish a fishing cooperative. To complement the material support, fishers were convened to share knowledge and learn more about fishing techniques that protect the mangrove ecosystems and respect their role as guardians of the coastal zone. Through increased income and awareness, these activities should significantly reduce the harmful impacts of human behavior on the mangrove system.

**Second, awareness-raising and movement building should transform community members and leaders into environmental stewards, focused on the protection and sustainable management of natural resources.** Despite the existence of laws and regulations meant to protect the environment, hardship drives the local population to exploit their ecosystems beyond capacity. However, Haitians are acutely aware of the state of their environment and have been living with the impacts of climate change – including more severe storms and unpredictable rainy seasons – for decades. Through a three-pronged movement building approach, Haitians are encouraged to see themselves as stewards of their environment, working to create balance and strengthen their own resilience through protection of the ecosystem. This project helped to transform intention into action by:

1. Bringing together local elected officials and government representatives with civil society to raise awareness and design collaborative, realistic strategies to respect existing regulations and national policies, and to establish stronger governance.
2. Creating collaboration among existing organizations, including non-governmental organizations (NGOs), community-based organizations (CBOs), fishing associations, international institutions, etc. to work towards common objectives for protecting local ecosystems; and
3. Launching an environment club program in secondary schools in both Paillant and Bondeau so that students can play a reporting role on the EbA approaches from ridge to reef while they lead the campaign to shift their local culture towards environmental stewardship.

Together, these strategies constitute a comprehensive and integrated EbA approach for protecting and sustainably managing the coastal mangrove ecosystem in Bondeau.

## BONDeau PES Project theory of change (TOC)

The Bondeau mangroves are part of a watershed with a complex ecological system where the impacts of a changing climate have already been felt for decades. Due to uncontrolled erosion reducing soil productivity and causing continual decrease in harvests, the population of Surrounding Mountain of Bondeau move down to the sea level to find economic opportunity increasing pressure on the existing yet limited resources of the area. On the other hand, fishers are facing challenges as uncontrolled sedimentation chokes mangroves, changing the coastal ecosystem etc.

J/P HRO’s participatory assessments in 2017-18 and workshops in May 2019 revealed that the community understands the importance of mangroves both as a refuge for aquatic species that are critical for fishing livelihoods and for protection during harsh weather. However, in the face of financial hardship, people living in Bondeau frequently use the mangroves as a source of supplemental income by cutting them to make charcoal.

Thus, the PES to Protect Mangroves in Bondeau articulated its intervention on an integrated approach from ridge to reef to address climate risk, to improve farming techniques in Paillant which supposed to have direct effect on the mangrove and fish population in the seaside. This approach assumed that with support to improve climate-adapted fishing and agricultural livelihoods, and the mobilization of youth in an environmental stewardship campaign, coastal mangroves in Bondeau that are critical to marine ecosystems and climate resilience would be protected.

Table : Outcomes, associated Outputs and Activities according to the project LogFrame

|  |  |  |
| --- | --- | --- |
| **Outcomes** | **Outputs** | **Main activities** |
| *SO1. Local actors have taken on the role of environmental stewardship* | *ER1.1 Stakeholders are mobilized and sensitized about natural resource management.*  *ER1.2 Stakeholders understand existing regulations and laws* | * Act.1.1.1 Identify key stakeholders for the project. * Act 1.1.2 Sensitization/mobilization meeting with stakeholders. * Act 1.1.3 Conduct baseline/Endline surveys * Act.1.1.4 Provide technical support/training to stakeholders. * Act 1.2.1. Primer and training on relevant policies, laws & conventions * Act1.2.2 organization of workshops to educate local stakeholders |
| *SO2. Livelihoods of fishers and farmers in Bondeau are improved by the end of the project.* | ER.2.1 Young people become leaders in action for environmental protection.  ER2.2 A participatory protection and management plan is adopted for the Bondeau mangroves.  ER2.3 Ongoing public education changes the narrative about the environment.  ER2.4 Improvement in socio-economic resilience of people exposed to the effects of climate change, due to EbA Facility interventions. | * Act 2.1.1 Establish environment clubs in schools. * Act 2.1.2 Develop research projects in Paillant & Bondeau. * Act 2.1.3 Students provide ongoing M&E through observation at sites. * Act 2.1.4 Convene stakeholders to dialogue on best practices/lessons learned. * Act 2.2.1 Hold conferences with working sessions to plan the development of protection & management plan. * Act 2.2.2 Realize participative workshops to elaborate the management plan for the Bondeau mangrove. * Act 2.2.3 Capacity building & accompaniment for key actors in plan. * Act 2.3.1 Develop regular meeting schedule & support collaboration among actors. * Act.2.4.1 Conduct Kwoledge,Aptitude and Practice survey (KAP) * Act.2.4.2 Conduct socio-economic Survey. |
| *SO3. Increased hygiene practices* | *ER3.1 Capacity of local fishers is strengthened.*  *ER.3.2 Farmers benefit from supplemental income and sedimentation in mangroves is reduced.* | * Act 3.1.1 Participatory assessment of existing fisher associations * Act 3.1.2. Establish cooperative of associations with shared goals & resources. * Act 3.1.3 Determine priority material resources and co- financing mechanism. * Act 3.1.4 Technical support/training & exchanges. * Act 3.2.1 Identify farmers or property owners on targeted lands. * Act 3.2.2 Provide trainings on nursery production and establish a tree nursery to produce moringa seedlings in Paillant. * Activity 3: Sign PES agreement, provide seedlings and PES until end of project. * Activity 4: Connect farmers to Acceso for sale of leaves. * Act3.1.3 Provide continuous technical support. |

## BONDeau PES Project activities

**III. evaluation purposes, evaluation questions and evaluation use**

The general objective of this evaluation is to measure the project impact through a comparative analysis of the outcome indicators measured at the baseline and the endline. This impact is assessed based on the outcome indicators that aimed to capture behavioral changes that the project sought to induce among its beneficiaries.

The evaluation followed the KAP (Knowledge, Attitude and Practice) methodology, it produced baseline values for the following three sets of outcome indicators:

**Knowledge:**

* % of local governance stakeholders who demonstrated understanding of improved governance and management of natural resources.
* % of project beneficiaries (farmers, fishers, and school aged youths) demonstrated understanding of mangrove ecosystems protection practices

**Attitudes:**

* % of local governance stakeholders with positive attitudes towards improved governance and management of natural resources.
* % of project beneficiaries (farmers, fishers, and school aged youths) with positive attitudes towards mangrove ecosystems protection actions.

**Practices:**

* # of activities undertaken by local governance stakeholders towards improved management of Bondeau’s natural resources.
* # of community led mangrove protection activities carried out.

This evaluation produced evidence that can guide the project implementation efforts to focus on the most critical areas where changes need to be induced.

# evaluation design and rationale

In this evaluation, we used a mixed-methods (quantitative and qualitative) design to address the three sets of evaluation indicators. The qualitative methods provided narrative around understanding of local actors of improved governance and management of natural resources, the attitudes towards improved governance and management of natural resources and the activities undertaken by local governance stakeholders towards improved management of Bondeau’s natural resources. We used the insight from the interviews with the stakeholders as context to enrich the report narrative and triangulation of the results. The quantitative methods provided data that presented side by sides on graphics the appreciate the level of changes between the baseline and the baseline values of the indicators.

## Quantitative methods and approaches

### STudents, Farmers and FISHERS’ surveys

At the baseline evaluation, the projects beneficiaries had all been considered a respondent to the survey. There was no need for a sampling as the project target was a relatively small numbers of direct beneficiaries. Therefore, we surveyed all the direct beneficiaries of the project. However, at the endline, we surveyed a sampling the beneficiaries: more than 45%. That choice was made due to the challenges faced by the team to reach all the beneficiaries, especially the students due to school disfunction at the evaluation period. The condition of insecurity, school misfunctioning and the high cost of transport due to fuel crisis were factors that constrained the evaluation team to same size of population at the endline as it was at the baseline. Despite that, the criteria to be selected remained the same: benefit directly from the main treatment of the project as a student, a fisher, or a farmer who lives at Bondeau, Nippes, Haiti.

**4.2. qualitative methods and approaches**

### document review

During this phase, the evaluation team conducted a desk review of all relevant available documents. This involves reviewing key internal and external documentation to collect benchmark data to guide the evaluation. Such documents included: the project design document, the project Log Frame and other evaluation documents produced in evaluation of similar projects in the past.

### key informant interviews

key Informants Interviews were used to gather information from people who have particularly informed perspectives on the project objectives/goal. The elected leaders (CASEC/ASEC and mayors), presidents of grassroot organizations, and other local government officials participated in the KIIs. Those Interviews were analyzed to provide information on the understanding, attitudes, and practices of the actors to improve the local governance of the mangrove’s ecosystems.

## data analysis

To treat and analyze the data collected, we used the python programing languages. Python has provided us with great tools that allow rapid data cleaning and analysis. Our datasets had a lot of issues that would have been very difficult to fix using classic excel. The python community has developed tools like pandas that allow to analyze datasets of various sizes. Additionally, as the data were collected in Creole, it was easier to be translated using python tools. The big advantage of such tools is the reusability of the entire work to go faster with the analysis of the endline data. It also helped to have reusable formula to calculate the values of the indicators at the end of the project.

The work environment was set using Jupyter-lab. A browser-based python extension that allow data analysis and plotting with python. Very flexible, it allows for data analysis and code sharing between teams.

## methodological limitations

The evaluation method is based on the well-established KAP with the development sector. This method allows to assess the level of understanding, attitudes and practices of survey participants using questionnaires. In this survey, we could not observe the respondent behavior in the real world to assess whether they commit to a lifestyle that aims to learn more and be responsible toward environment protection. Therefore, the results of the survey need to be considered in their context as current comprehension, attitude and declared practices of the beneficiaries regarding the projects concepts.

It also worth mentioning that we interviewed a sample of the population at the endline while we did interview every direct beneficiary at the baseline. Therefore, it’s harder to establish whether close results can be attributed to chance or as results of the project.

The gender in this survey is not balanced. This was not a methodological choice. It is just happened that among the project direct beneficiaries there were more men than women. Only among the students this situation is reversed.

# Findings

Here are presented the results obtained after the different surveys carried out on the field targeting for the predefined groups. The population for this study consists of three categories, which are farmers, fishers, and students. In all categories combined, 312 people were interviewed at the baseline and 146 at the endline. Below we will describe the different respondents.

## REspondents characteristics

Several categorical variables were chosen to characterize the different actors of the study. These variables are age, gender, level of education and the source of income. The next table and groups of graphs present the distribution of respondent per each group according to the earlier mention variables.

### GENDER

The gender was the first categorical variable that was retained to describe the population of interest and the graphs below give an overview how the population was distributed based on their gender at the baseline and at the endline.

Table : Representation of the different categories of respondents according to their gender

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Respondents | Students | | Fishers | | Farmers | | Total | |
| Gender | **Baseline** | **Endline** | **Baseline** | **Endline** | **Baseline** | **Endline** | **Baseline** | **Endline** |
| % Female | 58.6 (92) | 71.2 (37) | 4.6 (2) | 2.4 (1) | 18.9 (21) | 36.5 (19) | 36.9 (115) | 39.04 (57) |
| % Male | 41.4 (65) | 28.8 (15) | 95.5 (42) | 95.2 (40) | 80.2 (89) | 57.7 (30) | 62.8 (196) | 58.2 (85) |
| % No expression | 0 | 0 | 0 | 2.4 (1) | 0.9 (1) | 5.7 (3) | 0.3 (1) | 2.7 (4) |
| Total | **157** | **52** | **44** | **42** | **111** | **52** | **312** | **146** |

Except for students, which is the only category that contains more females than males, i.e., 58.60 % females against 41.40 % at the baseline males and 71.2% of females against 28.8% males at the endline, the male gender is the most common in the study. For the other categories, we found that the male gender is more representative with 95.2% (95.45% at the baseline) among the fishers and 57.7% (80.18% at the baseline) among the farmers. Note that 52 students, 42 fishers and 52 farmers were interviewed in total at the endline. Overall, out of the 146 people surveyed in the endline, 58.2% males were interviewed versus only 36.86% of females.

### AGE STRUCTURE

The second criteria used to describe the population of the respondents, was their range of ages. Four (4) age groups have been retained for the different categories. The below graphs represent the age structure of the different groups.

Figure 2: Representation of the different categories of respondents according to their gender

With no surprise, the respondents across the genders are very young for the students, less than 20 years old as a large group of respondents are students.

The age data at the endline somehow help to triangulate the data collected at the baseline. Since the time-period is not that broad, less than a year, it’s no surprise that there is no significant variation from the representation of respondents in the age groups. The difference observed can be attributed to hazard as we selected a sample to survey at the endline whereas we used the whole population at the baseline.

From the graph above,

For the students, the age range were distributed as follows:

* Less than 12 years old: This group contains 19 females, 8 males.
* From 12 to 15 years old: This group contains 35 female and 20 males.
* From 15 to 20 years old: This group contains 34 females, 33 males.
* More than 20 years old: This group contains the same number of males and females, which corresponds to 4 participants.

The same four age ranges were retained for both fishers and farmers, and the age distribution were as follows:

* Less than 25 years old: in this category there were only males, 2 fishermen, 3 farmers.
* From 25 to 35 years old: there were 8 fishermen and 1 fisherwoman; 18 male farmers and 5 female farmers.
* From 35 to 55 years old: 19 fishermen and 1 fisherwoman, 49 male farmers and 10 female farmers.
* Older than 55 years: 13 fishermen against no fisherwomen, and 19 male 6 female farmers.

### Respondents Education Level

The education level was the variable that had been considered. It corresponds to whether the person went to school and in the affirmative what level of education the person has reached.

Figure 3: Representation of the different categories of respondents according to their education level

The graphs show very a little variation for the students and fishers’ groups in terms of education level. For those two groups, a respondent is more likely to reach primary school. The first graph depicts that 64% of students attend primary school at the baseline and 60% attend the same level at the endline. That is a difference of 4 percentage points. The fishers reach primary school at 57% at the baseline and progress to attend 64% at the endline.

It's more likely that a farmer will reach high school or university than a fisher at Bondeau. As a matter of fact, the data depicts that 37% of framers attended high school at the baseline and progressed to reach 45% at the endline. On the other hand, 16% of fishers attended high school and progressed with only one point percentage at the endline. The data then show that a farmer met at Bondeau Nipper, Haiti is more likely to be advance in his/her education than a fisher.

4.1.4) Source of income (Fishers and farmers)

The fourth variable used to characterize the population of interest was the source of income. For these criteria, the students were not retained since they are less likely to have a source of income at their age given the country context. The next set graph gives an idea of the main source of income for the fishers and the farmers.

Figure 4: Representation of the different categories of respondents according to their education level

The first graph shows that the second most common source of income for the farmers are animal breeding. It represented 36% of the farmers responses at the baseline and increased to 42% at the endline. More farmers seem to be involved in small businesses at the end of the project. Although, the percent of farmers involved in chopping the mangroves’ wood for charcoal is stable during the two phases of the study, the endline data depicts an increase in the percentage of farmers that make charcoal with the woods of other trees. It is also interesting to see that as the farmers declare animal breeding and business as important source of income, there tend to be less of them that confirm having agriculture as main source of income as the data go from 94% at the baseline to 88% at the endline, which is a reduction of 6 percentage points.

For the fishers, there is less of them confirming fishing as main activities. The data go from 98% to reach 62% at the endline. The fishers tend to report more activities in making charcoal with the woods of other trees than mangroves as well as doing more animal breeding activities.

## Evaluation Indicators

### Knolwledge: what is level of understanding of repondents of climate change and environment management best practices?

In this part, the understanding of the respondents about some keys concept that is interested in the project have been tested. These concepts are environment, climate change, improved governance and management of natural resources, mangrove ecosystems protection practice. The next groups of graphs will represent the distribution of the understanding of the respondents for each concept.

**Indicator 1: % of local governance stakeholders who demonstrated understanding of improved governance and management of natural resources.**

To measure the percent of local authorities with good understanding of natural resources (mangroves) management, we used Key Informant Interview. We did ask 7 questions all related to knowledge about environment, mangroves, and environment regulation to the leaders. A percent of 53% of local authorities including Grassroots Organization Leaders demonstrated understanding of improved governance and management of natural resources.

**Indicator 1I: % of project beneficiaries (farmers, fishers, and school aged youths) demonstrated understanding of mangrove ecosystems protection practices.**

**Question about environment**

Some other open-ended questions were asked specifically to the students about the environment, their answer can be found in the set of graphs below.

*What is the environment?*

Figure 5: Representation of the student’s understanding of the environment

The question “What is the environment?” was asked only to the students. The data shows significant progress in their understanding of what the environment is. None of the student declare not knowing what the environment is. All of them seem to confidently be able to designate elements of the environment. Those who believe that environment is where people live remain relatively stable: 83% at the baseline and 85% at the endline.

The percent of students that believe environment include the spaces where animal live increase significantly from 6% to 35%. It is also the case for those that include rives. They vary from 2% to 15%. The spaces where there are trees increase from 15% to 38%. And the ones that include the sea go from 1% to 10%.

*How should the environment be for us to be in good health?*

For this question, the students responded as follows: the majority, which count for (73.35%) said that the environment should be clean at the baseline. That slightly increate to 83% at the endline. For 32.48% at the baseline, the solution is to not throw garbage in the mangroves, streets, and rivers, that also increase to 44% at the endline. 9% did not know at the baseline, that decreased to 2% at the endline. From 18% at the baseline to 35 % at the endline, the students that believe that people must plant trees mostly in the mountains and protect the trees that have already been planted record an increase of 17-point percentage.

**Question about climate**

Some other open-ended questions were also asked specifically to the students about climate change, their answer can be found in this section.

*What is Climate Change?*

For the question about what the climate change is, students have responded, and their answers were as follows: most of them, which counts for 41% said at the baseline that that Climate Change increases the temperature of the atmosphere due to emission of heating gases from human activities, that percentage change positively to 54% at the endline which is an increase of 13 percentage points. 31.15 % students said that they do not know what it is at the baseline, that increase to 43%. The question was asked on the format of multiple choices from which the respondents could have chosen all the correct options according to them. That may influence the level of students expressing not knowing despite having chosen other options.

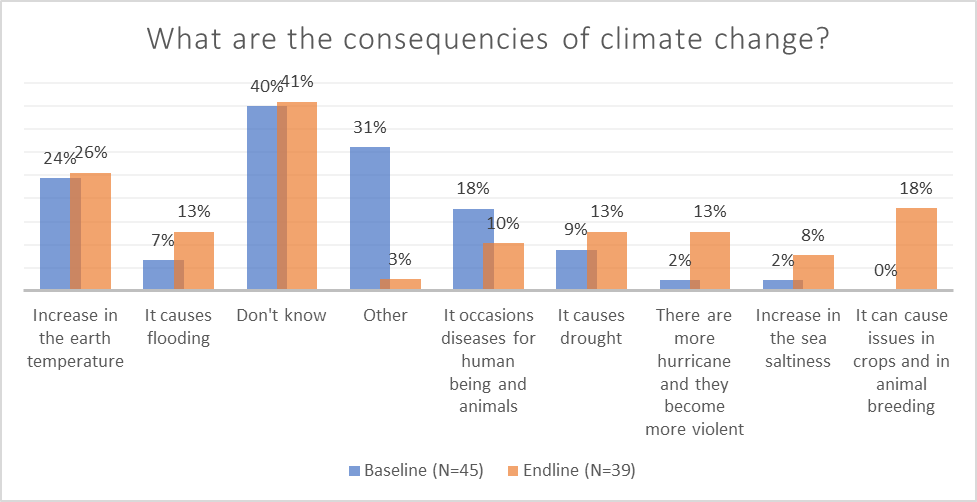
*Main heating gas do you know?*

The data for the question shows improvement in the responses. Twenty-eight percent (28%) of students at the baseline and 55% at the endline report that CO2 is the main heating gas they know. The percent of student who said not knowing decrease from 57% to 42%. It’s also interesting to see decrease in student that mentioned O2 as a heating gas as it went from 11% of responses in baseline to 3% at the endline.

*What produces heating gas?*

The students demonstrated a better understanding of what produces heating gas in general. At the baseline, 54% said they did not know. That number went down to 46% in the endline. While on the other hand those that chose correct options increase. For instance, the percent of those that thought the industries produce heating gas went from 2% to 31%, that is a 29 positive percentage points. Increase of animal breeding and use of fertilizers was also chosen at the endline by 8% of the students while none of the had chosen it at the baseline.

*What are consequences of climate change?*

With a difference of only one (1) percentage point between the percent of students declaring not knowing about the consequences of climate change between the baseline and the endline, they seem to also improve their knowledge about this topic in general.

A small change is observed in those that believe that increase in the earth temperature is a consequence of climate change. As a matter of fact, the values went from 24% to 26% for this option.

More students (13%) believe at the endline that climate change is responsible for an increase of the number of hurricane and their severity, while it was only two (2%) that believed that in the baseline. 18% of students highlighted the role of climate change in issues that may occur in crops and animal breeding while none of them mention that at the baseline.

*What can we do to adapt to climate change?*

For all options that may be obvious actions to undertake to face climate change, students have performed very well.

Despite 58% say they don’t know, 40% recommend to plant trees at the endline. That was 33% at the baseline.

Those that encourage reduction in CO2 emission also increase from 2% to 5%. The action toward better management of garbage is also encouraged as 8% of students has chosen it while only 2% did that choice at the baseline.

**Questions about mangroves**

In this part, questions were asked to all the respondents such as students, fishers, and farmers about mangroves. This set of graphs below illustrates their answers.

*What are mangroves?*

Figure 7: Representation of the different categories of respondents according to their understanding of mangroves

The students understanding of what mangroves are improved significantly by the end of the project. It went from 38% students at the baseline to 82% at the endline.

While the score was very high for fishers at the endline, there is a slight decrease to their answer at the endline. It went to 95% to 90% at the end of the project.

The farmers also did not give reason to believe that they understood better what Mangroves are at the endline.

*Are mangroves in danger?*

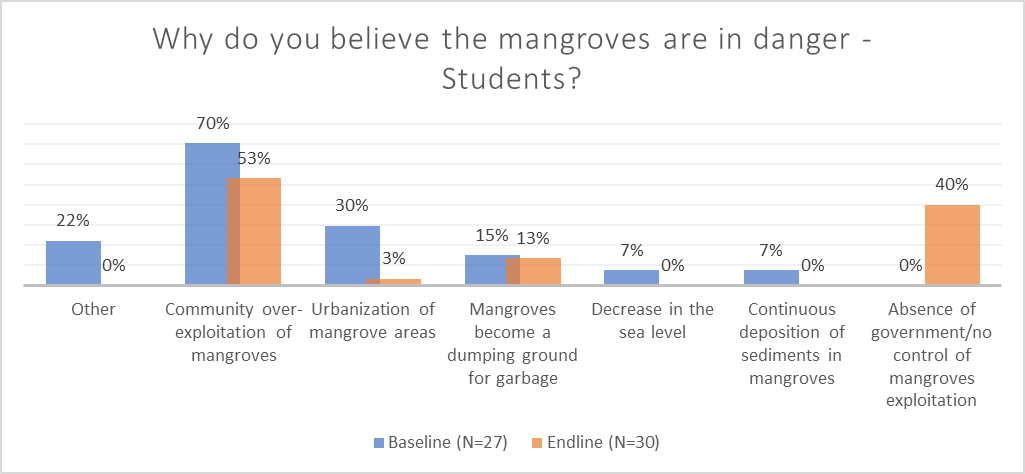
*Figure 8: Representation of the different categories of respondents according to their opinion on mangrove in danger*

The students believe the mangroves are in danger as 79% of them responded yes at the end of the project compared to 38% at the baseline.

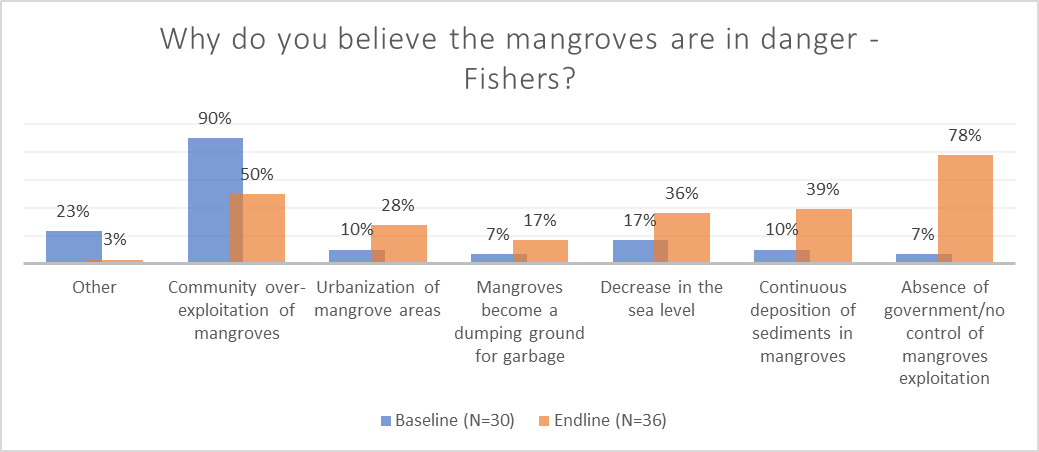
The fishers at a large majority (71%) of them at the baseline believe mangroves are in danger, the percent increased to 88% at the endline.

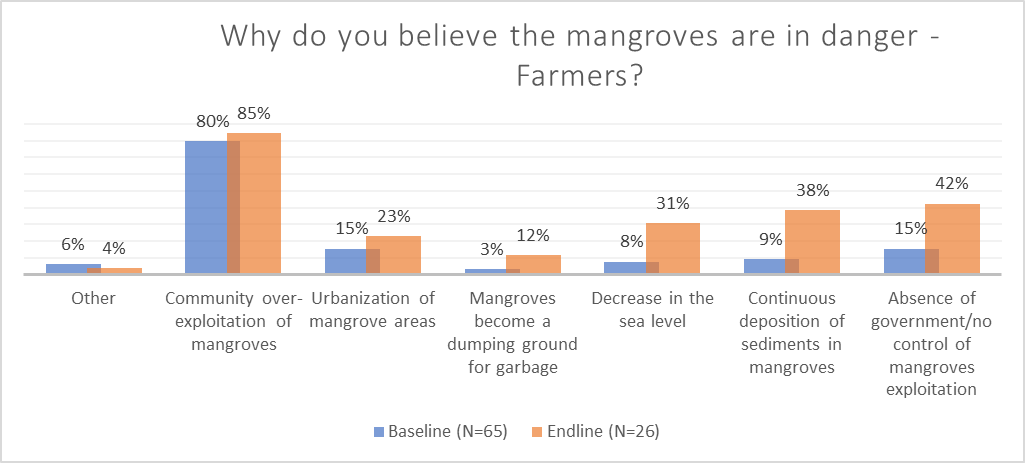
The farmers perception of whether mangroves are in danger did not vary that much at the two times of the evaluation.

*Why do you believe the mangroves are in danger?*

**When asking about the reason they believe mangrove are in danger, the student tend to attribute that to the absence of government interventions, lack of control of mangroves exploitation. The percent of students that believe that went from 0% to 40% at the end of the project.

The fishers also believe that the main problem that causes mangroves to be in danger is lack of control of mangrove exploitation. That proportion of response for fishers went from 7% to 78% at the end of the project.

The fishers also believe that a decrease in the sea level causes mangroves to be in danger (36%) of them at the endline while it was 17% at the baseline. The also think mangroves can’t be a dumping ground for garbage. That counted for 17% of the choices. They thought that urbanization is also a major risk for mangroves as 28% of them expressed that while only 10% of them did at the baseline. It’s curious to see that the fishers tended to not choose community over exploitation of the mangroves as a threat to them. Maybe that is a direct change in behavior induced by the project. That can’t be easily interpreted as the project has just ended.

**Farmers have performed very well in choosing the options that count as main reason mangroves are in danger. All options record positive variation at the endline compared to the baseline. The graph is read like this: 85% of farmers at the endline believe community over-exploit mangroves while it was 80% at the baseline.

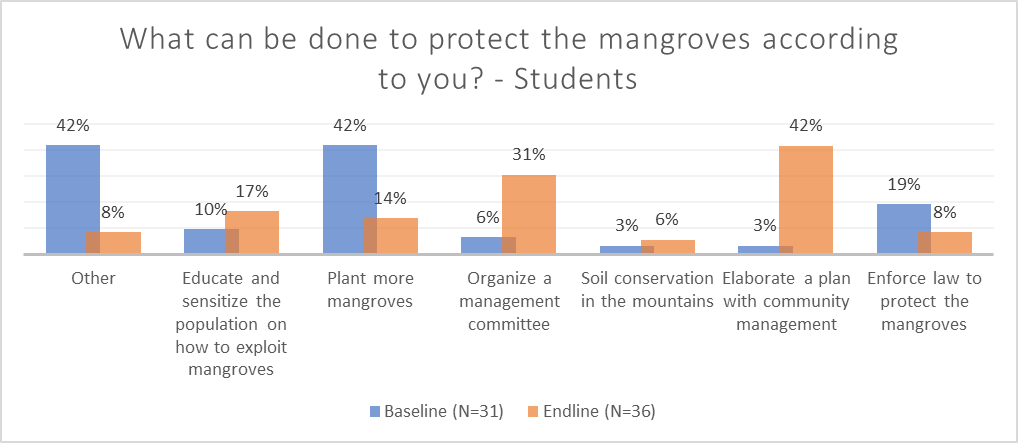
23% of farmers testified that urbanization of mangroves’ areas as a threat to mangroves.

12% of farmers believe mangroves can’t be a dumping ground for garbage.

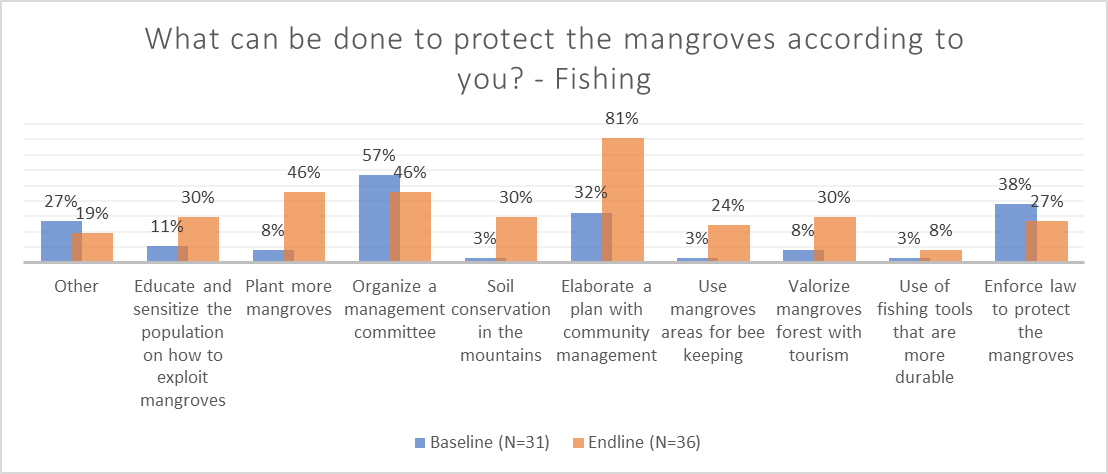
31% of farmers expressed that decrease in the sea level can cause mangroves destruction by choosing that option. Continuous deposit of sediments in mangroves from erosion also is a threat to mangroves according to farmers. Finally, 42% of farmers reported the lack of control of mangrove exploitation as a main threat to mangroves.

*What can be done to protect the mangroves?*

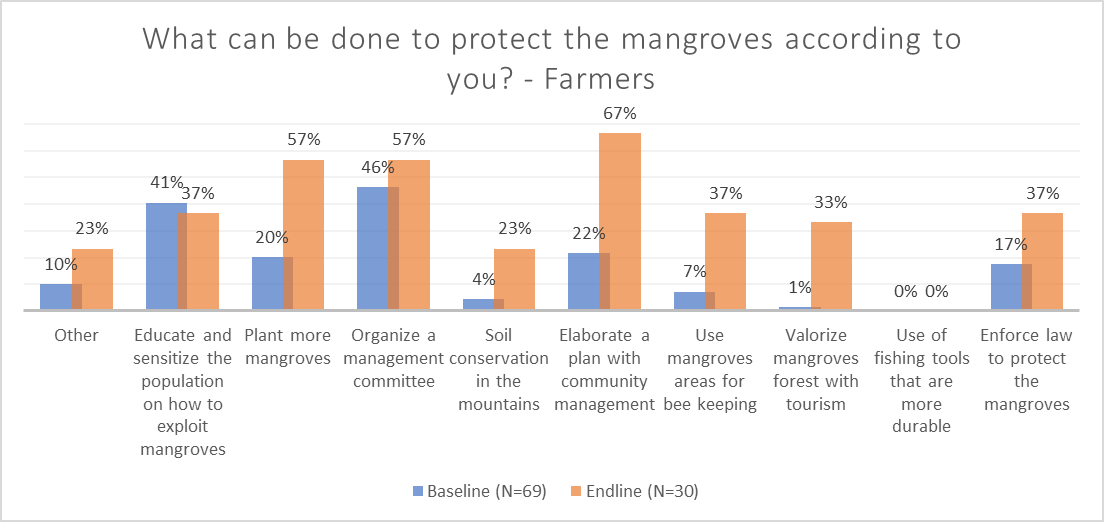
The students think to protect mangroves, actions should be taken in terms of:

* Education and sensitization toward the population on how to exploit mangroves: 17% at endline compared to 10% at baseline.
* Organize a management committee for mangroves: 31% at endline against 6% at baseline
* Elaborate a plan with community management: 42% at endline against 3% at the baseline.

The fishers are more likely to provide better insight as to how to protect mangroves. Since there are working at the sea level, they know more than any of the other categories the importance of mangroves.

Therefore, there responses about what can be done to protect mangroves go as follow:

* Education and sensitization: 30%.
* Plant mangroves: 46%.
* Soil conservation in the mountains: 30%.
* Elaborate a plan with community management: 81%.
* Use mangrove areas for bee keeping: 24%.
* Valorize mangroves areas with tourism: 30%.

The farmers also provided interesting answers across all options as to what can be done to protect mangroves. The key highlights are:

* Plant mangroves: 57% at endline compared to 20% at baseline.
* Organize a management committee: 57%.
* Soil conservation: 23%.
* Elaborate a plan with community: 67%.
* Use mangroves areas for bee keeping: 37%.
* Valorize mangroves forest with tourism: 33%.
* Enforce law to protect mangroves: 37%.

**Questions about environmental laws regulation**

This section is about the knowledge of the respondents about the environmental laws that the population of interests know.

*What text of law about mangroves do you know?*

All the categories were concerned by this question. Therefore, various answers were obtained. The answers were as follows:

* Don’t know any environmental laws: 50 % of students from baseline dropped to 8% at endline; 25% of fishers at baseline increased to 50% at the endline and the farmers who did not know went from 21% at baseline to reach 0% at endline.
* Decree that took place in 2005: More students (33%) know about that at the endline; 0% of fishers report knowing it and 17% of farmers confirmed knowing it.
* Decree from 2013: 58% of students mentioned it at the endline against 10% at the baseline. 45% of fishers mentioned it and 63% of farmers seem to know it.
* Possibility of other regulations: 0% mentioned that at the endline, 5% of fishers did and 17% of farmers chose those options.

Figure 11: Representation of the different categories of respondents according to their knowledge of text law on environment

*What does the law about the environment and mangroves protection say?*

Figure 12: Representation of the different categories of respondents according to their knowledge on law about the environment and mangroves protection say.

For this question, all categories responded. The answers are as followed:

* Do not cut them: 88% dropped to 25%. 100% of farmers dropped to 80% and 89% of farmers dropped to 69%.
* The option does not throw garbage at the mangroves has positive variation across the respondents.

### Attitude: what are the respondents attitudes towards improved mangroves management and evironment protection?

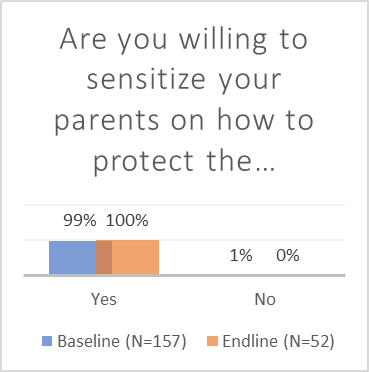
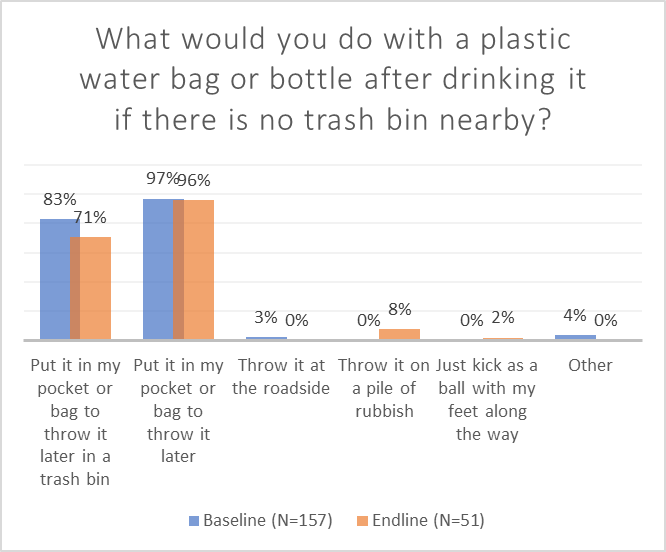
Understanding of environment and mangroves protection is very important. But it is necessary that the actors have the correct attitude to act accordingly to protect their resources. In this section, we present the descriptive statistics about the attitudes of respondents towards Environment and Mangroves protection.

**Indicator III: of local governance stakeholders with positive attitudes towards improved governance and management of natural resources.**

We did not retake the Focus Group Discussion with the government actors at the end of the project. That decision was since 100% of them expressed despite the constraints faced, the right attitude toward protecting mangroves and natural resources in Bondeau, Nippe. Considering the relatively short period between the baseline and the endline and the fact that the government actors were not replaced over the period, we can confidently believe that the situation has not changed. From the baseline evaluation report, it is read that: to come up with this indicators’ value, we analyze the responses of the local authorities who participated in the Key Informant Interviews. A hundred percent of the authorities have to right attitude and are willing to do what it takes to protect Bondeau’s mangroves. They have expressed good attitudes towards participating in training sessions to learn new technics for better local natural resources management.

**Indicator IV: % of project beneficiaries (farmers, fishers, and school aged youths) with positive attitudes towards mangrove ecosystems protection actions.**

To measure this indicator for all the categories of respondent of the survey, we used an open-ended question that led to either Yes or No the respondent is willing to do a particular action like participating in training session or not throwing non-biodegradable garbage in the nature. Although that measure has its limits, it helped to capture the most common behavior of the respondents towards the project success and their commitment to act in their daily life as to protect their ecosystem.

**Indicator IV.I: of students with positive attitudes towards environment protection**

The attitudes are correct for the most case and the slight difference observed can be attributed to chance. The first graph shows that 100% of the students are willing to sensitize their parents to take actions to protect the environment. In the second graphs almost all of them have chosen the options that they would manage plastic water bag correctly.

In the following graph, the students reported that they are more likely to put trash like plastic water bag in their bag to put it in trash bin at home.

**Indicator IV.II: of farmers with positive attitudes towards mangrove ecosystems protection actions.**

For this part almost all the farmers (at least 98% at both phases of the evaluation) have participated by giving their opinions on respectively the willing to protect mangroves, to be trained in tree nursery, to change agricultural practices to protect mangroves, and to adapt new culture such as moringa.

* Farmers gave their opinion about their willing to protect mangroves.
* Among the farmers who have given their opinions on their willing to be trained in tree nursery, only 1% said no at the baseline. All of them have answered yes at the endline about this question.
* All of them have answered positively about changing their agricultural practices to protect mangroves and adapting with new cultures like moringa.

**Indicator IV.III: % of fishers with positive attitudes towards mangrove ecosystems protection actions**.

For this part all the fishers (44 at the baseline and 42 at the endline) have participated by giving their opinions about their willing to be trained to protect the mangrove, to be trained in tree nursery, to learn new fishing techniques.

### practices: what are respondents doing to protect bondeau watershed natural ressources?

In this study, we were also interested in knowing the practices the respondents follow to protect the mangroves. All the practices were identified through the KIIs with the local authorities. In this section we present a summary of the results.

**Indicator V: # of activities undertaken by local governance stakeholders towards improved management of Bandeau’s natural resources.**

A total of 7 different activities were identified as being undertaken by the authorities and community leaders to protect the Bondeau’s natural resources’ including the mangrove ecosystem. Among the most common activities we found “Tree planting” and “Tree cutting prevention”, about 30% of the responses mentioned them. The second largest activity carried out by the authorities and leaders is “Soil conservation”, 15% of the responses mentioned it. “Soil slashing and burning prevention” is the third activity we identified in the responses; it was mentioned in 10% of the responses. The other ones were “Mangrove cutting for charcoal production prevention”, “prevent construction in the mangrove” and “sensitization of the population on the importance of the mangroves” where mentioned in only 5% of the responses.

# Conclusions

This evaluation helped to understand the understanding, attitudes and practices of local government actors, the students, the farmers, and the fishers of Bondeau, Nippes toward environment protection concepts and best practices.

Although the endline was conducted over a sample of the targeted beneficiaries, the results for most the indicators compared very well with the baseline results.

The study revealed that:

- All the respondents (students, fishers, and farmers) demonstrated improvement of knowledge about the topics (mainly environmental issues) they were tested for. From 27.4% of the students at the baseline that was able to demonstrate knowledge on the topics, the percent increased to reach XXX% at the endline. From the farmers, 48.65% demonstrated understanding of the questions at the baseline. That increased to XXX% at the endline. The fishers represent the category in which most respondents demonstrated understanding of the environment and mangroves related questions: 63.64% at the baseline and XXX at the endline.

- Almost at a 100%, the respondents demonstrated their willingness to be trained and to take the necessary actions to protect their watershed natural resources.

- A total of 7 different activities were identified as being undertaken by the authorities and community leaders to protect the Bondeau’s natural resources’ including the mangrove ecosystem. These practices are Tree planting, Tree cutting prevention, Soil conservation, Soil slashing and burning prevention, Mangrove cutting for charcoal production prevention, prevent construction in the mangrove, and sensitization of the population on the importance of the mangroves.

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## recommendations

# Annexes

* Scope of Work
* Notebooks: data cleaning overview