

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 is implementing a project entitled “Payment for Ecosystem Services (PES) to Protect Mangroves in Bondeau, Nippes, Haiti”. According to the project document, its general objective is 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 is 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 will be protected.

By the end of the project, we expect the following outcomes:

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 baseline evaluation for the project. The evaluation will be retaken at the end of the project to evidence the extent to which it creates the expected outcomes.

***Objective of the Evaluation***

The general objective of this study was to establish baseline data for the core outcome indicators that aim to capture behavioral changes that the project seeks to induce among its beneficiaries.

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

***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, we only had in-depth interviews with local authorities in 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 direct survey that led to the quantitative measures. 27 local authorities and leaders participated in the study as Key Informant. Therefore, they were asked open-ended questions in which they were expected the elaborate more and share their understanding of the underlying questions of the study.

With the exception of students, which is the only category that contains more females than males, i.e. 58.60 % females to 41.40 % males. The male gender is the most common in the study. For the two other categories, we found that the male gender is more representative, respectively 95.45% among the fishers and 80.18% among farmers. Note that 157 students, 44 fishers and 111 farmers were interviewed in total. Overall, out of the 312 people surveyed 62.82% of males were interviewed versus only 36.86% of females.

* 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 : % 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 : % 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 will be implementing the project titled: Payment for Ecosystem Services (PES) to Protect Mangroves in Bondeau, Nippes, Haiti, for the next 24 months. Funded by Caribbean Biodiversity Fund in the context of the Ecosystem-Based Adaptation (EbA) Program, the project aims 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”.

More than 70% of the tropical coastline is covered by mangrove forests (Raven et al., 2009). In the Tropical and Subtropical region, mangrove forests are the equivalent of salt marshes. 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 will articulate its intervention on an integrated approach from ridge to reef to address climate risks, in order 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 will be protected.

This document reports on the baseline evaluation conducted at the project launch. It provides baseline values for the project outcome indicators such that can be verified its impact at the end line.

# 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 1: 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 is 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 will also directly contribute to the community’s resilience to the impacts of climate change.

**First, activities to strengthen agriculture and fishing livelihoods will be implemented from ridge to reef.** The mountain ecosystems will be reinforced through a Payment for Ecosystem Services (PES) program focused on reforesting the most vulnerable lands along existing ravines. Farmers will receive moringa seedlings and technical support to create a living greenbelt that will stretch along the largest ravine from Paillant to Bondeau. This will have the dual impact of reducing sedimentation of the mangroves below while supplementing income for farmers. At the coastal level, fishers will benefit through practical support to establish a fishing cooperative. If the cooperative meets prerequisite steps to ensure sustainability, equipment and training with be provided, which may include motorboats and fish aggregating devices. To complement the material support, fishers will be 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 will significantly reduce the harmful impacts of human behavior on the mangrove system.

**Second, awareness-raising and movement building will 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 will come to see themselves as stewards of their environment, working to create balance and strengthen their own resilience through protection of the ecosystem. This project will 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

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. |

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 will articulate its intervention on an integrated approach from ridge to reef to address climate risk, 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 will be protected.

## BONDeau PES Project activities

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

The general objective of this evaluation is to establish baseline data for the core outcome indicators that aim to capture behavioral changes that the project seeks 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. The quantitative methods provided data that we disaggregated by sex to point out all sort of metrics related to the numerical indicators may they fall into the knowledge, attitude, or practices categories.

## Quantitative methods and approaches

### STudents, Farmers and FISHERS’ surveys

For this evaluation, the projects beneficiaries have all been considered a respondent. There was no need for a sampling as the project target a relatively small numbers of direct beneficiaries. We surveyed all the direct beneficiaries of the project. As a matter of fact, interviewing the whole population is always a better approach when possible than a sample from it. Since we did not have a massive number of targeted beneficiaries, it was more suitable for us to study them all. Therefore, the criteria to be selected to respond to the survey was 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 end line data. It also helps 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 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 about the environment protection. Therefore, the result of the survey needs to be considered and its context as being references for the project end line evaluation.

The gender is 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 in the field targeting for the predefined groups. The population for this study consists in three categories, which are farmers, fishers, and students. In all categories combined, 312 people were interviewed. Below we will describe the different respondents according to the evaluation criteria that were used.

## REspondents characteristics

Several criteria were chosen to characterize the different actors of the study. These criteria are age, gender, level of education and the source of income. The next three table and groups of graphs will represent the distribution of each group according to these criteria.

### GENDER

The gender was the first criteria that was retained to describe the population of interest and the graphs below give an overview how the population was distributes based on their gender.

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** |

With the exception of students, which is the only category that contains more females than males, i.e. 58.60 % females to 41.40 % males. The male gender is the most common in the study. For the two other categories, we found that the male gender is more representative, respectively 95.45% among the fishers and 80.18% among farmers. Note that 157 students, 44 fishers and 111 farmers were interviewed in total. Overall, out of the 312 people surveyed 62.82% of 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

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 third criteria 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

For the student, they are divided according to whether they are in primary school 10 males and 12 females, or in secondary school 12 males and 13 females.

For the farmers and the fishers, four (4) levels of education had been considered. These levels were: first, respondents who have never been to school; second, respondents who have reached primary school; third, respondents who have reached secondary school; and fourth, respondents who have been to university. We have found that:

* Twelve (12) fishermen, and 9 farmers (5 males and 4 females) had never been to school.
* Twenty-five fisherfolks (23 men and 2 women) and 59 farmers (48 men and 11 women) have reached primary school.
* Seven fishermen (7 men and 0 woman) and 41 farmers (35 men and 11 women) have reached secondary school; and
* Only one male farmer went to university. No fisherfolks from the respondents went to university nor the female farmers.

4.1.4) Source of income (Fishers and farmers)

The fourth criteria that used to describe the population of interest was the source of income. For these criteria, the students were not retained since they do not have a source of income as such. The next set graph gives an idea for 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 fishers and the farmers have different sources of incomes.

* For the fishers, fishing is the main source of income for 43 out of the 44 fishers that have been surveyed. However, this does not prevent some of them from having other lucrative activities such as agriculture (20 of them), animal breeding (11 fishers), and charcoal production (4 fishers; among them 2 are using mangrove wood for their production).
* For 104 out of 110 farmers, agriculture is the main source of income. Fourty farmers also practice animal breeding and the rest of them do some other activities like domestic building (masons, carpenters), businesses, fishing, black-smith, teaching. Eleven farmers also do charcoal and 2 among this number are using mangrove wood for this purpose.

## 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.

Figure 5: Representation of the different categories of respondents according to their understanding of the environment

*What is the environment?*

For the key concept of “environment” 20 students, who represented 12.7% of the population, were not able to give a definition. Then, for most of the students, 131 (83.43%) of them, the environment is “spaces where people live”. 23 (14.65%) answered that the environment is “spaces where there are trees”. Finally, by 12 students which is a small percentage, there were answers like “environment is the sea”, or it is the “rivers and water springs”, “schools and classrooms” and some other answers.

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

For this second question, the students responded as follows: the majority, which count for 128 (73.35%) said that the environment should be clean. For 51 (32.48%), the solution is to not throw garbage in the mangroves, streets and rivers. 14 (8.91 %) did not propose any solution. For the 12 (25.53%) remaining students, people must plant trees mostly in the mountains, and protect the trees that have already been planted.

**Question about climate**

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

Figure 6: Representation of the different categories of respondents according to their understanding of climate change

*What is Climate Change?*

For this first question, 61 students have responded, and their answers were as follows: most of them, which counts for 25 (40.98%) said that Climate Change increases the temperature of the atmosphere due to emission of heating gases from human activities. Nineteen (31.15 %) students said that they do not know what it is. For the rest of the students, they gave some other answers such as climate change is “when the crop gives nothing to harvest”.

*Main heating gas do you know?*

For the main heating gas, 47 students have responded to this question and their answers were as follows: For the majority, which count for 27 (57.45%), they do not know any heating gases. For 13 students (27.66%), the main heating gas is CO2. For the 12 remaining students (25.53%), there are some other gases such as oxygen.

*What produces heating gas?*

For this question, 41 students have responded to this question and their answers were as follows: the majority, which count for 22 (53.66 %), said that they do not know any heating gases. For the others, heating gases might come from deforestation and vehicles that run with fossil fuel.

*What are consequences of climate change?*

For this question, 45 students have responded, and their answers were as follows: 18 students, who represent 40 %, said that they do not know any consequences. Eleven students (24.44%) said that climate change induces the increase of temperature. The rest of the students gave other consequences such as the increase of the saltiness of the sea, flooding, more diseases for human beings and animals and more violent hurricanes.

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

For this question, 45 students have answered this question. Sixteen students (35.55%) said they do not know any solution, 15 (33.33%) propose to plant more trees to stock the excess of CO2, and other answers have reported such management as recycling garbage and reducing the amount of CO2 that is emitting into the atmosphere.

**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

For this question, 157 students, 109 farmers and 44 fishers have responded, and their answers were as follows:

* 59 (37.60%) students, 85 farmers (77.98%) and 42 (95.45%) fishers said that mangroves are trees that grow in forest by the sea.
* 88 (56.05%) students, 2 (4.55%) fishers and 24 farmers (22.02 %) do not know what mangroves are.
* For 10 students (6.37%), the mangroves are trees that produce mangoes.

*Are mangroves in danger?*

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

For this question, 66 students, 42 fishers and 89 farmers have responded, and their answers were as follows:

* 25 students (37.88%), 30 (71.43%) fishers and 62 (69.66%) farmers answered that mangroves are in danger.
* 41 students (62.12 %), 12 (28.57%) fishers and 27 (30.34%) farmers answered that mangroves are not in danger.

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

Figure 9: Representation of the different categories of respondents according to their education level

For this question, 27 students, 30 fishers and 65 farmers have responded, and their answers were as follows:

* The most commonly answer were community overexploitation of mangroves; 19 (70.37%) students, 27 fishers (90%), 52 farmers (80 %), gave this answer.
* Other answer was also given such as urbanization of mangroves areas, mangroves become a dumping area for garbage, decrease in the sea level, continuous deposition of the sediments in the mangrove area.

*What can be done to protect the mangroves?*

Figure : Representation of the different categories of respondents according to their opinion on what should be done to protect mangroves.

For this question, 31 students, 37 fishers and 69 farmers have responded, and their answers were as follows:

* 14 (37.84%) fishers and 30 (43.48 %) farmers proposed to educate and sensitize the population on how to exploit mangroves
* 21 (56.76%) fishers and 32 (46.38 %) farmers proposed to organize a management committee
* Other answers were also found, such as plant more mangroves, enforce law to protect mangroves, soil conservation in the mountains, valorize mangrove forest with tourists, use of fishing equipment that are more sustainable, elaborate a plan with community management, use mangrove areas for beekeeping.

**Questions about environmental laws regulation**

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

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

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

All the categories were concerned by this question. Therefore, various answers were obtained from 20 students, 16 fishers and 24 farmers. The answers were as follows:

* 10 (50%) students, 4 fishers (25%) and 5 farmers (20.83%), don't know any environmental laws
* 4 (25%) students, 2 fishers (12.5%), and 12 farmers (50%) talked about the environment decree that took place in 2005.
* 2 (10%) students, 4 (25 %) fishers and only 1 (4.17 %) farmers mentioned the mangroves decree from 2013.
* 4 (20%) students, 6 fishers (37.5%) and 6 farmers (25 %) mentioned the possibility of other regulations.

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

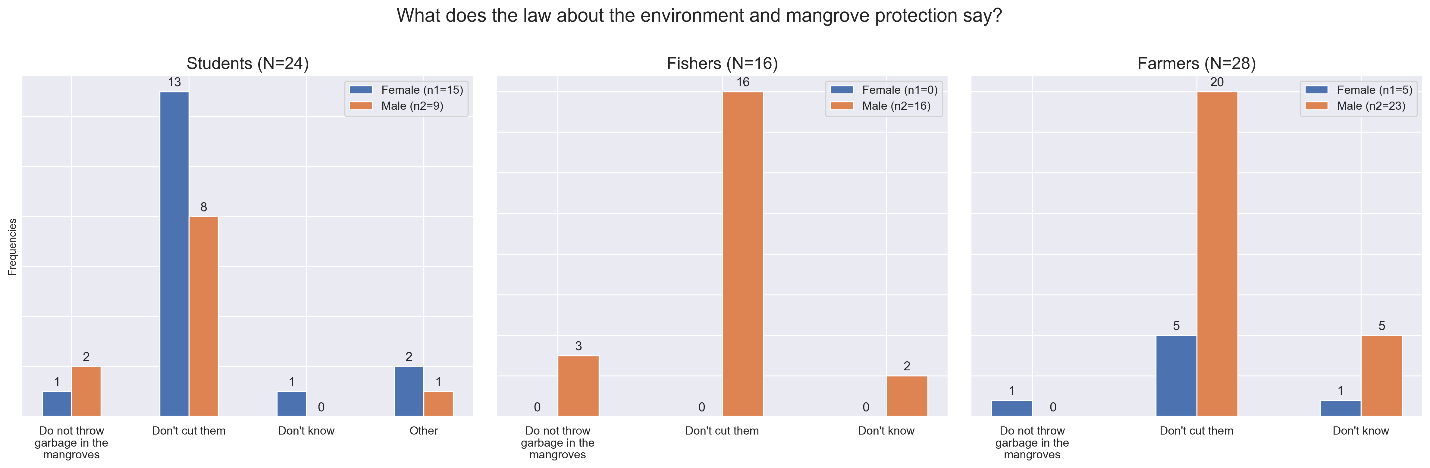


Figure 12: Representation of the different categories of respondents according to their knowledge on law about the environment and mangroves protection say.

For this question, 24 students, 16 fishers and 28 farmers have responded, and their answers were as follows:

* 21 (87.5%) students, 16 (100%) fishers and 25 farmers (89.27 %) do not cut them,
* The rest of them said they do not know what the environmental laws say about mangroves protection or do not throw garbage in the mangroves.

### 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 protects their resources. In this section, we present the descriptive statistics about the attitudes of respondents towards Environment and Mangrove protection.

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

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 express 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**

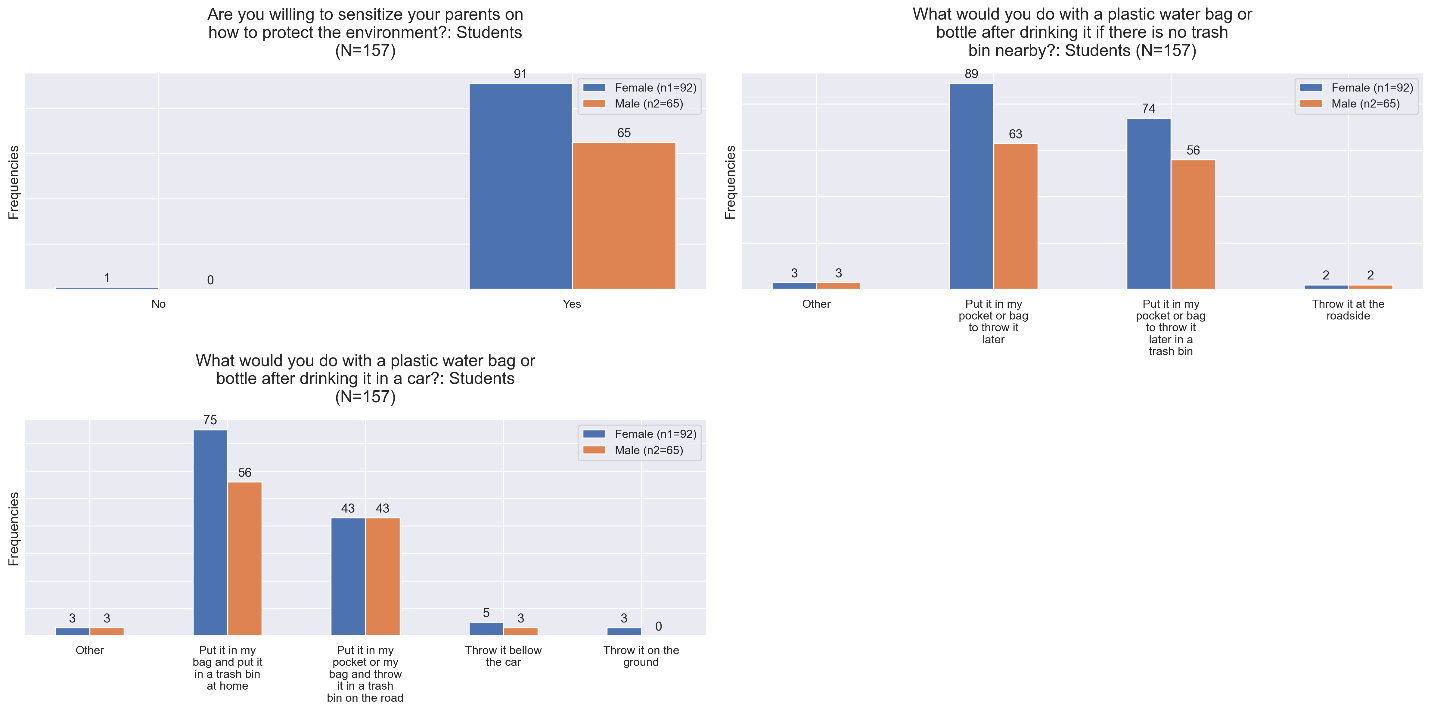


Figure 13: Representation of the different categories of respondents according to their education level

**For this part all the students have participated by giving their opinions**

*Are you willing to sensitize your parents on how to protect the environment?*

* For the question, only one student answered no about this question, all the others said they are willing to sensitize their parents.

*What would you do with a plastic water bag or bottle after drinking in it if there is no trash bin nearby?*

* For the question, 147 students (93.63 %) said that they would take it with them and throw it later.

*What would you do with a plastic water bag or bottle after drinking it in a car?*

* For the question, 140 students (89.17 %) said they would take it with them and throw it later. The others declare they would throw it below the car, on the ground, or doing something else with it.

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

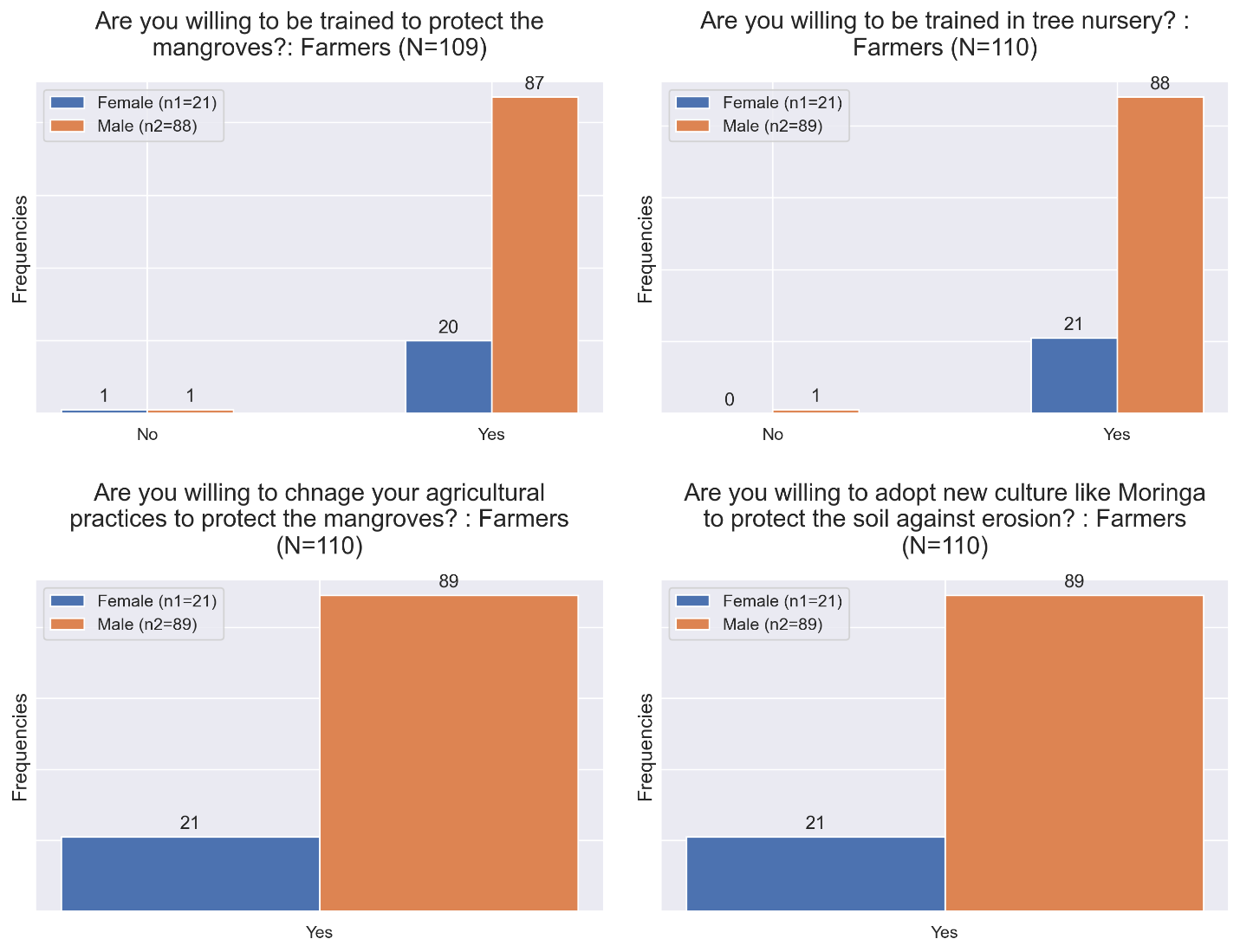


Figure 14: Representation of the farmer’s willingness for protecting mangroves.

For this part almost all the farmers (109 out of 110) 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.

* 109 farmers gave their opinion about their willing to protect mangroves. Only 2 of them have answered no about this question, all the others said they are willing to be trained to protect the mangrove.
* Among the 110 farmers, who have given their opinions on their willing to be trained in tree nursery, only 2 of them have answered no 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**.

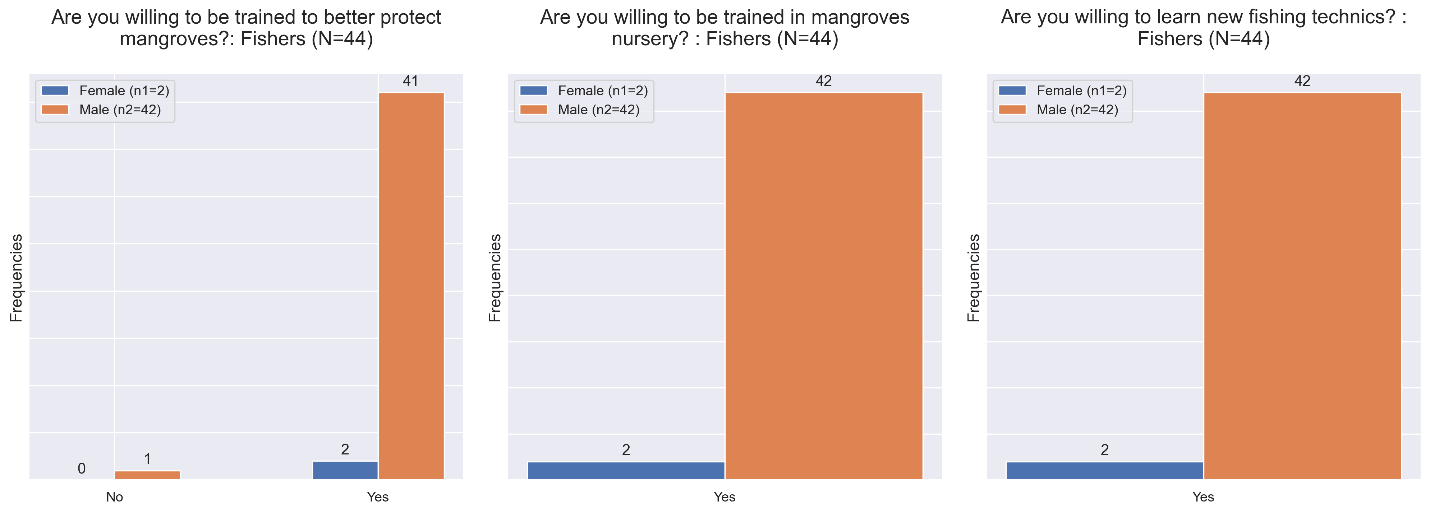


Figure : Representation of the fisher’s willingness for protecting mangroves

For this part all the fishers (44) 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.

* Only 1 of the fishers do not wish to be trained to protect the mangrove, all the others said they are. all the fishers want to be trained in tree nursery and 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 studied has allowed us to established baseline data that will serve a basis for comparison at the end line evaluation of the project “PES to protect mangrove at Bondeau, Nippe, Haiti.” Making use of a mixed methodology, the study had revealed that :

- All the respondents (students, fishers, and farmers) demonstrated lack of knowledge about the topics (mainly environmental issues) they were tested for. Only 27.4% of the students demonstrated understanding of the knowledge questions. From the farmers, 48.65% demonstrated understanding of the questions. 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 fishers responded accurately.

- 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.

- 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

* Although it is important to train all the categories, intensify training sessions for the school age children. The score of 27.4% among the students understanding of environment and its protection principle is the lowest all the categories considered.
* Make additional effort to make sure the females receive adequate training in such that they can serve as environment protection champions.

# Annexes

SOW

Notebooks: data cleaning overview

KII notes.