GVI COSTA RICA- BIOLOGICAL RESEARCH STATION, JALOVA

PROPOSAL FOR BECOMING A CLEAN & LOW CARBON EMISSION RESEARCH STATION IN THE TORTUGUERO NATIONAL PARK AREA, COSTA RICA

Contents

Introduction

The tropics that are well known for holding high biodiversity are also one of the more threatened ecosystems in the world. They are being cleared for agricultural use and for timber at unsustainable rates. Costa Rica small country making up less than 0.05% of the terrestrial area of the earth's surface (Wainwright & Arias, 2007) but is the possessor of a vast wealth of biodiversity (Henderson 2002; Guyer and Donnelly 2005; Stiles and Skutch 1989). With over 900 species of birds (Garrigues and Dean 2007) near 400 species of amphibian and reptiles (Leenders 2001) and at least 240 mammal species (Wainwright and Arias 2007). The high diversity found here can be attributed to several different factors, such as the location of Costa Rica in the tropics and the location of the country as a bridge between North and South America (thus displaying representatives species from both continents) and the fact that despite being such a small land mass there is a wide range of different life zones which are of different habitat and climates and support different arrays of species (Stiles and Skutch 1989; Garrigues and Dean 2007).

The Jalova Biological Research Station is operated by *Global Vision International* (GVI) and is located in the southern tip of the Tortuguero National park (TNP). TNP is located on the Caribbean coast of Costa Rica as shown in figure 1, it includes 76 000 ha of protected land (26 000 ha land) and sea and is classified as a tropical rainforest. The topography of the area ranges from 0 to 311m above sea level, and the average rainfall is near 6000mm per year with an average temperature of 26°C. (Lewis et al. 2009; Bermúdez and Hernández 2004; Bermúdez 2006) Within this area there are different habitat types including several different types of swamp forest (some dominated by several palm species some more species rich including high canopy tree species), herbaceous marshes, coastal forest (has a more open canopy, often dominated by sea grape - *Coccoloba uvifera),* dense forest (drier than the swamp forest areas often dominated by ficus species) coconut plantation and beach. (Halewood et al 2013; Lewis et al. 2009;Ramser 2006)

Figure 1. Map showing the location of Tortuguero National Park within Costa Rica, indicated by red point. Google Maps, 2015

Project

From the year 2010, GVI has been operating a research base in the South of TNP in order to conduct scientific studies which will help protect the area. We provide this data to different local and international institutions like the Costa Rican Ministry of Environment and Energy (MIANE), specifically to SINAC, Coastal Jaguar Conservation, Panthera, and the Sea Turtle Conservance. Our research focuses on recording abundance, biodiversity, dynamics, interactions between the species, and changes in population throughout the years on species like aquatic birds, jaguars, marine turtles, reptiles, amphibians and mammals.

The work is done thanks to volunteers who get trained as assistant researchers, on different monitoring techniques to gather the data needed as our partners don't have enough human resources to do the studies and protect the area. The data is used to study the trends, dynamics, population increases or decreases, compare it with other parts in Costa Rica and the world, and make better decisions on management plans. The training is done by our staff (trained researchers), who live in the station. Each year the base receives around 100 volunteers (assistant researchers) throughout the year, who carry on the different scientific studies, and who also live on base, which can impact on the environment around. Therefore, the aim of this proposal is to make this base as sustainable as possible to have the lowest human impact as possible.

Due to its location, the state of the facilities need constant maintenance which makes it more challenging to keep. Therefore, the project is to transform it into a more environmentally friendly and sustainable base to reduce the carbon footprint and human impact, as well as to be an example for other research bases around the area and provide them with the support and tools to become more environmentally friendly.

Place Description

The facilities of the Biological research station, Jalova, consist of rustic wooden buildings, in a clean area of the forest, with sand soil 100 meters away from the beach shore and 400 meters away from the Jalova river estuary (Figure 2).

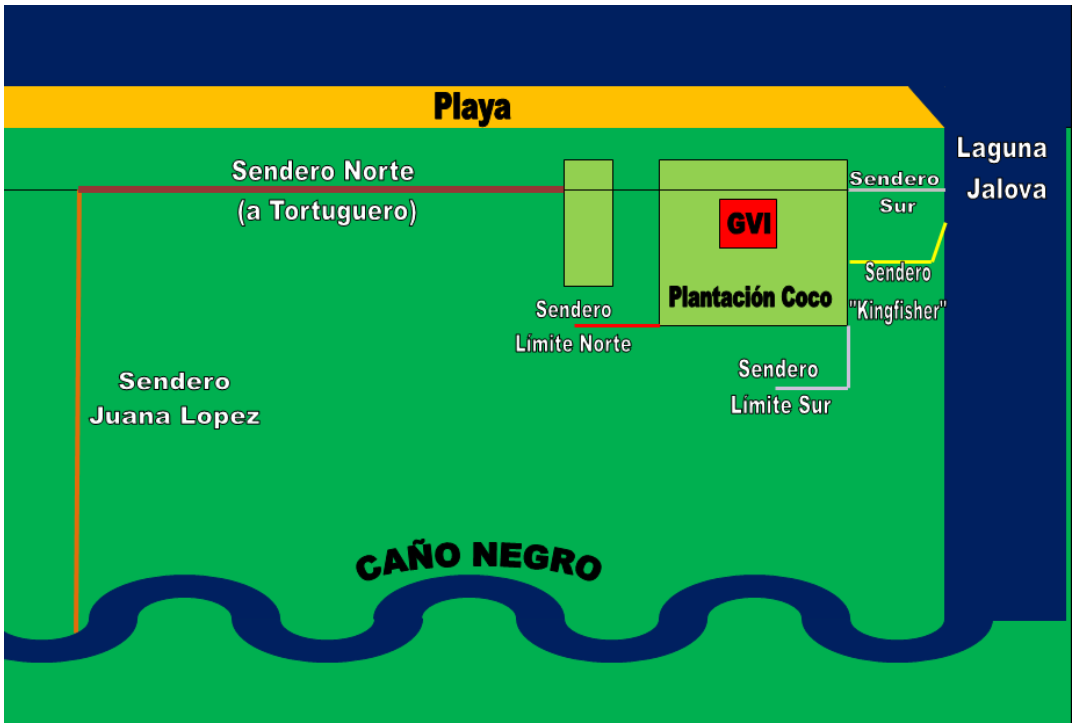

Figure 2. Location of GVI Jalova research station in relationship with the sea and Jalova lagoon and estuary.

There are four buildings for housing:

- 1 bedroom for research assistants (volunteers) with bathrooms (2 rooms with toilet facilities, 2 showers) and an external lavatory.
- 1 bedroom for investigation assistants without bathrooms.
- 1 bedroom for investigators, including a small office space, and a bathroom with toilet and shower, 1 external lavatory
- 1 dining room and kitchen

Four small warehouse type buildings:

- 1 for the generator
- 1 for storage equipment

- 1 for storage of hardware and maintenance equipment
- 1 for fuel storage

And one water tank tower.

The station has a maximum capacity for 30 people. The water comes from a well which works with an electrical pump. The water is tested by a laboratory approximately every 3 months to assure it is drinkable.

The electricity for the station comes from a generator fueled with diesel. The generator is used only for 30-60 minutes during the day to fill the water tank. Also it is turned on for approximately 3 hours every night (6 -9pm) to give light and to charge electronic equipment. There are approximately 10 bulbs and 10 electric jacks in the camp. There is a solar panel from the Costa Rican electricity Ministry (ICE), with its respective battery, which has the potential to charge 1 laptop or 2 cellular phones.

The dining room consists of a gas kitchen, area for meals, storage, a sink, bin, tables, chairs and shelves.

Improvements Proposal

Under advice of SINAC (Trade SINAC ACTo-GASP-PIN 036-2015) and proper review of the facilities, the following areas were identified like important for considering in the improvement plan, for the benefit and safety of the people who inhabit the base, and the sustainability and impact to the environment of the facilities:

1. Water treatment
2. Solid wastes disposal
3. Fossil fuels & alternative energy

1. Water treatment

1a. Gray waters

At present, the wastewater of the station is drained to the sand soil, which could represent an environmental impact to the area. Therefore, a solution has been looked after by putting in place a Biogarden in order to filter the gray water and naturally treat it before it goes back to the ground. This was suggested by a consultant firm named “Ecosaneamiento” (technological alternatives for the treatment of the wastewater) and for advices from the Central American Association for the Economy, Health, and Environment (ACEPESA).

According to CEPES, “It Is a system of treatment that allows cleaning of the water by means of filters (stones) and plants which inject oxygen by its roots to the water allowing the proliferation of microorganisms that contribute with the cleanliness of the water.”

An example of a system of biogarden finds in the Figure 4. Two biogardens would be needed to be built: 1 close to the bedrooms where there would come the gray

waters of the showers and the external lavatory; and another behind or next to the dining room where the water of the sink would come. It would be important to assure the exclusive use of native plants of the area in the biogardens.

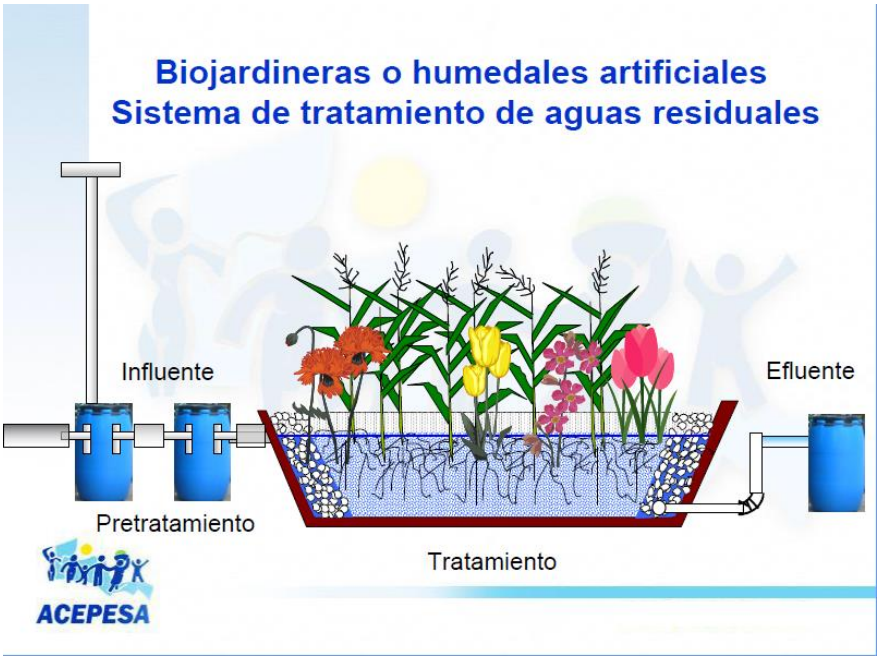

Fig. 4. Example of a biogarden system (Technological alternatives and sanitation 2015 ACEPESA.pdf)

1b. Black waters (toilets)

There are 3 toilets in the Station. Currently the black waters goes to 3 septic tanks, with capacity of 1000 liters.

Till now there have not been serious problems with the septic tank system, so there is not identified a priority. Nevertheless, it is recommended to investigate more on the system of current storage compared with systems now available on the market, to see the practicality of using new technologies (biodigestors,etc). Also it is recommended to consider the possibility of a system of dry toilets, which use natural processes for biodegradation of excrement and urines, and then it produces a material of fertilizer that can be reused.

1c. Rain water

At present there is no rainwater system at the Station. Having a rainwater system would reduce the well water consumption and reduce the fuel and water pump use.

A simple way would be an open tank covered with mesh to avoid the introduction of mosquitoes, with a valve that allows filling water buckets to empty the toilets and to remove the sand of the body when returning from beach patrols (two common uses of water at the Station).

A more complicated system would use canoes in one or several roofs of the Station, taking the water piped to a tank of reception (Fig. 5), which might have simple valves or be placed in a tower to create pressure and power to be used inside the tubes of the toilets. In some places the rainwater is even re-used for the showers, it would be necessary to investigate if this would expire with the sanitary regulations of Costa Rica.

2. Solid wastes disposals

The solid wastes divide into two categories: organic and inorganic. The organics split once again, into composting (most of the remains of raw meal) and not composting (for example, remains of meat and cooked meal), and the inorganic between recyclable and not recyclable (Fig. 6).

The system has worked very well in five years of inhabiting the Station, however the compost area needs to be improved and a better storage room built to get animals away from the wastes.

All the recyclables go to Tortuguero town to the solid wastes treatment plant and we pay 55 USD monthly to them to receive our solid recyclable wastes:

- Plastic
- Cardboard
- Office paper

- Aluminum
- Ink cartridges

The garbage bags are stored in a wooden structure and mesh done for that purpose, which is located behind the dining room, which sometimes attracts animals, so this structure needs to be rebuilt.

3. Fossil fuels handling

Currently fossil fuels are used in the station in order to give power to the generator which provides electricity. An alternative system of solar panels and batteries is proposed in order to diminish the use of the generator.

Based on the fact that it is a conservation project, it would be excellent to convert the facility into a place of very low carbon footprint, which could serve as an example for neighbors and local authorities. A system of 10 solar panels and 20 batteries will be needed to run the entire base on only solar power, the plan is to do it little by little as it is very expensive.

This will diminish the use of the generator and
reserve only for emergencies. It will also allow to consider improvements in the comfort of the station, for example, the addition of a solar refrigerator, to supply the researchers with meat and milk to facilitate a longer stay for the researcher and ensure the data collection has more consistency. A wind system is also an alternative, however this could impact on the birds population.

Costs

Costing table and project life span attached as a separate document.

Costs in USD													
Stages		**Jan**	**Feb**	**March**	**April**	**May**	**June**	**July**	**August**	**Sept**	**Oct**	**Nov**	**Dec**
Water treatment													
	Water collection system	500											
	Biogarden 1			2000									
	Biogarden 2								2000				
	Dry toilets											1500	
Solid wates disposal													
	Recycling management monthly pay	55	55	55	55	55	55	55	55	55	55	55	55
	Building of wastes area		500										
	Compost area						500						
	Local plants reforestation								300				
Fossil fuels and alternative energy													
	2 new panels & a set of batteries	1800											
	2 new panels & a set of batteries				1800								
	2 new panels & a set of batteries												
	2 new panels & a set of batteries							1800					
	2 new panels & a set of batteries										1800		
	Fridge and solar panel												1500

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