BANANA PEEL FOR WATER PURIFICATION

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Theme of the Project: Water Sanitation

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CONTENTS

1. INTRODUCTION.

It is very important that the student population in our educational unit knows the absorbent properties that the banana peel has and through them they will know those of their environment and why not tell the entire population where we live, and what better than usTHE TEAM: "UNI2 X THE WATER"As part of the John Fitzgerald Kennedy educational community, let us report the benefit that this magnificent youth water contest is giving us, promoted by the foundation GAIA PACHA through the initiative of the Swedish embassy in Bolivia, who have motivated us to carry out this research work regarding sanitation and hygiene, "For a Just and Resilient Future" where we can propose alternative solutions and in order to get rid of the ignorance that our community has about the different types of water pollution and very specifically about heavy metals as pollutants, is that we allow ourselves to show you the most comfortable and low cost way of how to build a home filter, that the raw material is the banana peel, residue or waste that is thrown away in our environment.

The present work shows us the different diseases that can be caused by ingesting water contaminated with heavy metals and the ignorance in which our community lives on this subject, it is necessary to investigate and work based on it; We also show how to build a homemade or handmade filter with materials from our context, which may seem insignificant, but this filter prototype that has been designed is a way to show how we can make use of the inputs that nature offers us and that There is no need to have expensive containers and a dispenser to purify the water that we consume daily at home. It is vitally important to know the purifying properties of the green banana peel and the diseases that we can avoid by consuming water free of heavy metals and that can lead us to death.

The elaboration of this project has led us to propose a solution to reduce pollution and improve the quality of life of citizens in the John Fitzgerald Kennedy educational community and the entire population where the educational unit is located. The solution has been innovative using context materials that are not given importance but are very useful when we give them utility with creative ideas.

2. OBJECTIVES

General Objective

Demonstrate that the banana peel flour has absorbent properties, for the removal of heavy metal contaminants in a filter made with homemade materials for the purification of water extracted from the tap in the homes of the John Fitzgerald Kennedy educational unit.

Specific goal

Make the John Fitzgerald Kennedy educational community aware of the absorbent properties of the banana peel. Dehydrate and pulverize the banana peel as an absorbent material and be used in the prototype of a homemade filter. Build a prototype of a homemade filter with materials from the context. Prevent diseases caused by heavy metals by consuming water inside homes.

3. JUSTIFICATION

Talking about water sanitation to improve the quality of life of citizens, is talking about the set of measures that can eliminate the harmful effects on man and the environment and break the cycle of diseases originating in this case from contaminated water. In our context, most know different methods to purify water, including performing water filtration practices in order to provide healthiness and eliminate possible bacteria, parasites, waste, viruses, fecal waste and even plastics that the water that is consumed in may have. our environment, but there is little talk of eliminating heavy metals, which is why there is a need in the first instance to make known about this pollutant, since the consequences that are suffered are the different diseases that occur in the human body, This project expands our knowledge about the contamination of water with heavy metals to be more aware of how to make the drinking water that you consume at home healthier by eliminating heavy metals. Now we can ask ourselves: Is the water that I use at home full of heavy metals? The truth is that we cannot identify at a glance what type of heavy metals the water that reaches our homes has, because, although the water at home It is purified and disinfected, it is necessary to treat it to remove heavy metals in drinking water and in our environment we do not have a laboratory to identify the type of heavy metals that the water we consume contains, much less with a treatment center for contaminated water.

The students of the educational unit and therefore their family and the community where we live will know the importance of eliminating heavy metals in a homemade and innovative way, using materials and supplies from our context, many times we complain because we do not have what is at hand. necessary to be able to purify this liquid element that is of vital importance for living beings on earth. Knowing the way of life of our ancestors and the lack of lighting in the canchones of the houses, batteries were used a lot (batteries for flashlight), once the batteries were exhausted they were thrown away in the

canchon, those who live on the edge of the rivers that we have around our province did the same, they were even thrown into the rivers and lagoons, all of this has caused the contamination of the rivers and fresh water sources and therefore different types of diseases, this should make us aware to reach out of what nature offers us and to be able to value in this case the BANANA PEEL as absorbent for the purification of polluted water. Some residents in our community have artisanal wells, since it is known that groundwater is of better quality in terms of turbidity than surface sources, however, it may contain heavy metals, causing odor, color and taste problems. It is for this reason that this work provides us with an economical and organic method of cleaning or decontaminating water with the presence of heavy metals, through the reuse of BANANA PEEL, which in our midst is most of the time discarded. In order to alleviate this problem regarding the consumption of tap and well water contaminated with heavy metals, we have applied an alternative of homemade methods with local supplies and materials for the removal of contaminants and, in turn, this filter prototype that we have built be a way to create new filters with supply systems where more water enters to be purified or why not say that it is improved and executed for the benefit of the different families where our educational unit is located.

4. THEORETICAL FRAMEWORK

We know heavy metals as metals with a high density or molecular concentration, they can be found in the water of wells, rivers and industrial networks around the world and the most common are chromium, nickel, copper, aluminum, lead and cadmium. It is worth mentioning that not all heavy metals are toxic, there are some such as iron, zinc or cobalt that, in low concentrations, allow our body to function well. Lead in water:Lead (Pb) is one of the most used metals by human beings until now, we can mention that there are still many old pipes made of lead, which when driving drinking water dissolve and concentrate part of the metal in it and then we go and we receive that water at home to cook, drink or wash ourselves. Lead, its high concentration in the body accumulates in the brain and nervous system, lead blocks the absorption of iron, cadmium and molybdenum. This can cause anemia, sclerosis, fatigue, kidney problems, sleep disturbances, etc. Mercury in the water:Mercury (Hg), being almost insoluble in water, has not been considered a contaminant for a long time, in fact, dental amalgams were made up of mercury, however, since in Japan there was a case of poisoning of more than

100 people and 54 deaths, things changed. The waters that received mercury from the industry were investigated and high concentrations of mercury were found that, after a biochemical process called methylation in the mud at the bottom of the lakes, seemed to be incorporated into the food chain of these people, imperceptibly entering the human organism. When there is mercury in our body there are more options to suffer from autism, insomnia, depression and respiratory problems. Mercury accumulates in the kidneys, brain, nervous system, etc. And prevents the absorption of zinc, selenium, iron, etc. Mercury destroys vitamin B12 and often causes chronic fatigue, mercury is usually found in large fish, agricultural and livestock pesticides, dental amalgams, etc. Cadmium and chrome in the water:For its part, the presence of cadmium (Cd) in water usually causes prostate problems, bronchitis, infertility and vascular diseases such as hypertension. Chromium (Cr) is not far behind, affecting the kidneys, the liver and increasing the chances of lung cancer. Copper in the water:Copper is an essential trace element for humans, acting as a necessary cofactor for many enzymes and proteins, what spoils it is its excess, an accumulation of copper in our body causes damage to the liver, kidneys, anemia and intestinal irritations. Banana peel, in addition to being a cheap and highly available residue, has pectin hydroxyl and carboxyl in its composition, elements capable of adsorbing not only heavy metals but also organic compounds(Renata et. Al, 2009). Banana peel, when dried and ground to a very fine flour, has the ability to clean water contaminated with heavy metals effectively and cheaply.

5. METHODOLOGY

We can say that water is an important part of our lives, since it keeps our body and mind healthy, so it is essential to make sure we drink it daily and know how to purify this elemental liquid for our lives. It is necessary to delve into the absorption properties of the banana peel, as a solvent and as a potential bioadsorbent for the removal of heavy metals and any impurity of other contaminants. According to research carried out by a group of scientists in Brazil, mashed banana peels serve to remove (remove, erase, eliminate),heavy metals in waterriver.

It is known that rivers often harbor contaminants when they receive industrial or agricultural waste along the way and most of the cleaning and purification mechanisms are expensive, that is why we present the option of banana peel as an excellent alternative. Our city is surrounded by rivers and boats sail through them as a means of transport,

where many times the people who travel in them are not aware of avoiding throwing the waste of the food or drinks they drink into the river and the containers are made of plastic, metal, organic waste and thus increases pollution in rivers and lakes. The banana peel cleans the water of metals such as lead, copper and other metals and is also more effective, less expensive and healthier than current systems for our environment where we live. Banana skins, dried and pulverized, when mixed with contaminated water, clean it of heavy metals. A proportion of 5 ml per 100 of liquid is capable of purifying water with uranium, cadmium or nickel molecules by 65%. It's possible because the heavy metals have a positive charge that causes them to be attracted to the negative molecules in the banana powder after spending a week in the sun to dry. If the process is repeated, it is possible to purify the water completely (ECOLOSFERA, 2013). The banana peel transforms around 90% of its starch to sugars approximately 12 days after harvest; a content of up to 14.6% sugars on a dry basis has been found. The fiber content in the shell is 13% on a dry basis. The main components of the shell are: cellulose (25%), hemicellulose (15%) and lignin (60%) (CLAVIJO and MANER, 1974). In case you do not have a dispenser or a plastic container with purified water at home, here we leave you a good option and why not say a safe way or process that can help you enjoy the benefits that free water offers you. of heavy metals and other contaminants that the water you consume may contain. This filter, which we will detail its construction below, is very low cost, since most of the supplies and materials we have in our context and, more than anything, it is a filter that you can build at the moment so that you have no excuse that you do not have how to purify the water you consume and in this way have a healthy quality of life, the materials and supplies do not release any type of contaminants.

OBTAINING THE FLOUR FROM THE BANANA PEEL

The procedure consists of the following steps: Collect banana peel (we can collect from the consumption we make daily, since in our environment the banana is one of the number one garnishes that is consumed in our diet) Selection and chopping of the banana peels to facilitate drying and subsequent manual grinding (here in our environment there is the tacú with the handle that is used to grind and the families of our students do not have another means to pulverize in this case banana peel) The banana peel should be left exposed to the sun for a week (We can also dehydrate them in our kitchen ovens in case the days are cloudy, but it is necessary that the first days be exposed to the sun) The dried shells are crushed and sifted, leaving a very fine powder that is easier to use. In addition

to the banana flour, other selected filter materials will be used as a complement for the construction of the homemade filter.

CONSTRUCTION OF THE HOME OR ARTISAN FILTER:

The procedure consists of the following steps: Collection of materials: Curi (replaces the wooden or metal support), screws to secure, tutumas (replaces the containers or plastic container for the filter), sand, medium gravel, small gravel, cotton and others. Subsequently, the curi or tacuara support is assembled in the form of a ladder, where the tutumas are placed one below the other with the filtering materials. The elaboration or construction of this homemade or artisanal filter prototype is very easy to build and we will do it in the educational unit to which we belong as part of a content or topic to be developed, since we can integrate 3 learning areas in the construction of said filter (biology, physics and chemistry). It is very important to highlight the relevance of the construction of this homemade filter where we highlight the banana peel as the raw material for this project and we will make students aware of the different types of water pollution and we will focus on heavy metals. It is also worth mentioning that the lack of general and adequate information, especially on this issue of water contamination with heavy metals, makes our student population and therefore their families neglect the sanitation and treatment that they should give to the water they consume in their homes. The methods applied for the elaboration of the flour from the banana peel and the construction of the artisanal filter have been clearly from the place and the context where we live, the tutuma to say a fruit that after being harvested green, is left to rest for 24 hours, it is cut, pulped, sanded internally and in this case we have concluded with the use of the containers for our homemade filter, the curi in our environment is used to surround the canchones and we gave it the utility of support for the containers made of tutuma.

SCHEDULE

The following schedule shows us the different activities that will be developed, mentions those responsible, the material that will be used and the time in which the prototype of the homemade filter will be built. También se menciona las actividades a seguir para obtener la harina de cascara de plátano y el tiempo destinado para construir el prototipo del filtro casero y los materiales e insumos utilizados hasta pulverizar la cascara del plátano deshidratado.

Action Plan			
Activity	Actors	Supplies	Date
Organization of the team under the timeline	Student and tutor	Notebook Pencil Others	20/05/202
banana peel collection	Student and tutor	Bags Banana Peel	21/05/2022 to 23/05/2022
selection, washed and chopped banana peel, to proceed to the drying or dehydration of the skin exposed to the sun (one week, if cloudy 10)	Student and tutor	Containers Water Banana peel.	23/05/2022 to 31/05/2022
Location and transfer to the place where the materials and supplies for the construction will be collected prototype home. surrounding harvest tacuaras or curi, tutumas) tutor, parents of family Y student.	Student, tutor, parents of family and others.	Machete. Motorcycle (as means of transportation to the place where will cut the tacuaras) Tacuaras Saw Others.	05/24/2022 (while the shell is collected the collection site is located materials filter)
Collection of other filter materials (gravel, sand and others)	Student, tutor, parents of family and others.	Gravel Sand Cotton.	05/24/2022

Selection of the tacuaras and construction support where I know will place the tutumes as containers with materials and supplies filters.	Student, tutor, parents of family and others.	Saw Tacuaras. Hammer. Screwdriver Screws. Sandpaper Other	05/26/2022 (3 days)
Pulped of the tutumas for be exposed to the sun and subsequent drying of the same.	Student, tutor, parents of family and others.	Tutumas Nife Spoon Water Others	05/29/2022
Ground and sifted from the dehydrated banana peel. (only part of the first shells that were collected)		Tacu. Dehydrated Banana peel. Sieve	05/31/2022

The activities mentioned above were carried out on the precise dates that are registered in the previous schedule, implying that our project has been executed 50%, that is, up to the date May 31, 2022, we have managed to build only the homemade system that We will use as a filter prototype that will be accessible, it is low cost, but more than all the materials and supplies that have been used give us the ease of construction in the fastest way and with a very simple mechanism. With the investigations carried out on the absorbent properties of the flour from the banana peel, we will experiment with the filtration time and take different types of samples, such as the water from the rivers and the water that is consumed in the homes of the Fatima area. It is also worth mentioning that the time it takes to build this prototype of a rustic home filter, including obtaining the flour from the banana peel, is only 15 days. Here we are not counting the filtration time to obtain purified water in a certain percentage free of heavy metals.

6. RESULTS.

The results that we will describe below are based on the scientific reports that have been verified and the ancestral practices of the students' families. 4.1. In the construction of the prototype of the homemade filter. – In the construction of the homemade filter prototype, the ancestral knowledge and practices of our context or region where our John Fitzgerald Kennedy educational unit is located were taken as a reference, revaluing the traditions and reinforcing the cultural identity of our Yacuma Province in the construction of the utensils and containers that they used in the kitchen, such as: clay pots and in this case the shell of thetutumathat they used it as a container to drink the well-known chivé movima as part of the natural soft drinks of our region. With this clarification we can mention that one of the results obtained from this project was to be able to show the creativity that was had using the wealth that we have in our region, so that in this way the residents of the area observe the usefulness that we can give this fruit that in our midst we call the tutuma. In this opportunity THE "UNITED FOR WATER" TEAM participants of the water contest, resorted to the shell of the tutuma (to avoid generating expenses) that was used as containers to place the materials and supplies for ourhomemade filter prototypeand as a support to settle the containers we use the tacuaras or curi that we find both materials in our environment and when observing it already finished, I draw a lot of attention, due to the material from which it is built.

<u>In obtaining the flour from the banana peel</u>

For us and for our educational community, showing the benefits of this organic waste as an absorbent of heavy metals will have a very beneficial result.(BANANA PEEL),In this way, our students of the educational unit will get soaked and learn about the simple, low-cost, homemade procedures, but more than anything that can be replicated in the place where we find ourselves as a raw material that adsorbs heavy metals in the water. 4.3. The results that are intended to be achieved with the construction of the prototype of the homemade filter and the obtaining of the flour from the banana peel: - (Taking into account the scientific information and experiments in laboratories) Through our experimentation of pulverizing the banana peel and with the results obtained from the chemist Milena Boliono who carried out a study of contaminated water where she devised the purification of water with a simple banana peel, effective, biodegradable and easy to obtain as raw material and showing an alternative as a means of natural filtering of water and its recycling. We have also taken as a reference the research work of Caballero (2012) to say that our results will be favorable and optimal, since he used the banana peel for the

removal of arsenic in the water for consumption and was efficient up to 80%. in water samples and coincides with the research by Padilla, et. Al (2014) where they compared a simple and multiple filtration process to treat groundwater with a high iron index and the results were the decrease in iron and the stabilization of the PH of the water and they also mention that in a time of 15 days it is not possible to reuse it again due to saturation and decomposition of organic matter. Another result that we can mention is that after socializing this project with all the members of the educational community about how harmful heavy metals are in the water, they will become aware that it is not only to counteract or seek a solution to purify the water, but also of the environment where we live so that there is a detoxification of all individuals and the environment. It is intended that students interact and have an affinity with home chemistry, since in our environment we do not have a laboratory so that they can observe the results obtained through an organic solvent. We can also mention as a result the process of crushing and sifting the banana peel, we see that the particles become uniform and a fine powder is obtained, we begin it by rehearsing it at home with cloudy water only to experiment in this case the separation of visible organic residues , since in our environment we do not have laboratories to take samples and find out the type of contamination, we add water to a glass taking into account that for every 100 ml of water we add 5mg of banana peel powder, with this practice we want to observe and experience what has been proven in a chemical laboratory that the decontamination rate is at least 65% every time the water goes through this process, that is, if it is put into practice over and over again it is possible to reach high cleaning levels. With the application of this project it is intended to test in a homemade way what researchers from the Institute of Biosciences of Botacatu Brazil said that banana peels can work 8 Even better than conventional purifiers like aluminum oxide, cellulose, and silica, these materials have potentially toxic side effects and are expensive. (Industrial & Engineering Chemistry 2011), although in our environment we do not have these purifiers within reach, we are left with the results that using the banana peel as an adsorbent of heavy metals will give us.

7. CONCLUSIONS AND RECOMMENDATIONS.

Conclusions In our environment we need to obtain totally drinkable water without risks to human health and we require an additional and low-cost treatment that eliminates heavy metals. Implementing this type of solution in your life guarantees health and hygiene and this ingenious system that we have used has the main advantage that it has already been

implemented in other places, although not with the same materials and supplies, as we wanted to show the students and residents of the area that it is not necessary to have a lot of money to be able to have a filter that eliminates heavy metals and to be able to prevent diseases in our organism. Heavy metal pollution is a serious health problem due to its cumulative and silent effect, any measure we can adopt is necessary and even more so if environmentally friendly technologies are used, for that reason we must join forces to provide solutions and if they are economic and sustainable much better. It is very necessary to seek measures to mitigate its impact, especially that of heavy metals, the banana peel not only purifies the water of heavy metals but also stabilizes its PH. After observing the construction method of our filter prototype, we can say that saving is important, as much as health is, a home filter that is manageable, simple and efficient, like the one we have built with materials from the context, is of vital importance to have in our educational unit. With a homemade water filter it is possible to prevent diseases caused by heavy metals in the water and more, taking into account that you need to drink about 2 liters of water a day. The smaller the pore size of the filter element, the cleaner the water will be and the better it will be for people. They are also effective in eliminating a good part of the bacteria that are attached to these residues, giving you the opportunity to have better health. Having a homemade filter in our educational unit and in our homes and much better if it is an ecological filter with ahome water filtration.

It is a more than effective option to guarantee economic savings, since automatically there is much more awareness of the vital liquid and its reuse. if they are installed homemade or handmade water filters.

In our educational unit or in a home it is easier to have control over this aspect, since each person will be consuming clean water without ingesting chemical agents. After all, all liquid ends up in landfills or in the sea, and they are ecosystems that must be taken care of as well.

The product extracted from the banana peel, one of its main objectives in this project is to prevent diseases caused by heavy metals that are found in the water that is consumed daily. This filter with a rustic appearance will fulfill its function very well, the best thing about it is that it is built with homemade and everyday materials and we will use it as a homemade filter in the educational unit.

Recommendations

It is not easy to achieve the goal of cleaning the body if you have the environment against you with all its components, especially those caused by man. - Within the

recommendations we can say that, to improve and technify this idea, a small and automated system can be developed to be used in our educational unit and why not say in the homes of our students or in a central point of the area where they live to multiple families, the knowledge is there, what we need now is innovation and construction. It is very important to make the population aware of heavy metals, in this case lead has a strong effect on human health and not only this but also considerably affects the ecosystem where they accumulate, because although heavy metals can be found naturally in the environment, the speed and quantity in which they are generated by industrial activities simply exceeds the assimilation capacity of any ecosystem, which is why the contamination of this type of element is a reason for special attention and due Due to its high toxicity, it is extremely necessary to control its impact on the environment, since it has repercussions on the health and well-being of man. Another replicable way of this filter prototype is that it can be used on a larger scale as part of the drinking water treatment system, for which it is necessary to implement a continuous system with water storage before and after treatment. To those who come to read this project, motivate them to design and build homemade filters, much better if they are handmade ecological, using different filter materials, we can mention not only the banana peel, but also the cassava peel, coconut and others, to improve the quality of life of people who consume water contaminated with heavy metals. Use a clarifying agent, it can be activated carbon to eliminate the yellow color that the banana peel imparts to the filtered water. Raise awareness among the inhabitants of the area by making them aware of the harmful and toxic effects that heavy metals cause to living beings, for example: just a watch battery inside contains 30% heavy metals between lithium, mercury, etc. It can contaminate 600 thousand liters of water. To the Municipality of Santa Ana del Yacuma and other authorities of our province, we call for the implementation of a laboratory with equipment that allows us to obtain optimal and efficient results that guarantee accurate information on water contamination.

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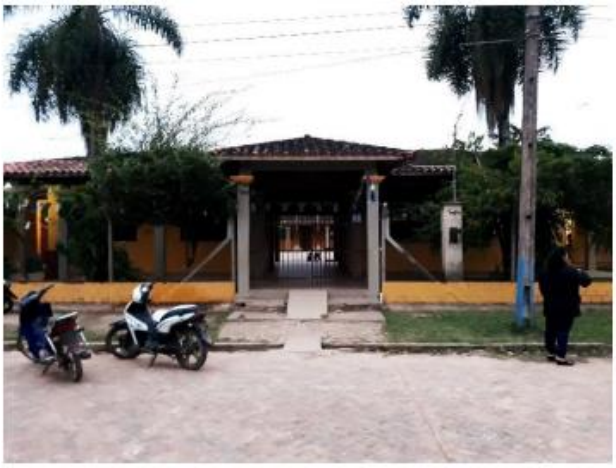
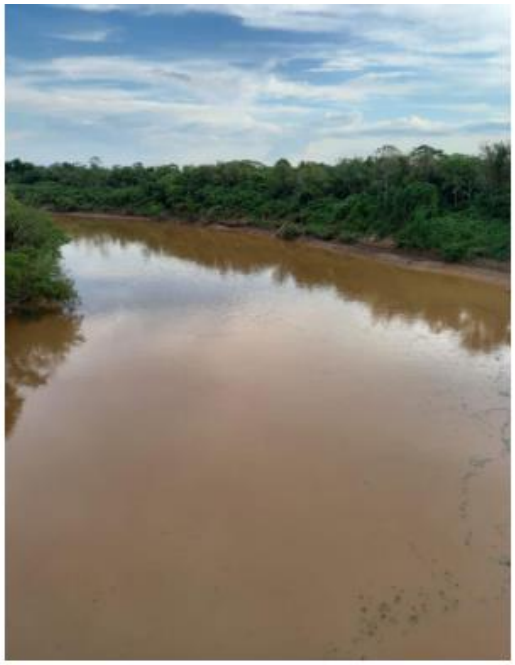
9. ATTACHED

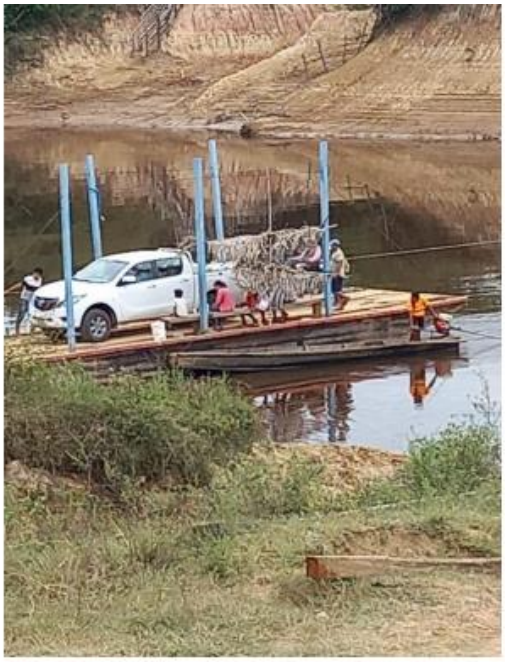


School “John Fitzgerald Kennedy”

Water tank



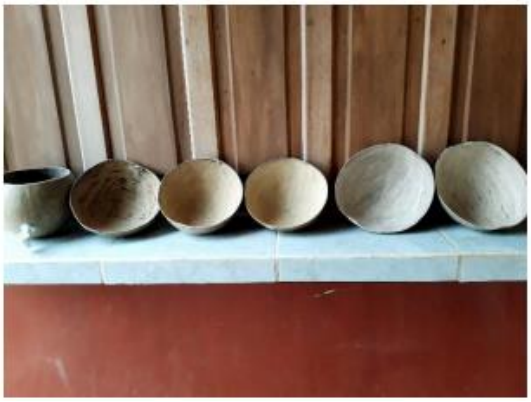
Rapulo River



Saint Lawrence River

Assembling the Tacuara Filter

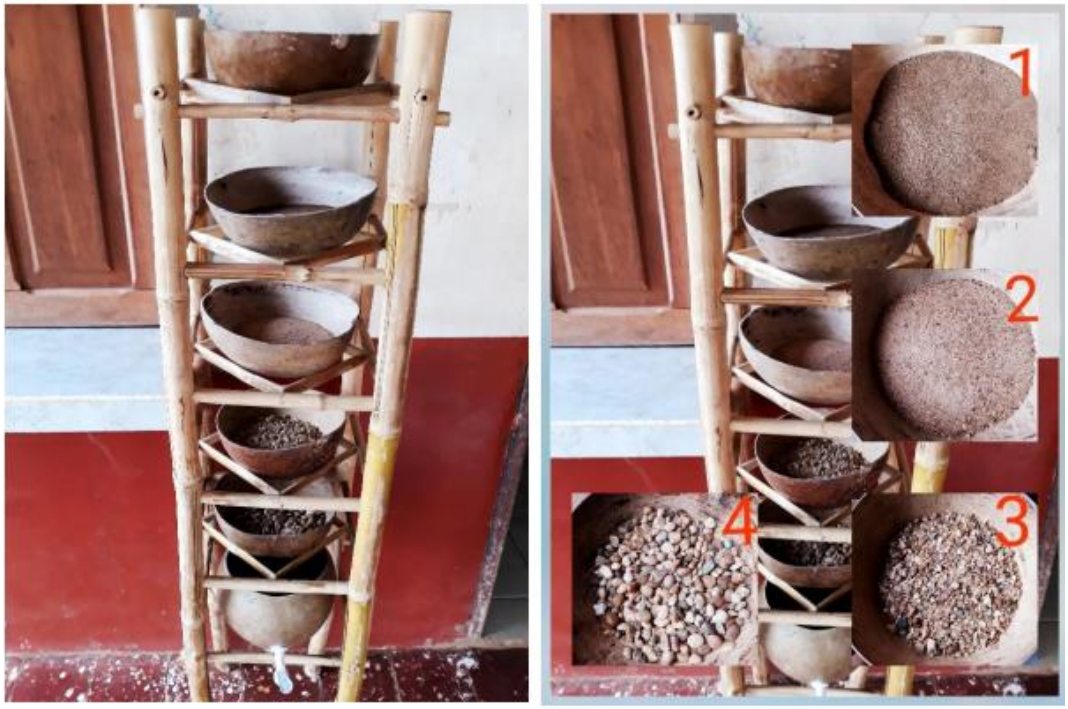
Sifting the flour from the Banana Peel



Receiver made with the shell of the tutuma

Banana peel flour

Filter Materials: banana peel flour, sand, small gravel and medium gravel



Prototype of Rustic filter