

Increasing Energy Efficiency by Cooking with Sunlight

By

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I. General Information:

Project title: Increasing Energy Efficiency by Cooking with Sunlight

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Organization: Damas of Chira

Location: Isla Chira, Costa Rica

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GEF Focal Areas: Land Degradation, Climate Change

Themes: Renewable Energy, Energy Efficiency, Waste Management, Fire Management

II. Project Summary

This project aims to supply 66% of Chiran households with solar cookers, meeting the GEF Focal Areas of Land Degradation and Climate Change, and also following the themes of Energy Efficiency, Renewable Energy, Waste Management, and Fire Management. The solar cookers operate by reflecting sunlight off of aluminum sheets shaped into parabolas by a metal frame, to concentrate the light in the center of the mechanism and heat objects placed there.

By using solar energy to cook rather than fossil fuels, local people will increase energy efficiency by using their abundant natural renewable resource (sunlight). This will reduce deforestation and land degradation by eliminating the need to use wood as fuel, and decrease the number of forest fires caused by wood-stove cooking. The project will also improve waste management/recycling efforts by using the naturally produced waste of aluminum cans for construction of the cookers; reusing the trash is a cost-effective way of obtaining materials. Finally, there is also a health benefit in reducing respiratory issues associated with woodsmoke.

Our goal is to supply 66% of the Chiran community (about 1000 households) with an operational solar cooker by the year 2025. To achieve this, we hope to create a working model from local materials, gather public acceptance of the cookers, and educate the people on their use.

III. Organization Information:

The 43km-long island of Chira is home to approximately 6,000 people and is filled with small beaches, cliffs, forests and plains. It has had electricity since 1987, when an electrical network was installed, and has had potable drinking water since 2000. Both are imported via a line to mainland Costa Rica. This line comes from various pipelines that run from Guanacaste to Chira. Before these installations, the people of Chira drew water from wells until the population grew exponentially and water became scarce. This was when they began to realize the pressure they were putting on natural resources and began to look elsewhere for other basic services.

The main source of income that the people of Chira rely on is fishing. This is a flawed economy, as the people are almost entirely dependent on a very sensitive resource. It especially became a problem due to poachers illegally fishing, leading to overfishing and near depletion of the resource, which has reduced the available income (Sanchez).

In the past, living conditions were also majorly affected by gender inequality. However, since the Damas de Chira came along in 2000, these issues have improved. The Damas of Chira is a group of women who focused on breaking away from the patriarchal, solely fishing community mindset that the island had before and started La Amistad, a community hostel that supports rural tourism. Tourism was an industry previously unexplored by the men of Chira, but these women recognized that relying only on fishing was not sustainable. Now, they are one of the main providers of the economic resources that the island uses, and also are instrumental in decision-making. Due to the Damas de Chira, the livelihood of the inhabitants of Chira has majorly improved (Sanchez).

Although prospects have improved for Chirans thanks to the Damas, waste management is still a problem. Currently, the people of Chira dispose of trash by burying, burning, or placing the trash on the land or in the ocean. Recently, the Damas have helped to create a Recycling Center on the island in the hopes of providing Chirans a permanent and reliable location for trash to be effectively disposed of and also provides the opportunity to recycle (Indiegogo).

IV. Project Justification

As a rural, isolated island community with a growing population and lack of reliable access to both monetary and physical resources, Isla Chira is a community in need of aid. The Recycling Center is still in its infancy- many of the island's inhabitants still dispose of their waste by burning it in piles, creating harmful emissions and negative health effects (Indiegogo). Although an exact estimate of the amount of fuelwood Chirans use is not known, similar rural communities use an average of 4.42 tons of fuelwood per community per year. If the people of Chira can use the solar cookers (which several members of the Chiran community already use effectively), they will cut down far less trees, decreasing deforestation rates (Miah et. al).

The parabolic solar cooker weighs about 5 kg and is portable and easy to use. The solar cooker has a low production price and produces 175 W of thermal power which can cook a meal for two people in about two hours (Aramesh, et al., 2019). Solar cookers are very energy efficient because of their ability to save fuel because they only use the energy of the sun. Another benefit of the solar cooker is it can help reduce pollution and deforestation from fires and its use for outdoor cooking is especially helpful when the amount of attainable fuel is low or when the risk of a forest fire is high (Singh, et al., 2012).

Community participation will come from the locals who already have the cookers and have a working knowledge of how to build, use, and understand them. They will educate those in need of the solar cookers on their construction and their safe/efficient

use, which will allow the community to run the project sustainably without external education. Only some of the materials (nails/clips, potentially some of the metal needed for the frame) will come from outside the island.

V. General Project Objective:

Our general objective is to limit Land Degradation by increasing Energy Efficiency and the use of Renewable Energy by ensuring that 66% of Chiran households (about 1000 households) have a solar cooker by the year 2025. This will be done by collecting scrap metal and aluminum cans from the Recycling Center to construct the cookers, which is both cost-effective and provides an alternative use for the metal waste. Participants will be instructed on the construction, use, benefits, and safety procedures of the solar cookers by members of the community who already have and use them.

VI. Logical Framework:

Specific Objectives	Main Results	Impact Indicators	Main Activities
1. Create a working model made with local materials	Proof that cooker is functional/sustainable with only local materials	a) Cooker able to boil water. b) Quantity of aluminum cans that can be harvested from waste	Construction of cooker
2. Public Acceptance	Households willing to use solar cookers as alternative energy source	Survey estimating willingness	a) Demonstrations of solar cookers in use b) Gather consent
3. Education on Use	a) Knowledge of how to obtain materials/build cookers b) Knowledge of how to use cookers/benefits c) Knowledge of Safe Operations/Risks	a) Working partnership with Recycling Center b) Attendance of classes taught by locals who have cookers already	Classes educating consenting participants
4. Achieve goal by 2025	66% of households have solar cooker by 2025	Number of households with cookers	a) Collaboration on construction b) Keep record of households with cookers

VII. Literature cited:

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