

Production and Dissemination of Solar Water Heaters, Côte d'Ivoire

Themes

- ★ Renewable Energy
- * Innovative technology applications
- ❖ Technical capacity development
- * Education (MDG 2)

PROJECT DATA

Name: Training for young artisans in the production and dissemination of solar water heaters

Implementing Organization: Opportunities Industrialization Center (NGO)

Location: urban and rural areas of Côte d'Ivoire

SGP contribution: \$22,128

Start Date: July 2001

ENERGY OVERVIEW

Energy Resource: passive solar

Technology: solar water heaters ("auto-storage" and solar collector models)

Application: water heating

Sector: public (schools, health centers), domestic

Cost of equipment/installation: \$280 - \$430 per unit produced locally (compared to \$1,000 - \$2,000 per imported unit)

Capacity: 2 m² reflector; heats 200 liters water/day (meets the needs of an 8-10 person household)

Number of People Served: 30 young people trained to produce them, 15 solar water heaters constructed out of a planned 30, solar water heaters installed in 10 public facilities

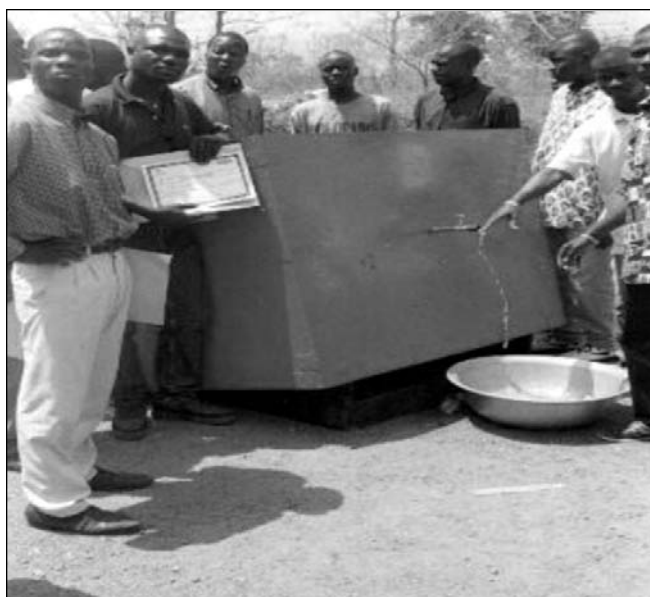
BACKGROUND

In Côte d'Ivoire, most schools and health centers in urban areas use electric solar water heaters. However, these are often out of order, and when they are working they consume large amounts of electricity: approximately 2kW to heat 150 liters of water. In rural zones where electricity is not available, firewood is used to heat water. Yet, Côte d'Ivoire is well-endowed with solar energy, and using passive solar heating can meet hot water needs while reducing the use of firewood and electricity. However, an imported solar water heater costs approximately \$1,000, which is too expensive for most users. Developing the capacity to produce water heaters in-country at a lower cost can make it possible to distribute this technology more widely.

PROJECT DESCRIPTION

Overview

This project developed local capacity in Côte d'Ivoire to produce solar water heaters that cost less than imported models. The solar water heaters can be used in community centers, health clinics, schools and eventually in individual homes.



Locally-manufactured solar water heater, auto-storage model (Côte d'Ivoire).

Implementation

The grantee, the Opportunities Industrialization Center (OIC), has formed a cooperative of 30 previously unemployed young people, and trained them to produce solar water heaters adapted for local use. These young people had prior training in metal work, and through this project learned the specifics of building solar water heaters. They have produced 15 prototypes so far, out of a planned 30 units, and these have been placed in institutions such as schools and health centers. The project thus helps young people learn a trade and increases their opportunities to generate income. After they complete their training, the members of this cooperative are expected to form their own micro-enterprises and train other apprentices.

A second phase of this project, currently in the planning stages, will involve several micro-finance organizations as partners. These partners will help integrate solar water heaters into the design of new homes being built by Habitat for Humanity in rural and peri-urban zones. The cost of the water heater will be incorporated into the price of the house, and the micro-credit agencies will provide access to credit for buyers.

Technology

Two models of solar water heaters are being built: the so-called "auto-storage" model, and the solar collector model. The first is the simplest to construct, and is suited for rural needs. It was used primarily in the first phase of the project. The second model is more complicated, and is better suited to urban needs.

"Auto-storage" model: This model consists of a 200 liter water reservoir painted black and placed in the center of a semi-parabolic reflector. The water is warmed by solar rays directed towards the sides of the dark reservoir. The whole apparatus is placed inside a wooden case that is covered with a glass pane.

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to retain heat and tilted at an angle of 15-20 degrees to receive the maximum amount of sunlight.

Solar collector model: This model consists of a large glass pane covering a black water cistern that absorbs solar energy. A thermosiphon makes the warmed water flow from the area covered by the pane to a thermally insulated storage area. Particular adaptations made to reduce equipment costs and meet local needs in West Africa include: local fabrication of thermosiphon tubes by artisans trained in metal-working; use of a special vegetable fiber found in coconuts to insulate the storage tank; and construction of the insulated storage tank, which is normally imported, using locally available recycled materials. For example, a 100-liter oil drainage tank can be cut in two to create two 50-liter storage tanks. The use of recycled materials reduces the cost of this equipment by 30-50%.

Environmental Benefits

Global: For each 200 liters of water heated using solar energy, 50 kg of firewood is saved in comparison to heating water over a "3-stone" fire. If an improved stove is used, approximately 16 kg of firewood is saved. If solar water heaters replace electric ones, such as in urban areas, then fossil fuel-powered electricity use is avoided. In all cases, greenhouse gas emissions are being reduced.

Local: By reducing dependence upon firewood in rural areas, local forests and ecosystems may be under less pressure, which could result in local environmental improvements.

Livelihood Benefits

Health: Access to hot water is critical for maintaining sanitary conditions. The use of solar water heaters may improve hot water access in urban areas, where electric water heaters in health centers and schools are often in need of repair, and in rural areas where only a limited amount of firewood is available. When firewood use is avoided, smoke inhalation may also be reduced, which has additional health benefits, particular for women and children.

Employment: The 30 young people involved in this project are not only receiving training to construct the solar water heaters, but also are being assisted in forming their own businesses.

National Benefits

This project is helping improve access to affordable water heaters in Côte d'Ivoire by designing locally adapted models and by building local capacity to construct them. If these models indeed prove widely usable, this can help Côte d'Ivoire conserve foreign exchange by avoiding the import of solar water heaters, and generate greater economic activity inside the country.

Beneficiaries

The project beneficiaries are the young people employed by the project and the potential users of solar water heaters who could not previously afford the imported versions, including institutions such as health clinics and schools.

Capacity Development

A key element of the project involves building the capacity of young artisans in constructing solar water heaters. The grantee has also produced a manual, including diagrams, for how to construct the heaters. In addition, participation in the project's cooperative will improve the capacity of the trainees to manage their own enterprises later.

Partners

So far, the main partners are SGP, the Opportunities Industrialization Center, which has been designing the technology and training young artisans, and the Fund for the Development of Professional Training, which has supported the capacity building aspects of the project through substantial co-financing. In the next phase of the project, new partnerships are expected to be formed to expand the impact of the project. Micro-finance institutions, such as the Credit and Savings Cooperative of Côte d'Ivoire, and organizations building new homes, such as Habitat for Humanity, will be important partners to enable the project to integrate solar water heaters into the domestic sector.

LESSONS LEARNED

Environmental Management

Adaptation of existing technology to local conditions has allowed artisans to produce affordable solar water heaters. The project thereby promotes sustainable livelihoods, improves sanitation, reduces air pollution and carbon dioxide emissions, and decreases the pressures on the local environment caused by dependence on wood for fuel.

Barrier Removal

Financial: At least on a small scale, this project appears to be successfully reducing financial barriers to the use of solar water heaters in Côte d'Ivoire. The use of local materials, and in particular recycled metal, has been shown to reduce the cost of constructing solar water heaters. The project is already planning for the next step in reducing financial barriers, namely the introduction of credit schemes to enable domestic users to purchase them.

Technical: This project has also sought to reduce technical barriers by developing locally adapted models of solar water heaters, and by training young artisans to make them.

Scaling Up

The project's approach – building a cooperative of young trainees – may be particularly helpful for scaling up. The core group of artisans trained in the project's cooperative are expected to form their own micro-enterprises, and also train other apprentices. According to the SGP national coordinator, the creation of this "cooperative-school" is a key step toward improving the technology and its construction in order to prepare for larger scale manufacturing operations.

The current phase targets institutions as users, while the next

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phase seeks to establish mechanisms to disseminate the solar water heaters in the domestic market.

SOURCES CONSULTED

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