

Solar Household Energy, Inc.

Excerpts from:

THERMAL CONSTRUCTION AND ALTERNATIVE HEATING AND COOKING TECHNOLOGIES

Final Report

Bureau of Applied Research in Anthropology

University of Arizona

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Project Description

The Thermal Construction and Alternative Heating and Cooking Technologies Project was funded by the Arizona Department of Environmental Quality (ADEQ), with support from the U.S. Environmental Protection Agency, to build upon successful collaborative relationships to improve environmental quality in communities located along the US-Mexico border in the cities of Nogales, Arizona and Nogales, Sonora (“Ambos Nogales”).

The principal goal of this project was to assess approaches for reducing emissions generated by the use of wood and other combustible materials as fuel for household-level heating and cooking in Nogales, Sonora. To achieve this goal, researchers from the Bureau of Applied Research in Anthropology (BARA) at the University of Arizona undertook assessment, demonstration, education, and training activities in two colonias of Nogales, Sonora over the period from July 1, 2005 through August 20, 2006...

This project would not have been possible without the support of ... many individuals, groups, organizations, and institutions in the states of Sonora, Mexico and Arizona, USA. More than 350 people took time from their busy schedules to participate in interviews, workshops, and focus group sessions. We personally thank the following individuals and groups for their special contributions: Darwin Curtis, Camille McCarthy and all the staff at Solar Household Energy, Inc. (SHE-Inc.) for coming to Nogales to share their knowledge and encourage the research team members and residents in our efforts to introduce solar HotPots in Nogales and for donating HotPots for use in this project...

Research

Research activities began in Colonia Bella Vista, of Nogales, a 30-year-old colonia that includes both long-term residents in established houses and families living in unfinished homes of scrap material.

Residents consistently expressed interest in more efficient and less-polluting cooking and heating technologies, largely because these technologies also help to save money, but also because of the health benefits associated with improved air quality and reduced exposure to open fires and smoke. Based on input from interviews, household visits, and focus groups, the research team selected three energy-efficient, low-emissions stove designs: (1) solar ovens, (2) wood gas stoves, and (3) rocket elbow stoves. As other studies have shown, it appears unlikely that new stove designs will entirely replace existing stoves. Families in Nogales tend to use a variety of stoves so that they can remain flexible to changes in fuel price and availability, seasonal heating needs, and different cooking needs. Nonetheless, many families consistently used the low-emissions alternatives introduced in this study, demonstrating that technological change at the household level can contribute to reducing air pollution

According to the United Nations Development Programme, “(I)ndoor air pollution. . . accounts for a greater share of lost life expectancy in developing countries than malaria, but receives little attention” (UNDP 2005: 6). Wood is used for heating and cooking throughout the world, primarily because it is an available, affordable, and easy to use fuel source. The United Nations Food and Agriculture Organization (FAO) estimated in 1983 that three-fourths of the developing world’s population depended on wood and other forms of biomass for heating and cooking, including surprisingly large numbers of people in urban areas (FAO 1983). This [Nogales] research differs from many other investigations of appropriate technologies because the participating communities are in an urban setting. [It] revealed that the promotion of alternative technologies can yield environmental, health, and economic benefits for urban households.

Operations

The first workshops were held in December, 1995 and January, 1996. The second series of workshops were held in February and March, and the final series were held in May and June. Having the workshops at three different times of the year allowed researchers to observe the impact of weather conditions on initial stove acceptance. Since all of the solar workshop participants had previously attended an introductory workshop, the vast majority of them had already decided that they wanted to use a solar HotPot. (See Fig. 3.1 for details.)

Solar stoves are emissions-free stoves that require little to no maintenance and no fuel purchasing or collection. Solar energy is available year-round in Nogales, though insolation levels during the months of November, December, and January fall below the ideal 4 kWhr/m²/day. SHE-Inc was eager to contribute to this project and had connections to a manufacturing plant in Monterrey, Mexico from which it was relatively easy and inexpensive to ship the stoves.

Solar cooking is similar to conventional cooking but does require some adjustment. Food should be prepared early in the day to take advantage of full sun, which means that cooks often have to prepare for lunch in the morning and dinner at midday. Once food is placed within the HotPot, however, it requires no additional supervision and can be left for hours without risk of burning or spoiling. The HotPot can be used for almost all of the foods that Nogales residents eat regularly, including baked goods, but can not be used for frying. Cooking times vary based on the amount of sun, but meat can consistently be cooked in less than three hours on a day with sufficient sun. During the summer months in Nogales, it is possible to cook two or even three separate meals in the HotPot in a single day. Because solar stoves require no fuel, initial costs are recuperated quickly.

The solar HotPot ...cannot be used for frying, though it can be used for heating, boiling, water purification, and baking. Table 3.4 shows that many common foods were consistently cooked in the solar HotPots during the study period. In addition to these common foods, household cooks experimented with a wide range of other foods including desserts, baked goods, tamales, meatballs, fish, Chinese food, and a variety of meat dishes. Household cooks in Nogales, Sonora seemed to adjust fairly

easily to the solar cooking process, Household cooks are also concerned about healthy eating and tended to appreciate that solar stoves did not require oil and fat for cooking.

Findings

An important finding is that leadership of these hands-on workshops could quickly move from outside experts to local users. For example, the first solar workshop was conducted by a representative of Solar Household Energy, Inc. (SHE-Inc), the organization that has designed and disseminated the solar HotPots. The next two solar workshops were conducted by SHE-Inc and BARA researchers. The final workshop in Bella Vista was solicited by solar users who wanted to share the technology with their friends and neighbors. The research team agreed to conduct the workshop on the condition that the solar users themselves lead the training. This community-led workshop was excellent, and while researchers still helped to facilitate the training, leadership from community members probably helped to improve acceptance and understanding of the solar stoves and demonstrated that local solar users can help to disseminate the technology in the future.

Widespread use of solar HotPots would greatly reduce the amount of wood burning in Nogales. (See Table 3.5) Households that typically combine gas and wood burning use open fires and wood stoves to prepare slow-cooking foods such as beans and menudo. Beans, a staple in Nogales, take up to five hours to cook on a wood stove and consume a considerable portion of most wood user's firewood. While gas cooks much more rapidly it is still much more expensive than wood, so people tend to make slow cooking foods with wood

This project focused on evaluating potential alternatives to wood burning in Nogales. The research team also considered whether there exists the necessary social and financial resources to support the large-scale adoption of alternatives. Several solar HotPot users expressed interest in selling the pots to friends and family and the micro-credit organization BANCOMUN expressed interest in providing credit for small-scale vendors. The logistics and costs of ordering solar HotPots from Monterrey, Mexico would be manageable for a small-scale enterprise. BANCOMUN would also consider providing financial assistance to help people obtain an ecological stove.