



***The Improved Stove
Certification Center at
Zamorano, Honduras***



Project Proposal and Objectives

- The proposed project targets the installation of a certification center for improved stoves in Zamorano University by accomplishing the following objectives:
 - Evaluate heating efficiency by type of fuel and pollution production of five of the most commonly used improved stoves, and a normal stove in campus.
 - Test the same stoves' efficiency and pollution production within households at Yeguaré Valley.
 - Create a certification standard on stove construction materials, to be used for projects and direct sales in Guatemala, El Salvador, Honduras and Nicaragua.

Progress Update

- A center was built to identify the most effective and least polluting stoves based on economic and environmental variables. The structure has 6 adobe cubicles 3 x 3 meters, with one door and one window, to simulate living conditions.
- There were some delays in building the center since suppliers ran short of construction materials due to a law passed by the Government (no wood could be harvested for new buildings). The design was changed to a metal structure and tin roof and completed August 2009.
- AHDESA acquired the stove models to be tested, and installed them while the structure was completed.



Progress Continued

- Stoves are first built and tested in the center and then built and tested in the field (in 5 case houses—2 more are being installed now).
- The technical component of the testing process itself will be an adapted version of the technical know how of the scientists in Aprovecho. Aprovecho is a non-profit research and education center based in the US. Two representatives from Zamorano visited Aprovecho in March 2009 and spent a week in the training center, learning their testing procedures.
- Aprovecho also has protocol development information which will be used and adapted for the preparation of a certification protocol for the most commonly used stoves in the C4 countries (Guatemala, El Salvador, Honduras and Nicaragua).

Testing Procedures

- Seven types of stoves are being built in coordination with AHDESA in seven community houses where the cook is willing to substitute their traditional stove for an improved one.
- The stoves that are being evaluated are Justa, Justa 2x3 (Proyecto Mirador), Eco-fogón, Onil, Malena, Patsari and the Incahuasi.
- There are three protocols for testing that Zamorano will be using (based on Aprovecho) 1) Water boiling Test (WBT), 2) Controlled Cooking Test (CCT) and 3) Kitchen Performance Test (KPT).

Testing Example: Water Boiling Test

- The Water boiling test consists of three phases that determine the stoves ability to:
 - bring water to a boil from a cold start;
 - bring water to a boil when the stove is hot; and,
 - maintain the water at simmering temperatures.
- The first phase of the WBT is to start a fire and take 5 litres of water to boiling point. A measurement device is placed to assure that all samples reach the same temperature. The wood is weighted, as well as the paper used to start the fire and the pot full of water. The equipment is connected to the Portable Emissions Measurement System (PEMS).
- After all elements have been weighted and recorded, the fire is started.
- The emissions collection process is straightforward, the hood and fan collect the smoke from the stove. A flow grid system in the tube measures the velocity of the smoky air. The sample line and pump draw off a sample so the concentration can be measured by the sensors in the sensor box; while, the computer displays and records the flow and concentrations in real-time. The software analyses the recorded data to report the performance of the stove based on the mass of emissions measured.
- The sensors box reads the amount of CO, CO₂, particle matter (PM), flow temperature.
- The pressure transducer sends a voltage signal to the computer based on the pressure drop measured across the flow grid. This signal is easily calibrated on a daily basis with an onboard analog pressure gage. The flow grid system of measurement provides a low pressure drop through the system and a strong differential pressure signal.
- The temperature sensor provides a voltage output for use in calculating the volumetric flow of emissions, all of which are recorded.
- After the water reaches boiling point temperature, the burning wood is taken out of the stove, fire suffocated, and the leftover pieces of wood and charcoal are weighted to determine used fuel. The pot with water is also weight and data recorded, finalizing the first phase of the WBT, and ready to start the second and third phase.
- This test is done three times for each type of fuel and for each type of stove; with the data, the efficiencies of stoves, types of fuel, time for heat transfer, etc. will be defined, and parameters established for the certification of stoves.

Tests in the Center



Emissions are evaluated; Zamorano acquired the Portable Emissions Measurement System (PEMS) to measure CO₂, CO and PM emissions; and the Indoor Air Pollution Meter (IAP) to measure indoor concentrations of CO and PM.

Tests in the Field

- Field tests began in 5 homes in August 2009 and will last over the course of 1 year.
- Families are agreeing to the course of testing in return for a clean stove



Next steps

- An improved stove can use 60% less firewood, has an outside chimney and can improve cooking times. Regardless of the efficiency of some improved stoves there is not a clear policy of how to duplicate this kind of projects or what stove specifications to use.
- Currently, many NGOs and Government programs are supporting the use of improved stoves, but there is no certification about the quality of them.
- Improved stoves are used by indigenous populations and very poor people, so it is a moral issue to secure the quality and assure spare parts and replacements in case of failures. Therefore, there is a need for improved stoves to be certified in order to assure their benefits are fully taken advantage of.
- For the process of Certification, Zamorano is working closely with the National Standard Organization (OHN) to develop protocols.
- The vision of Zamorano is to become a Regional Evaluation Center for Latin-America.



Sources of Information

- Marta Rivera from Fundación Solar visited and evaluated progress May 2009.
- Zamorano sent a follow up report Sept 2009
- Thayer spoke with 3 main representatives by phone Sept 2009—Arie Sanders, Career Director, Gracia Lanza, Professor in charge of the project and Tim Longwell, Professor in Forestry