Honduras

Total population*	**8, 303,771**
Urban (%)	**54**
Rural (%)	**46**
%Population that uses biomass*	**54.46**
% rural**	**89.1**
% urban**	**24.4**
%Population with access to LPG and electricity**	**39**
Number of households that use biomass**	**1,049,069**
Number of annual deaths from HAP (WHO 2012)	**3,001**
Number of annual child deaths from HAP (WHO 2012)	**290**
Price of LPG (25 lb tank)	**13 USD*** **
Price of electricity (Kw/h)	**0.124 USD*** **
Average consumption of firewood per year	**7.83 m3*** **
Average price of Firewood per year	**217USD*** **

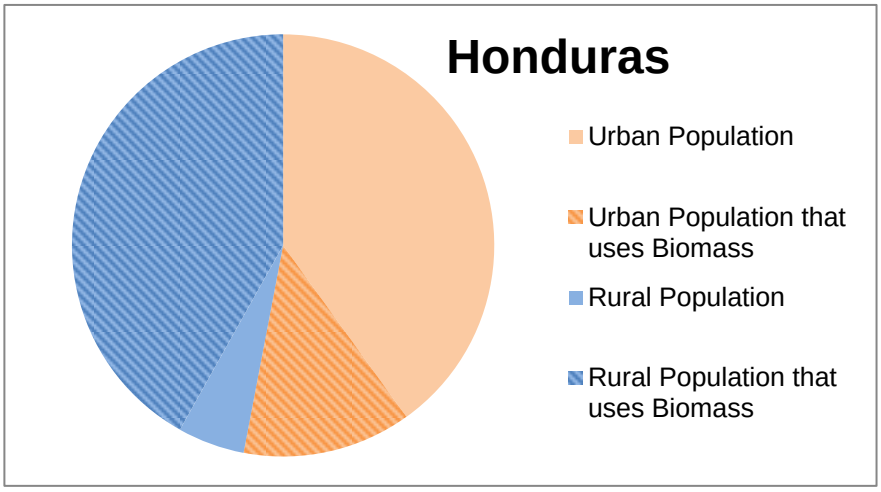
* Source: censo 2013 del INE. http://www.ine.gob.hn/

**GACC (Global Alliance for Clean Cookstoves) web page

***February 2016

WHO: World Health Organization Global Health Observatory data base

HAP: Household Air Pollution



History of Efficient Cookstoves

Number of efficient cookstoves distributed so far	**210,000**
Type of technology distributed so far **Justa (40,000), Justa 2x3 (85,000), Envirofit (80,000) and others**	
Cost of the technology	**80- 190 USD**

Technology performance assessment Where was it evaluated? **El Zamorano Laboratory**	Type of cookstove	**Justa**
	PM concentration in kitchen	**114 µg/m^3**
	CO concentration in kitchen	**0.2 ppm**

National Program

Is there a national program? **Yes**	Since when? **2014**	Government goal: **400,000 stoves by 2014-2018**
Type of technology to be distributed	**Justa and Envirofit stoves**	
Responsible from the government program	**Rocío Tábora. Presidency Director of Planning, Budget and Public Investment**	
Other stakeholders	**$4,624,620 support from IDB SREP and FOMIN with a goal of 75,000 cookstoves World Bank Fundación Hondureña de Ambiente y Desarrollo Vida Fundación para el Desarrollo Integral de Honduras (FUNDEIH) GIZ Proyecto Mirador**	
Universities involved	**Universidad Agrícola El Zamorano. certification laboratory**	

Stoves models and organizations working in Honduras[1]

In Honduras, ICS projects have an established tradition. As a result of a health campaign conducted by the Health Ministry in the 80s, many Hondurans have stoves with chimney; there is also a clear preference for stoves with continuous plancha so the pots are not in direct contact with the fire (so pots don´t get black). For these reasons the main stove disseminated in the country is a type of JUSTA model. The JUSTA stove has multiple variations, but it fulfills the cultural needs of Honduras: (i) a continuous *plancha*, so pots and pans are clean and not exposed to fire, (ii) an area for making tortillas, (iii) an area large enough to cook other meals over the *plancha, and iv) a* chimney to eliminate the smoke from the kitchen. The combustion chamber has a rocket elbow and the entrance fits larger pieces of firewood, which is attractive to rural population and women in general, because it does not require full time attention. It is very well accepted, and introduction of other stoves has proven difficult. There are two main organizations working with JUSTA stoves in Honduras: ADHESA and Proyecto Mirador.

ADHESA is a local NGO that started ICS activities in the 90s. This NGO works with several models of JUSTA stoves: in-situ models made out of cement or bricks, as the JUSTA 16x24 –which is the most

[1] Source: What have we learned about Household Biomass Cooking in Central America? ESMAP, The World Bank, 2013

popular to date-, to portable models made out of metal. Recently, AHDESA developed a new metal stove named COPAN that has been well accepted by users.

The JUSTA stove achieves 48% savings in firewood use, 73% reduction in PM2.5 and 87% reduction in CO concentrations with regards to traditional fires. The cost of the stoves is in the range of $120-165 USD depending on the specific characteristics. ADHESA has manufacturing capabilities, but their main dissemination strategy has been to provide training to other NGOs and individuals in the construction of the Justa stove. AHDESA works also closely with several international NGOs and donors. Until now, they have trained 22 NGOs and individuals, with an estimated 40,000 stoves disseminated. The stoves used to be given for free, but increasingly other business models have been explored, particularly as a result of a collaborative project with GIZ, and currently it is expected that people pay at least 40% of the stove cost.

ADHESA works with two USA NGOs, Trees, Water and People in Colorado and APROVECHO in Oregon for technical assistance and funding. In 2005, ADHESA received the Ashden Award. In Honduras they work as well in partnership with GIZ Honduras.

ADEHSA has manufacturing installations for the production of several ICS stove models. They generally work with international organizations, and donate the stoves, providing training. There is an effort to sell stoves, and people can come and purchase them, but not in quantities to support a manufacturing business. Currently, they do not have a program and the production is marginal.

ADHESA's main concern is their impossibility to supply users in remote regions with the spare parts of the stove. As the plancha surface is in direct contact with the fire, it needs a patch to reinforce it. Sometimes the patch last only 6 months in place, when the patch is lost, the plancha deteriorates in the spots where fire hits directly. Their main model has a life span of 3-10 years, depending on the maintenance.

ADHESA estimates that 55% of the cost is the stove itself, 15% the follow up, 15% administration costs, 8% research and 7% the cost of the supervision requirements of their partners.

Justa 16x24 in situ

Copan stove

Oven

Justa 2 X 3 (Proyecto Mirador)

Proyecto Mirador is an NGO trained by ADHESA in the Justa stove. They developed their own model called Justa 2x3 and started their work in the Santa Barbara region. The JUSTA 2x3 is built in-situ, saves 55% of firewood and has a production cost estimated at 77 USD (i.e., the direct cost of building the stove without accounting for indirect project costs). Proyecto Mirador achieved Gold Standard™ Registration in June 2010. Till now, they have built 85,000 stoves in 10 years and the aim is to achieve 100,000 stoves by 2016. Stove users provide the local materials (with an estimated cost of $USD 17) and the stove is installed for free (implying a direct subsidy of $USD 60 from the project developer).

The process begins with request from groups of women who have heard about the stove and the program. These requests have to provide their names and identification numbers. When these solicitations are received at the Proyecto Mirador office, a meeting with mayors and village leaders is arranged with all interested parties in the community to explain the benefits of the stove, the materials needed, and to set a date for construction in each village. After the meeting a house by house plan for implementation is developed. Proyecto Mirador provides training to users and keeps a close monitoring and evaluation of the stoves installed. Stoves come with a 5-year warranty and are installed by five contractor companies, in charge of the construction of the stoves, the training and the supervision of the stoves every 1, 7 and 14 months, with an aggregate annual production capacity to build between 30,000 and 35,000 stoves. Production of *planchas* and chimneys is centralized. Dissemination is done on a community by community basis, based on meetings with local leaders and word-of-mouth advertisement. Every stove is located by GPS system. With an estimated reduction of 2.7 tons of CO_2/year per stove and a lifetime of 5 years, carbon prices of $10-20/ton should allow to cover a significant part of the program's costs. The project is estimated to generate 270,000 tons CO_2/yr when it reaches full-scale operation. They already received revenues in exchange for the carbon credits.

General Attributes of Selected Stove Programs in Honduras

Attributes	**ADHESA Justa stove**	**Justa 2x3**
Main Features Stove Disseminated	In situ (brick and a metal *plancha*) and portable (metal) stove with chimney. Rocket combustion chamber.	In situ (brick and a metal *plancha*) with chimney. Rocket combustion chamber
Implementing agency and main partners	ADHESA GIZ Honduras Tree, Water and People	Proyecto Mirador IADB
Program Duration	1998-present	2004-present
Achievements (stoves and also other impacts documented)	More than 30,000 stoves distributed 22 NGOs trained Five different models.	85,000 stoves distributed
Approach	Train individuals and NGOs in the Justa stove. R&D on new models.	Adapted Adhesa Justa stove into Justa 2x3. Work together with communities. Includes M&E process
Challenges	ADHESA has a good quality control in their stoves but can´t guarantee the stoves built by those trained by them, especially because it is difficult to find the “plancha” outside the capital city.	The in-depth training and follow up makes it difficult to move the project to other regions.
Financing and subsidies/pricing	AHDESA has worked for the past years with GIZ, which promotes the Justa stove and gives a US$7 per person per house subsidy to buy the stove. People have to pay at less 40% of the stove price. In other cases ADHESA trains technicians that charge a fee directly to people to build a stove. Other stoves are given for free by donors.	El MIRADOR provides most of the cost of the stove. People provide local materials. The project is certified by the Gold Standard and joined the voluntary carbon market.
Market Development	AHDESA has good partnerships with donors like GIZ and Trees, Water	El MIRADOR works with written agreements by communities. The project is explained and users are

	and People. Together they are seeking product diversification (e.g. by building bread ovens) and mechanisms to assure the supply chain for Justas as well as the quality of Justa stoves when built by third-parties.	trained in stove use and maintenance. Stoves are monitored every three months, and the whole project assessed every two years.
Improved stove identification and development	AHDESA has been working with different stove models to solve the problems identified. For example to increase the duration of the “plancha” due to direct fire. They are working in the creation of a stove supply chain, to have spare parts accessible to users.	Trained by ADHESA in the installation of the traditional Justa stove. El MIRADOR changed the stove dimensions to make it easier to build the “plancha” from the larger pieces of iron commercially available.
Communication/ Promotion	Promotion is not done to people in extreme poverty. AHDESA promotes the stove through technicians trained by them. About 50% of the program costs go to socialization and promotion. The idea is that users need to learn by doing.	El Mirador has worked mainly in the Santa Barbara region. The project is approached by the communities interested in the Justa stove.
Local Perceptions	Women from Honduras prefer a big plancha, do not like to cook over a direct fire, and some already use a chimney in their traditional fire.	The trials carried out by El Zamorano showed that women liked the Justa 2x3 and the Justa 16x24 stoves the most.

Government distribution of Envirofit stove:

The Foundation for the Integral Development of Honduras (FUNDEIH) is in charge of the Envirofit stove distribution and installation. They work in 45 municipalities from a total of 200. They receive a list from SEDIS (Ministry of Development and Social Inclusion) with the people assigned a stove. Envirofit manufactures are in charge of maintenance (they have a call center). The stoves are fabricated in Mexico and assembled in Honduras. They can produce 600 stoves per day. The cost is 190 USD per stove. The stove was evaluated in the Zamorano certification center. The new model, Envirofit HM- 4000 had a good performance. The stove weight is 80 lb.

Envirofit stove

Papers published with studies in Honduras:

1. Ashden Awards Report*. Stoking up a cookstove revolution. The secret weapon against poverty and climate change.*

https://www.ashden.org/files/pdfs/reports/Cookstove_report_final.pdf

Abstract

Fighting climate change and improving the health of the world's poorest people are often seen as competing priorities. Yet some technologies address both tasks at the same time. And one technology is among the cheapest methods of achieving either: improved cooking stoves.

Almost half the world's households, some three billion, eat food cooked on fires and stoves burning wood, dung, coal, straw, husks and charcoal. Traditional stoves make kitchens death traps for the world's most vulnerable people. Pollution levels from smoke and gases such as carbon monoxide are typically hundreds of times those that would be tolerated in the streets or a factory. An estimated 1.6 million people die annually as a result, including around a million children under five, mostly victims of childhood pneumonia.

But our calculations suggest that a global program to manufacture the half-billion improved stoves needed to convert the world's poor to safer cooking could save hundreds of thousands of young lives a year - and at the same time cut global greenhouse gas emissions by the equivalent of up to one billion tons of CO2 a year.

Such investments ought to attract large sums through the carbon market. We calculate that improved cooking stoves can keep a ton of CO2 out of the atmosphere for as little as $1-3 – an exceedingly good deal in a market where offsets can be sold for $20-30 a ton.

The Ashden Awards for Sustainable Energy have recognized and supported advancing designs for different cultures and cooking needs. Since 2001, 18 stove projects in Africa, Asia and Latin America have won awards, most of which have gone on to expand and develop.

2. Ramirez S., Dwivedi P., Ghilardi A., Bailis R. Diffusion of non-traditional cookstoves across western Honduras: A social network analysis. Energy Policy Volume 66, March 2014, Pages 379–38 http://www.sciencedirect.com/science/article/pii/S0301421513011154

Abstract:

A third of the world's population uses inefficient biomass stoves, contributing to severe health problems, forest degradation, and climate change. Clean burning, fuel-efficient, non-traditional cookstoves (NTCS) are a promising solution; however, numerous projects fail during the diffusion process. We use social network analysis to reveal patterns driving a successful stove intervention in western Honduras. The intervention lacks formal marketing, but has spread across a wide area in just a few years. To understand the process, we map the social network of active community members who drove diffusion across a large swath of the country. We find that most ACMs heard about stoves twice before sharing information about it with others and introducing the stove into their own communities. On average, the social distance between ACMs and the project team is 3 degrees of separation. Both men and women are critical to the diffusion process, but men tend to communicate over longer distances, while women principally communicate over shorter distances. Government officials are also crucial to diffusion. Understanding how information moves through social networks and across geographic space allows us to theorize how knowledge about beneficial technologies spreads in the absence of formal marketing and inform policies for NTCS deployment worldwide.

3. CEPAL. Encuesta nacional de leña consumo de leña en hogares y pequeña industria en Honduras. Informe final. 2011

El presente documento manifiesta los resultados de la Encuesta Nacional de leña, por medio del cual se estableció el consumo de leña de los hogares hondureños y la micro, pequeña y mediana industria (MIPYME), asimismo se determinó la procedencia del recurso, aspectos relacionados con su uso y el grado de participación de otras fuentes. Los resultados permitieron conocer y analizar la contribución del uso de la leña en el balance energético del país y realizar proyecciones de consumo. Como dato transcendental se identificó que sólo el 33,7% de los hogares hondureños entrevistados en las zonas urbanas, utilizan leña como fuente energética para cocinar, no obstante en las zonas rurales el uso de la leña sigue predominando, cerca del 59,2% de los hogares usan este energético como fuente primaria para cocinar y un 21,8% combina el uso de la leña con otras fuentes energéticas. La combinación más frecuentemente mencionada fue: leña - electricidad seguido por leña -gas. El consumo de leña per cápita en promedio es 5,2 Kg/día, sin embargo aquellos hogares donde la leña es el único combustible utilizado para la cocción de alimentos es en promedio de 5,4 Kg/día con una variación de 0,2 Kg/día entre la zona urbana y rural, mientras que en aquellos donde se combina la leña con otro combustible es de 5 Kg/día con una variación de 0,4 Kg/día entre la zona urbana y rural.

En la gran mayoría de los hogares el jefe del hogar es el recolector principal (50,3%). En general un hogar recolecta una vez por semana y el tiempo estimado para esta actividad es aproximadamente de dos horas; la recolección de la leña se realiza con mayor frecuencia durante la época de verano debido a que durante el invierno hay menos tiempo disponible por la ocupación en las actividades productivas.

Adicionalmente, La relación entre el bienestar de los hogares y el consumo de la leña se realizó mediante un análisis multi- variable basado en un modelo de hogar (household model), encontrándose

una relación negativa y significativa con el consumo de la leña, el resultado indica que los hogares más prósperos valoran más su tiempo debido al costo de oportunidad y prefieren comprar su leña.

4. Clark M.L., Reynolds S.J., Burch JB, Conway S., Bachand A.M., Peel J.L. *Indoor air pollution, cookstove quality, and housing characteristics in two Honduran communities.* Environ Res. 2010 Jan;110(1):12-8. doi: 10.1016/j.envres.2009.10.008.

http://www.ncbi.nlm.nih.gov/pubmed/19922911

Abstract

Elevated indoor air pollution exposures associated with the burning of biomass fuels in developing countries are well established. Improved cookstoves have the potential to substantially reduce these exposures. However, few studies have quantitatively evaluated exposure reductions associated with the introduction of improved stoves, likely due to the cost and time-intensive nature of such evaluations. Several studies have demonstrated the value of estimating indoor air pollution exposures by evaluating personal cooking practices and household parameters in addition to stove type. We assessed carbon monoxide (n=54) and fine particulate matter (PM (2.5)) (n=58) levels among non-smoking Honduran women cooking with traditional or improved wood-burning cookstoves in two communities, one semi-urban and one rural. Exposure concentrations were assessed via 8-h indoor monitoring, as well as 8-h personal PM (2.5) monitoring. Housing characteristics were determined to indicate ventilation that may affect carbon monoxide and PM (2.5). Stove quality was assessed using a four-level subjective scale representing the potential for indoor emissions, ranging from poorly functioning traditional stoves to well-functioning improved stoves. Univariately, the stove scale as compared to stove type (traditional versus improved) accounted for a higher percent of the variation in pollutant concentrations; for example, the stove scale predicted 79% of the variation and the stove type predicted 54% of the variation in indoor carbon monoxide concentrations. In multivariable models, the stove scale, age of the stove, and ventilation factors predicted more than 50% of the variation in personal and indoor PM(2.5) and 85% of the variation in indoor carbon monoxide. Results indicate that using type of stove alone as a proxy for exposure may lead to exposure misclassification and potentially biased exposure and health effects relationships. Utilizing stove quality and housing characteristics that influence ventilation may provide a viable alternative to the more time- and cost-intensive pollutant assessments for larger-scale studies. Designing kitchens with proper ventilation structures could lead to improved indoor environments, especially important in areas where biomass will continue to be the preferred and necessary cooking fuel for some time