

# El Salvador



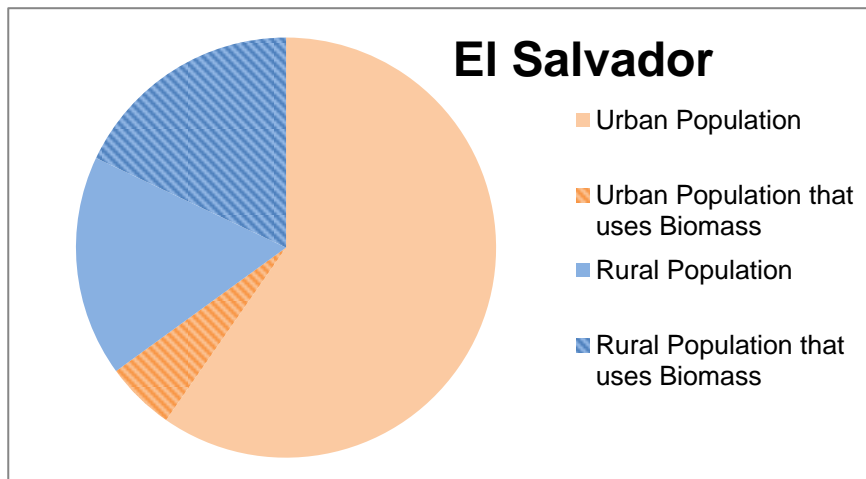
Total population*	<b>6,340,000</b>
Urban (%)	<b>66</b>
Rural (%)	<b>34</b>
%Population that uses biomass*	<b>19</b>
% rural**	<b>51.4</b>
% urban**	<b>8.2</b>
%Population with access to LPG and electricity**	<b>74</b>
Number of households that use biomass**	<b>342,784</b>
Number of annual deaths from HAP 2012*	<b>1,425</b>
Number of annual child deaths from HAP 2012*	<b>77</b>
Price of LPG (25 lb tank)***	<b>15 USD</b>
Price of electricity (Kw/h)***	<b>0.26 USD kw/h</b>
Price of Firewood***	<b>15 USD/month</b>

HAP: Household Air Pollution

\*WHO observatory data base

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

\*\*\*September 2015



## History of Efficient Cookstoves

Number of efficient cookstoves distributed so far	<b>30,000</b>
Type of technology distributed so far	<b>Ecocina, Turbococina, Onil, Lorena in situ</b>
Cost of the technology	<b>65 to 200 USD</b>

### Stoves models and organizations working in El Salvador<sup>1</sup>

The Environment, Energy and Education Ministries were involved in the distribution of stoves in El Salvador, as well as the non-governmental groups Stove Team, Inversiones Falcon and Turbocina, and the Centro American University José Simón Cañas.

Several ICS programs are in place in El Salvador, which at the moment is the most innovative country within the region regarding ICS. The most salient stove models are the “Ecocina” produced by the “Stove Team” Group and the “Turbococina” manufactured by “Tecnologías Ecológicas Centroamericanas”.

The Ecocina is portable cement stove without chimney, with a rocket elbow in the combustion chamber. It saves about 50% of firewood and 70% of IAP, compared to the traditional open fire. The stove sells for 65 USD and about 20,000 units have been distributed since 2006. Dissemination of the Ecocina is supported by the Rotary Club; the stoves have been either sold at 50% of the market price or given for free. Besides Ecocina, five additional ICS industrial models have been developed by the project leader, Gustavo Peña. The new models, are marketed using word of mouth promotion and sold at full market prices. There are two models made specifically to target *tortilleras* and an oven to cook bread or pizzas. The new models prices vary from US\$113 (the Eco3) to US\$250 dollars (the two larger models for *tortilleras and the oven*). The new models have capacity for cooking several dishes at the same time (either on the *plancha* or in direct contact with the fire), which reflects the local cooking practices which Mr. Peña has incorporated, innovating the stove models continuously.

The two models specially designed for *tortilleras* (women business that sell tortillas) save seven times the amount they use to pay in LPG, considering that with the new rules, there is not subsidy in the LPG for business.

The Ecocina is built in El Salvador but production in Guatemala, Nicaragua and México is expected to start soon.

The Turbococina is an advanced combustion biomass cookstove, based in the principle of low-temperature combustion. It is planned to be mass produced, made of steel, uses an electric fan and has an innovative design of the combustion chamber that produces clean and efficient combustion, comparable with LPG stoves. It was designed by the Salvadorian engineer René Núñez, and currently distributed by the group Tecnologías Ecológicas Centroamericanas (TECSA). The turbococina reduces approximately 90% of use of firewood. It needs to be fed continuously with small pieces of firewood. The retail price of the stove was not provided by the manufacturer; so far it has not been marketed to final users. Its mass production cost is estimated at US\$140. In a first step, 1,200 Turbococinas have been deployed in public schools through a joint initiative with the Ministry of Education. The stoves were given for free and 12,000 women (mostly mothers of the children attending the schools) have been exposed

---

<sup>1</sup> Source: What have we learned about Household Biomass Cooking in Central America? ESMAP, The World Bank, 2013

and used the stove to prepare the children's lunch. TECSA plans to use carbon financing to up-scaling the project to reach 3,500 schools and a total of 120,000 households. To this end, a PoA (program of activities) was prepared for the Clean Development Mechanisms (CDM). The project was registered in 2011 and its first phase covers the period 2010-2014. The expected mitigation associated to the stoves is 4.66 tons of CO<sub>2</sub>/stove/yr for household stoves and 6.05 tons of CO<sub>2</sub>/stove/yr for institutional stoves (i.e., those installed in schools). The maximum annual carbon mitigation that the project may achieve while operating at full scale is estimated to be therefore 580,000 tons of CO<sub>2</sub>/yr. TECSA will give the stoves for free to customers, using the revenues generated by the selling of carbon credits to pay for the entire stove and program costs.



**Ecocina**

**Eco 3**



Fuente:

<http://globalendeavors.files.wordpress.com/2010/10/making-tortillas.jpg>



## Tortilleras selling tortillas in an ICS sold by Gustavo Peña



**Oven, Inversiones Falcón**

**Turbococina**

**Turbococina**

Another innovator, Ing. Oscar Figueroa, has developed four ICS models, two that work with charcoal and two with firewood. The models are all industrial steel-made stoves. The charcoal models are made of stainless steel, with a charcoal deposit and a grill where the pot is placed. It needs only 150 grams of charcoal to work for over two hours. It will cost around US\$60 - US\$75 dollars. It can cook 1kg of beans in two hours. The second model is similar but larger and has a cover to improve the efficiency.

The third and fourth models (Consentida and Cuadrada) were designed for a family. Similar to the Turbococina, they work with firewood in small pieces and a fan, requiring electricity and the firewood being continuously feeding the stove. It uses 500 grams of small pieces of wood in one hour and can be used to cook food for 2-8 people. Its cost is between US\$400 and US\$500 dollars. The developer has the capacity to build ICS in mass production and the costs can be lower if mass-produced.



**Mimosa stove**

**Mimosa with cover**



**Consentida stove**



**Cuadrada stove**

These stoves have not been tested in a laboratory, but Ing. Figueroa keeps his own records of the savings.

Institutions working in this field:

- Ministry of Education 2009-2011
- National Center for agricultural technology and forestry. Centa 1994 till today.
- Fondo de iniciativas de las Américas. Fiaes. 1993
- Fundación Salvadoreña de apoyo integral.2012
- Universidad centroamericana UCA
- Universidad Don Bosco
- Universidad Matias Delgado



## General Attributes of a Selected Stove Program in El Salvador

Attributes	El Salvador Ecocina	El Salvador Turbococina
Main Features Stove Disseminated	Portable cement stove without chimney Rocket combustion chamber.	Portable metal stove without chimney. Advanced combustion and stove design, uses an electric fan. Uses small pieces of wood
Implementing agency and main partners	Stove Team Inversiones Falcón Club Rotario	Tecnologías Ecológicas Centroamericanas (TECSA)  Ministry of Education
Program Duration	2006-present	2010-present
Achievements (stoves and also other impacts documented)	11, 170 stoves distributed.  Five different models	1,200 stoves distributed in schools. Aims at 3,500 schools and 100,000 households
Approach	Their main model is distributed and highly subsidized by the Rotarios Club.	ABS are given for free to rural schools through an agreement with the Ministry of Education
Challenges	Relying on heavy subsidies for the Ecocina stoves makes it difficult promoting the newer models.	The stove needs electricity for the fan and small pieces of firewood need to be placed every two to two and a half minutes while cooking.  The metal top surface is small. It can cook one dish at a time.
Financing and subsidies/pricing	The <i>ecocina</i> is sold at a low price (US\$60) leaving a short profit margin. Even so, most users pay only 50% of the stove price, and sometimes the stove is given free.  Other models are sold directly to users who pay the full price.	All the stoves have been donated. The project seeks to donate the stoves and finance the cost of the program through the carbon market. The project has been certified by the CDM in the modality of small-scale program.
Market Development	Two different strategies are in place. For Ecocina -the simple model disseminated by Stove Team- a subsidized donor-driven approach is used. For the new more sophisticated models a	TECSA promotes the stove through rural schools (where wood is used by local women to prepare children's lunch). Up to now, 12,000 women have used a Turbococina, and TECSA believes they will be willing to get one at home. The

	business model is sought.	stove cost will be subsidized by the earnings from the CDM program
Improved stove identification and development	Gustavo Peña is an innovator. He has developed many different ABS models and is constantly experimenting with new ideas. He has developed two models for “tortilleras” stoves and a new oven to make bread.	TECSA is working in a fan that works with the residual heat of the stove to avoid the need of electricity. The stove is highly efficient and has virtually eliminated black carbon emissions. TECSA is also working to lower the stove production cost.
Communication/Promotion	The promotion of <i>ecocina</i> is done through the Rotary Club, local governments and NGOs. The promotion of other models is done directly by the owner through his own networks.	They have not promoted the stove to users yet but they are promoting the stove with the government and with international agencies looking for sponsors for their project.
Local Perceptions	Women in the tortilla and pupusa’ businesses like these stoves as they estimate that they save more than 80% of total fuel expenditure, particularly since the government reduced the LPG subsidy.	They did a pilot study with 15 turbococinas in a community. They report high acceptance levels.

**Paper published with studies in El Salvador:**

1. Northcross A.L., Smith K.R., Hernández M.T. (2012). *Turbococina Field Assessments in Schools*. Household Energy, Health & Climate Change Research Group School of Public Health UC Berkeley.

ABSTRACT. This study measured changes in kitchen concentrations and personal exposures to fine particles (PM2.5) and carbonmonoxide (CO) and fuel use after introduction of the school Turbococina™ (TC) cookstove in school kitchens currently using the Plancha chimney woodstove. The TC reduced the mass of fuel wood used on average by 73%

Compared to the Plancha, we did not see evidence that the TC consistently reduced personal exposures or kitchen concentrations of CO and PM2.5 Personal exposure increased in six of the eight schools monitored when the TC was used. One explanation for the increase could be the difference in fuel loading practices. The small woodfuel pieces needed by the TC require the cook to spend more time in close proximity to the stove in comparison to the Plancha, which can hold large pieces of wood that take more time to burn.