NICARAGUA
ECO-STOVE
REPORT

By Elene Cloete, Alex House, and Lauren Handley
SMOKE-FILLED HOMES: A Global Issue

Globally, three billion people use plant or animal-derived solids (biofuels) to fuel their cooking fire. Approximately 20 million of these people live in Central America, of which 86% are located in Nicaragua, Guatemala, and Honduras.¹ What is concerning about their biofuel dependency is that people often use this fuel source inefficiently, with existing cookstoves’ poor ventilation exposing households to highly toxic, dense smoke. Research estimates that a wood fire can produce smoke equivalent to 400 cigarettes in just one hour,² and since women and children spend most of their time near the domestic hearth, they are the ones most directly exposed to its toxic pollutants. Exposures of this magnitude come with detrimental health consequences, including cataracts, nasopharyngeal (head and neck) cancer, heart disease, and sleep-disordered breathing, particularly among children.³ Perhaps the most significant consequences are respiratory infections which, in addition to heart diseases and birth complications, are among the most common causes of premature adult deaths in Nicaragua.⁴

The ongoing use of biofuel and traditional cookstoves also has negative implications for the environment. Traditional cookstoves lack proper airflow and require large amounts of firewood to reach and maintain an appropriate cooking temperature. In Nicaragua, this can range between 2.5 and 2.8 kg of firewood per capita, per day,⁵ which takes a heavy toll on the environment.⁶ Inefficient cookstoves also negatively impact families’ household budgets. As deforestation expands around local communities, families have to buy wood from outside vendors, straining their already thin household income. Poorly ventilated and inefficient cookstoves place an enormous burden on Nicaraguan communities’ health, environment, and household economies.

Seeking a Solution⁷

Since 2007,⁸ Alcance Nicaragua (AN)⁹ practitioners have been working closely with local communities to implement community-led development, with the ultimate goal of establishing community-based organizations (CBOs). In this approach, community members collaborate to identify, analyze, and take action to address poverty-related issues. One issue community members recognized during their analysis process was the problem of smoke-filled homes. Close to 90% of households cannot afford a gas cooker, nor do they have access to electricity, leaving no other option but to cook using poorly ventilated cookstoves. These stoves leave homes continuously filled with toxic smoke, which in turn contributes to myriad health problems. Since the cause of the problem resides with their current stoves’ inefficient fuel usage and poor ventilation, a potential solution was to install cleaner-burning cookstoves, or Eco-Stoves.

What is an Eco-Stove?

A traditional cookstove can range from three bricks with an open flame in the middle, to built-in stoves with little to no ventilation system. <see figure A> The Eco-stove, in contrast, is a fixed, built-in unit, made with a base of adobe bricks with clay binding that insulates the ceramic combustion chamber. The fire’s isolation,
in combination with better air flow, makes the stove more efficient, requiring a smaller fire and less wood to thoroughly cook food. The combustion chamber has a unique elbow shape connected to a metal chimney, which carries smoke directly from the chamber outside of the home. On top of the wood-burning chamber, a concrete top provides more surface area for cooking that ranges in temperature.

The Eco-stove’s name captures its economic and eco-friendly benefits—it is a model which has been implemented across various Latin American countries, taking on different designs and labels. One such variant is the Inkawasi stove, a cookstove developed in Peru, and introduced to Alcance Nicaragua by the Peace Corps. While the Eco-stoves installed in some AN-communities closely resemble the Inkawasi design, other communities made slight adjustments to their stoves to improve quality and longevity.

The stoves are usually built collaboratively, with local masons working closely with new owners to plan, construct, and finish their stoves. Since the stoves are composed mostly of natural materials, Eco-stove owners need to closely monitor their stoves’ structure for any wear and tear. Since they helped build their stoves, owners can quickly identify and repair any leakages themselves. For more significant problems, their local mason will assist.

**FIGURE A**

**ECO-STOVE**

This design incorporates elements from the Ikawasi, as well as from other cleaner-burning cookstove designs introduced by colleagues in the development sector.
Eco-Stove Project Implementation

In 2011, four communities10 decided to give the Eco-stove a test run. With AN staff’s support, CBOs from these communities implemented the first four Eco-stove projects, building 171 stoves in their respective communities.

Following this first set of projects, the same communities continued to analyze the issue of smoke-filled homes, with more families wanting a cleaner cookstove option. News about the Eco-stoves’ benefits also started to spread between AN-affiliated communities. Women who were among the first to install Eco-stoves started sharing with those in neighboring communities how the stoves work and why they are using them. As a result, the demand for Eco-stoves rapidly increased. By December 2020, AN and the community organizations they support had implemented an additional 11 Eco-stove projects and constructed 312 more Eco-stoves. Typically, the stoves’ implementation comes with health education and stove-maintenance training. These extra activities increase community members’ awareness around the benefits of cleaner cookstoves, and provide examples of why it is vital to maintain their stoves for ongoing use.

Of the 483 stoves thus far implemented, 403 (83%) are still in use. Factors that impact the stove’s ongoing usage include households not maintaining their stoves, families replacing the original stove with a different kind, or households doing home renovations - including new roofs that might cover the stove’s chimney.

Local Ownership, Local Management, Sustained Action

The 15 existing Eco-stove projects are owned and managed by different CBOs in their respective communities. The CBOs take ownership throughout the project’s planning and implementation stages, during which they seek out interested funders, submit the necessary funding proposals, and, if successful, ensure transparent project implementation and fund management.

Local ownership also means local management. 14 CBOs oversee repayment programs where Eco-stove owners pay back a small counterpart to their respective organizations. The organizations will then use the collected counterparts for eventual maintenance. Before project implementation, CBOs and their members decide on the counterpart’s size, which can range between 10 and 25% of the stove’s total cost. The CBOs also consider an appropriate repayment structure, which stipulates how and when stove owners will settle their counterpart.

Implementing 15 Eco-stove projects in less than ten years is significant, but considering the ongoing widespread use of traditional stoves, the work is far from over. AN staff, CBO leaders, and their members continue the work of sharing their experiences, analyzing the issue of smoke-filled homes, and seeking out more funding opportunities to minimize families’, in particular women’s, exposure to poorly ventilated cookstoves.

10 Communities are kept anonymous throughout the document to protect their identities and locality.
483 stoves built

2,200 people breathing easier

3,800 trees planted

15 communities invested in Eco-stoves

74% of the local leaders overseeing Eco-stove projects were women
Improved health is one of the immediate changes Eco-stove users reported on after using their new stoves. Cindy’s reflection puts such changes into perspective:

“For many years, I have used the traditional two-burner kitchen, causing respiratory problems. The doctor has told me that I am asthmatic, and he has forbidden me to cook because the smoke causes me a lot of coughing and fatigue. My house, made of pieces of wood and old zinc, is small. The kitchen is inside [the house and the old stove] produced a strong heat and smoke spread[ing] throughout the house. We all had watery eyes; the zinc [ceiling] in the kitchen was black with soot [...] Now I enjoy the benefits of cooking [with the Eco-stove...] There is no longer smoke inside the house; I have felt better. Since I have my [new] kitchen, I do not [need to] visit the doctor [for respiratory issues].”

Cindy’s report of improved health is reminiscent of many more Eco-stove users. For example, in the pilot program launched in 2011, participants reported decreased coughing (by 69%) and watering eyes (by 73%). Over three years, Eco-stove users also reported a 20-60% decrease in respiratory problems after switching to their new, more efficiently burning stoves.

More Than Just Cleaner Air

The impact of Eco-stove projects extends beyond better air quality. Practitioners’ reflections and Eco-stove owners’ feedback point to other, less-immediate benefits. These other outcomes are not necessarily because of the stoves’ actual construction; instead, they were developed out of the numerous meetings and activities leading up to and following the projects’ implementation.

Empowering Women

The issue of smoke-filled kitchens is a women’s issue. “As women, we are exposed to smoke from the time we [start to] learn how [to] cook,” Dania, an Eco-stove user explained. “We never smoke, but our lungs, to a doctor, look like we had smoked for 30 years.” Men, such as Alvez, are also recognizing how gendered the issue is:

“Before this experience, I did not understand very well what was talked about in the meetings. I only understood that the women felt uncomfortable cooking, having smoke. After a workshop, I told my wife that I would make the dinner and it was like this: I had the most stressful 50 minutes as the heat, smoke and agitation from the traditional stove had me suffocating. This is a really stressful task.”

Women’s exposure to high levels of indoor air pollutants is also of generational concern: “For many years, I have suffered from this [respiratory] illness, and doctors have forbidden me to cook or light a fire and make a lot of smoke near the house,” Martha, an eco-stove owner, shared. “I would not like my daughters or grandchildren to suffer the same as me.”

Considering both their current predicament and concerns over the health of their daughters, women are at the forefront of implementing change. Such action ranges from advocacy for cleaner-burning cookstoves to taking the lead in implementing their communities’ Eco-stove projects. Recent leadership numbers indicate

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11 We use pseudonyms throughout the report to protect community members’ identity.
that across the 15 participating communities, women are in more than 75% of Eco-stove-related leadership positions. For many of these women, these positions are their first opportunity to develop leadership skills and take on the responsibility of making a positive change in their communities.

In addition to providing them with a cleaner-burning cookstove, the Eco-stove projects are providing women with spaces where they can learn more about each others’ issues, and develop the capacity to lead their communities toward healthier cookstove alternatives.

**Increasing Solidarity**

Health concerns are commonly felt, but not necessarily openly shared. Such limited sharing might be because community members do not have access to communicative spaces to talk openly about their smoke-filled homes. The Eco-stove project in Alisha’s community provided her with a safe space to talk about smoke in her own home, and also a space to analyze, with others, the impact of traditional cookstoves. Alisha summarized her experiences as follows:

> “My family and I suffered a year-and-a-half ago with the illness of my mother; she spent days in the hospital with cough [and] fatigue. Doctors did several tests, and the doctors gave us the bad news that my mother was terminally ill. They found smoke in her lungs; they said that her condition was very advanced and there was nothing else to do to cure her illness. She never smoked cigarettes, but they found smoke. She breathes artificially.

> I recognize that I have never talked about this problem with anyone in my community [...] Now after talking about my individual situation with all my neighbors, I feel that it is good to know the diseases, causes, and consequences of the smoke. I can change my life and implement new ways of cooking and look for other alternatives that may be beneficial for everyone.”

The Eco-stove projects provide spaces in which women feel free to talk about and analyze their current situations. It is during their sharing that women also realize that their problems are not necessarily unique to them. Instead, the issue of smoke-filled homes is a community-wide struggle, which challenges the majority of their friends and neighbors. Cindy’s story captures the process many women undergo—from feeling alone in her health struggles, to recognizing a shared challenge:

> “...Before in the community, we had never had the opportunity to meet and share our problems. I thought that only my family had this problem; I was wrong, I realized that everyone in the community was affected by cooking in the three-stone kitchen.”

Learning more about each others’ problems contributes to people developing a strong sense of solidarity. Adriana, a community member, sums it up as follows: “...Now I express my ideas without fear; I have also learned to listen to my friends. Together, we have gone forward and we hope to grow and gain more experience to support and improve my community.”

Are meetings necessary for households to build their Eco-stoves? Most probably not. But without such meetings, and the accompanying communicative spaces they provide, community members miss out on opportunities to connect with one another and strengthen their social capital.
Inspiring Reforestation Efforts

When communities analyze their poverty-related issues, they usually take a close look at the broader effects of such issues. In the case of wood-burning stoves, one alarming result is ongoing deforestation. Increased usage of Eco-stoves reduces households’ firewood consumption, primarily because the stoves are more fuel-efficient. For example, the Patsari cookstove, an Eco-stove equivalent widely used in Mexico, uses 56% less wood than traditional cookstoves. AN-supported communities have reported similar reductions, with one community reporting a 60% decrease in firewood consumption among their Eco-stove users.

While reductions in firewood consumption are good, until gas and electric alternatives become more affordable, AN-supported communities will continue to rely on wood for fuel. To counteract the environmental toll of wood-burning stoves, two communities decided to include a reforestation component to their Eco-stove projects. This includes one community planting 80 fruit trees alongside their Eco-stove project. By including tree-planting activities with their Eco-stove projects, community members take a more holistic approach to community development. Poverty-related issues do not take shape in isolation, but relate to many different factors, consequences, and causes.

Stimulating More Collective Action

When community members talk about their problems, implement solutions to such problems, and then see the results of such solutions, they become inspired to take on more shared challenges. Their initial projects act as a gateway to an ongoing community development trajectory. Using the capacity gained during the Eco-stove projects, CBOs and their leaders have since taken on more significant and community-wide problems, ranging from large scale water projects to establishing health services and clinics.

Smarter Stoves, INSPIRED COMMUNITIES

Research on cleaner cooking alternatives increasingly shows that improved cookstove projects are implemented most effectively in collective and collaborative community settings. AN-supported communities, their CBOs, and community members are a testament to that. Their Eco-stove projects provide community members not only with cleaner cooking options, but also with opportunities to talk with others about their commonly shared problems. From such discussions, stronger connections develop, leaders emerge, and collective action transpires. Susanna, a local community member, says it best:

“Thanks to the Eco-stove, illnesses are less. In my family, we use less firewood, and I like to share with the others affected all these benefits that my family is having. But the most important thing is to get involved and work together to solve our problems.”

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12 Catalan-Vazquez et al. (2018).
13 (Clean Cooking Alliance, 2020)
ADDITIONAL RESOURCES

Eco Stove Project Video | Nicaragua Outreach International

BEFORE:  Traditional stoves fill homes with smoke, leading to vision and respiratory issues.

AFTER:  Eco-Stoves vent smoke outside of homes, minimizing health risks while maximizing efficiency.
REFERENCES USED:


