COOKING IN ONE MILLION KITCHENS:

Lessons Learned in Scaling a Clean Cookstove Business

ENVIROFIT®

Introduction

Envirofit International is a social enterprise that uses a market-based approach to create access to affordable, efficient, clean cooking energy technologies for household and commercial uses, which improves livelihoods, empowers communities, and transforms lives.

Since 2007, Envirofit has been on a journey that has seen the company progress from a start-up clean cookstove manufacturer to a growing business that has now served one million customers, impacting five million lives in 45 countries. However, the path to selling one million stoves has been a difficult journey. Through many trials, with successes and failures, we have learned a number of hard lessons that have shaped the business today. While reaching one million homes with clean cooking solutions is a milestone for Envirofit and the clean cookstove sector, the goal of reaching the nearly three billion people who lack access to clean cookstoves is still far from being achieved.

Over the past eight years, we have learned from practical experiences – both ineffective and effective ways to design, develop, and distribute clean cookstoves. Today, Envirofit is pleased to see the growing market of manufacturers, distributors, and last mile entrepreneurs that did not exist when we first embarked on this endeavor. Through sharing our journey we aim to highlight areas where governments, development agencies, NGOs, social investors, private companies, and fellow cookstove manufacturers can accelerate the expansion of the clean cookstove sector.

Our Business Model

To deliver clean cookstoves, we implement a market-based approach that starts with testing and developing technology in our clean cookstoves laboratory that improves combustion efficiency. We subject our prototypes to rigorous stress and emissions testing that simulate multiple lifetimes of use. Before a stove is ready for high volume production, we test and refine our products with customer feedback to make sure the product meets their needs.

After initial prototype testing, our stoves are manufactured at scale using a centralized manufacturing model. Materials and products are sampled, evaluated and inspected throughout the production and shipping process. Stoves are sent from our regional business units to our distribution partners, whom we support with training and marketing collateral to deliver products to our customers.

FROM DESIGN TO DELIVERY

We provide high performance, durable, affordable, and desirable clean cookstoves from our lab to customers worldwide

WORLD CLASS R&D

ROBUST FIELD TESTING

HIGH QUALITY PRODUCTION

EXTENSIVE DISTRIBUTION

INNOVATIVE PARTNERSHIPS

DELIVERING CUSTOMER VALUE

Background

THE COST OF INEFFICIENT COOKING

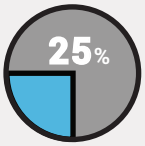
42% of the world's population cooks over an open fire (3 Billion people).

Here is how it affects our world.

ENVIRONMENT

300 MILLION TONS OF WOOD
are consumed cooking every year in Sub-Saharan Africa alone.

1BILLION TONS OF CO2
are produced each year from inefficient cookstoves



of black carbon emissions come from burning solid fuels for household energy needs.

ECONOMY

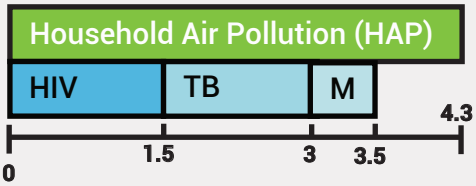
$13 BILLION

are spent annually in costs to health, environment and economies in the developing world due to the use of solid fuels for cooking.

HEALTH

4.3 MILLION DEATHS

Every year HAP leads to more deaths than HIV, Malaria, and TB combined.



DEATHS IN MILLIONS IN ONE YEAR

Smoke from an open fire can lead to:

- Stroke
- Pneumonia Lung Cancer COPD
- Heart Disease
- Cataracts

Solving a Global Crisis

Over the past decade, the clean cookstove sector has made major advancements in the technology development, manufacturing, distribution, and financing of clean cooking solutions. Much of this progress was aided by funding and initiatives from foundations, academic institutions, governments, non-profit organizations and development agencies who have committed to help solve a global crisis.

The fight against traditional cooking methods gained a major ally in 2010 with the founding of the Global Alliance for Clean Cookstoves (GACC), a public-private partnership. GACC has succeeded in uniting an industry to mobilize partners, resources, and funding to raise awareness, build capacity and improve access to clean cookstoves. While these efforts should be celebrated, the industry still needs a wide range of players to make an impact on the nearly three billion people who are still cooking with solid fuels.[1]

When Envirofit set out to tackle the clean cookstove challenge with a market-based approach, it was seen as a pioneering effort, as this approach was not as prevalent as it is today. Cookstoves were primarily artisan-built, offering a short lifespan and with untested and often variable performance. In the early stages of the clean cookstove sector, these artisan stoves were often distributed through well-intended government give-away programs. However, the majority of cookstoves available provided only basic improvements when compared to an open fire, and failed to achieve health and environmental impacts.[2]

Impacting One Million Households Through a Market-Based Approach

In 2007, Envirofit embarked on a mission to use a development model based on business principles that would design and deliver clean energy technology through a sustainable approach. Using a market-based model, we developed a range of affordable, durable clean cookstoves that improves the access and adoption of clean cooking solutions on a global scale. Over the past eight years Envirofit has evolved its model to prove a market-based approach is a more sustainable and scalable way to tackle a global cooking challenge. When Envirofit first started in India, we adopted a Business-to-Consumer (B2C) model, which helped to address consumer preferences and significantly improve access to clean cooking solutions. We began by conducting consumer research, which fed into the design and development of clean cookstoves. Data from this research led us to develop stoves that are aesthetically pleasing and high in quality and performance (reduction of smoke and toxic emissions up to 80% and reduction of fuel use by up to 60%). Today consumer insight is still a key to influencing business decisions. However, Envirofit has since evolved into a Business-to-Business (B2B) model that has enabled us to reach more consumers, and develop long-term regional commercial business units that have the capacity and commitment to address post-sales services.

Reaching one million households required us to constantly analyze and reiterate our technology and business model. Envirofit learned the solution wasn't only to produce a high-quality product, but also to innovate a business model that can overcome market barriers such as the lack of market infrastructure, limited rural distribution, and lack of consumer awareness and large-scale manufacturing.

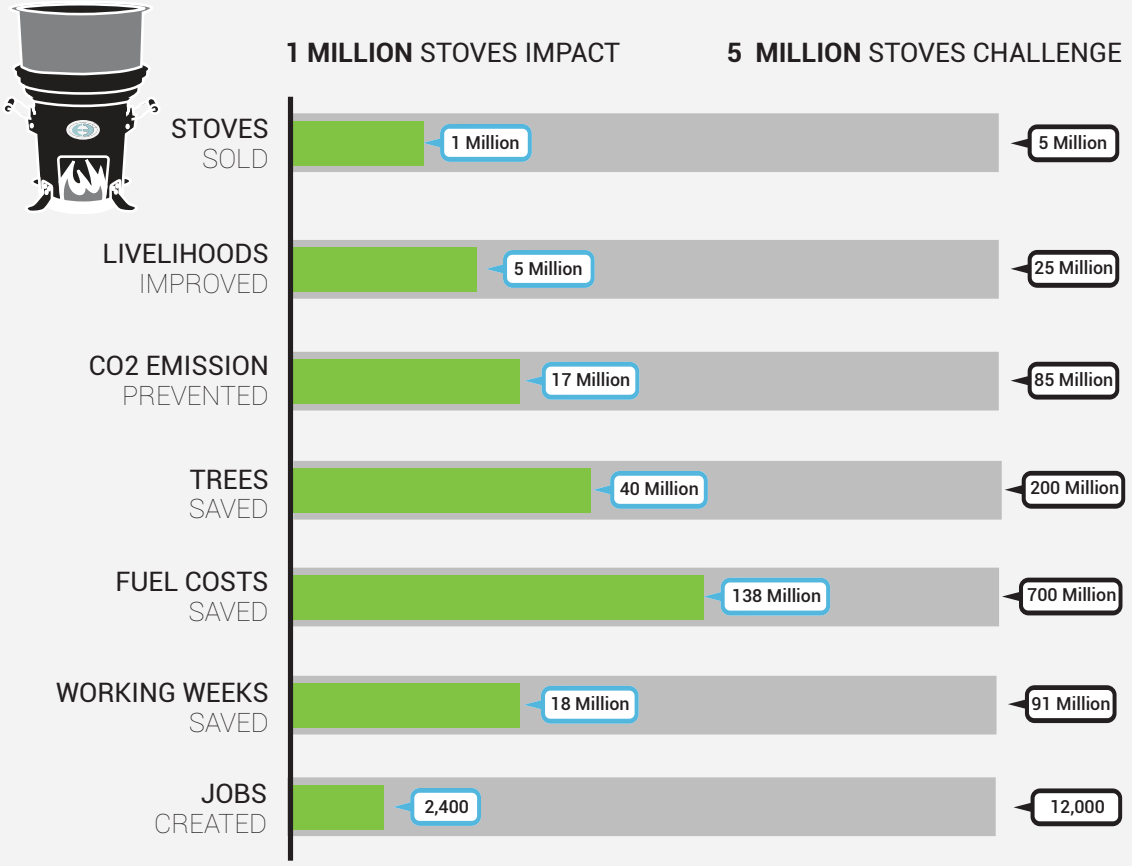
[1] The State of the Global Clean and Improved Cooking Sector. Technical Report 007/Venkata Ramana Putti, Michael Tsan, Sumi Mehta, Srilata Kammila Energy Sector Management Assistance Program | Global Alliance for Clean Cookstoves | The World Bank. May 2015

[2] Clean and improved cooking in sub-Saharan Africa: a landscape report. Africa Clean Cooking Energy Solutions Initiative. World Bank September 2014

This growth required lots of flexible and patient funding to test different methods that could globally deliver low-cost, high-quality products to low-income consumers. Through testing a variety of approaches, we have grown from a business with one product in India, to an early stage global business with over a dozen user-designed products. In addition, to better serve customers, we made a strategic decision early on to set up regional manufacturing and distribution centers in East Africa (Nairobi, Kenya), West Africa (Lagos, Nigeria), India (Pune), Latin America - Mexico (Mexico City), and Honduras (Tegucigalpa), as well as manufacturing centers in China. In the past 12 months we have been able to accelerate our growth, and now directly employ over 480 people, and have indirectly created jobs for 2,400 people throughout the value chain including our last-mile distribution partners.

While working to scale our business, we have had to solely tackle major market barriers (some of which don't exist for new manufactures today), and that is why it has taken eight years to reach sustainability. Also, it has required millions of dollars of investment and grant funding – not just to support us but also address the gaps in the market. This funding helped to develop clean cooking technology, pilot test marketing initiatives, and build scalable manufacturing facilities, supply chains, and distribution networks. Since 2007, Shell Foundation, an independent charity, has been a critical partner to us – providing a blend of patient and flexible grant funding, extensive business support and value chain linkages to help Envirofit design, pilot and scale a market-based solution to deliver more efficient cooking technology at the base of the economic pyramid. More recently, as the business matured, Shell Foundation has used different instruments – including loan guarantees and equity – to enable Envirofit to raise significant medium-term debt capital from OFID, Calvert Foundation and OPIC.

THE IMPACT OF 1 MILLION STOVES



Building local clean cookstove markets also required collaboration with private corporations, non-profit organizations, and governments to pilot different distribution models and develop local channels – some of which failed, and others that were successful. Our partnerships with:

- **Vitol Foundation** helped to develop and pilot a new institutional stove model in eastern Africa.

- **Integrated Village Development Project** and **SKS** in India proved the concept for microfinance organizations to develop clean cookstove distribution channels.

- **The Honduran Government** lead by **President Juan Orlando Hernández** was a leader in investing in building a scalable clean cookstove industry to deliver stoves on a national level.

Today, the guiding principles of the Global Alliance for Clean Cookstoves include the promotion of a market-based approach while supporting the development of high quality cookstove solutions. Without the support from foundations, investors, governments, and development institutions, the growth of this sector would not be possible.

We realize these global impacts have been an eight-year collaborative journey, and in that time we have learned many lessons that have shaped how we do business today. Growth through these lessons has positioned the company to reach our next goal of impacting five million households over the next five years.

Lessons Learned Reaching One Million Households

Lessons 1: Adapt, Innovate and Respond To Consumer Preferences

Challenge: *How can products be designed that are scalable across different countries for consumers with different cooking needs?*

Over the years we have strived to design and manufacture the highest quality stoves at an affordable price to consumers. Finding the balance between affordability, efficiency, utility, and durability is a difficult task, and after years of research, we are still working to create a Tier 4[3] wood fueled stove (the highest ranking on clean emissions) that meets all of these conditions. Working toward this goal, we have spent the past eight years focused on creating stoves that would not only be used in one target market but across different countries with different cooking habits and patterns. The constant for Envirofit has been striving to develop clean cookstoves at scale without compromising on standards or increasing the cost to customers. We have tried to tackle this in several ways.

Let The Customer Drive The Design

Envirofit launched its first stove model, the B-1200, in 2007. It was designed using basic rocket-stove technology, and featured a ceramic chamber with utilitarian handles and a cast iron pot support. While consumers liked the fact that the B-1200 could save them money on wood consumption, the value proposition wasn't high enough to convince them to purchase one. The B-1200 was heavy; the ceramic material was often damaged in transport; and the product was designed for affordability but not aesthetics and needed to evolve in order to become a household appliance that people would aspire to purchase.

To convince customers of the value of clean cookstoves, we had to shift our technology development from a singular focus on building an efficient stove to a multifaceted focus on designing a high performance, aspirational home appliance. Through years of consumer research, focus groups, and product testing, we evolved our design to reflect the needs and desires of our customers. After hundreds of focus groups, Envirofit learned that customers sought more than a stove – they wanted

[3] http://cleancookstoves.org/technology-and fuels/standards/iwa-tiers-of-performance.html

a modern appliance they were proud to have in their kitchen. Customers also desired a product that kept their kitchen clean and didn't need replacing or frequent rebuilding. Our customers also wanted a stove to be portable so they could vary their cooking location depending on the weather.

With the help of our long-term partner, Shell Foundation, Envirofit has been able to conduct broad research to improve the efficiency of the stove using advanced computational fluid dynamics analysis and robust emissions and durability testing to optimize the stove geometry and material selection. We believe that for the sector to grow, customers must have an impressive first experience with clean cookstoves – and quality and durability is key. For this reason, we have performed more than 5,000 performance tests and 270,000 hours of durability testing, constructed over 500 prototypes, and conducted field-testing in 15 countries across four continents to ensure that the stove meets a high performance standard.

The result has been a series of design and utility patents that have catalyzed the development of clean-burning, efficient, lightweight, and affordable cookstoves.

When developing stoves for the Indian market, one of our key innovations was in materials development, as we extended the life of a clean cookstove from months to years. Living in some of the world's most challenging places, customers in India often cook outside, on dirt floors, or in hot, humid environments. Durability was important to creating a desirable product. This prompted us provided a warranty for our products, which was the first in the industry.

Envirofit also improved the stove handle design to address the desire for the stove to be portable, while an engineered increase in the efficiency and firepower reduced the amount of time spent cooking. Finally, Envirofit invested in industrial design to create a product that was not only cost effective, but visually appealing to customers. The new orange stove appliance was complete with built in handles, an improved metal combustion chamber, and an aesthetic design for the Indian marketplace. In the two years following the launch of the redesigned product, the G-3300 wood cookstove, sales outpaced the former B-1200 model by 330%. Evolving the stove design, India has been able to sell nearly 500,000 clean cookstoves over the last 8 years.

"To be attractive, the stove needs to be low maintenance, effortless to use, produce no smoke and cook food quickly. Looks matter. A good-looking product is as important in a small rural village in Myanmar as it is anywhere else. During field testing, we found participants preferred the Envirofit model mainly because of ease of use and the attractive design."

– David Nicholson, Mercy Corps

DESIGN EVOLUTION

KEY FEATURES

Very low-cost with a marked improvement of 32% efficiency compared to an open fire.

Stove design based on extensive R&D. First commercially available clean cookstove with extended warranty.

Lower cost lighter weight design with improved durability. Nestable design allows for quicker production and localized assembly.

One Size Does Not Fit All

After designing a product that responded to the needs of consumers in India, that were identified in the market research, we attempted to make this same solution available to consumers in sub-Saharan Africa. In 2011, we began building a distribution network in Kenya around the G-3300 wood cookstove, and quickly discovered that the features that were desirable in India, differed from what customers desired in Kenya. For example, people preferred the black color to the orange color and required a stove that could support large pots to feed large families.

We learned we had to again invest in market research and found a range of different cooking needs such as cost, fuel type, pot fit, and cooking versatility which could not be solved with a single stove model. While consumers in Kenya saw a need for improved cookstoves, price was an even larger barrier than in India, as was fuel type. In India the majority of solid fuel users cook with wood and dung than with charcoal. In India only 0.4%[4] of the population uses charcoal, whereas in Kenya charcoal is used by 17%.[5]

Ensuring the efficient combustion of both wood and charcoal requires different stove designs for each fuel type, so Envirofit developed multiple cookstove models that were segmented to different target markets in rural, urban, or peri-urban environments. In response to consumer input, Envirofit developed and designed the M-5000 wood cookstove model and CH-4400 charcoal stove models in order to reach the largest percentage of both wood and charcoal users. By segmenting the market in Kenya from one to several fuel-burning options we saw sales grow by 25% in the first year and 60% in the second year.

As a Tier 4[6] charcoal stove, the CH-4400 was the cleanest burning stove we had developed, but at a price of $45-50 it was unaffordable for the mass-market of customers earning between $3-$10 a day. This prompted Envirofit to segment the market and develop additional stoves at different price tiers. Envirofit designed premium products for higher margin households as well as institutional model stoves for schools and hospitals. These higher margin products helped to develop a market for the lower margin mass-market stoves. These new stoves range from $25-$30. In the first full year of sales in Kenya, we sold four times as many Econochar stoves than all of our premium charcoal model stoves combined. Although, this lower price point can reach a larger target audience, we are still working to develop more affordable solutions for the mass market, refine product components, and reduce supply chain costs to lower the price of cookstoves for people at the base of the economic pyramid.

> "IDVP partnered with Envirofit for an improved biomass cookstove program for the last two years. Working with Envirofit stoves, we have observed positive improvements in the lives of our members including a 50% reduction in usage of firewood, 80% reduced smoke, faster cooking and a positive economic impact on their family."
>
> -Francis Kulandei, IVDP

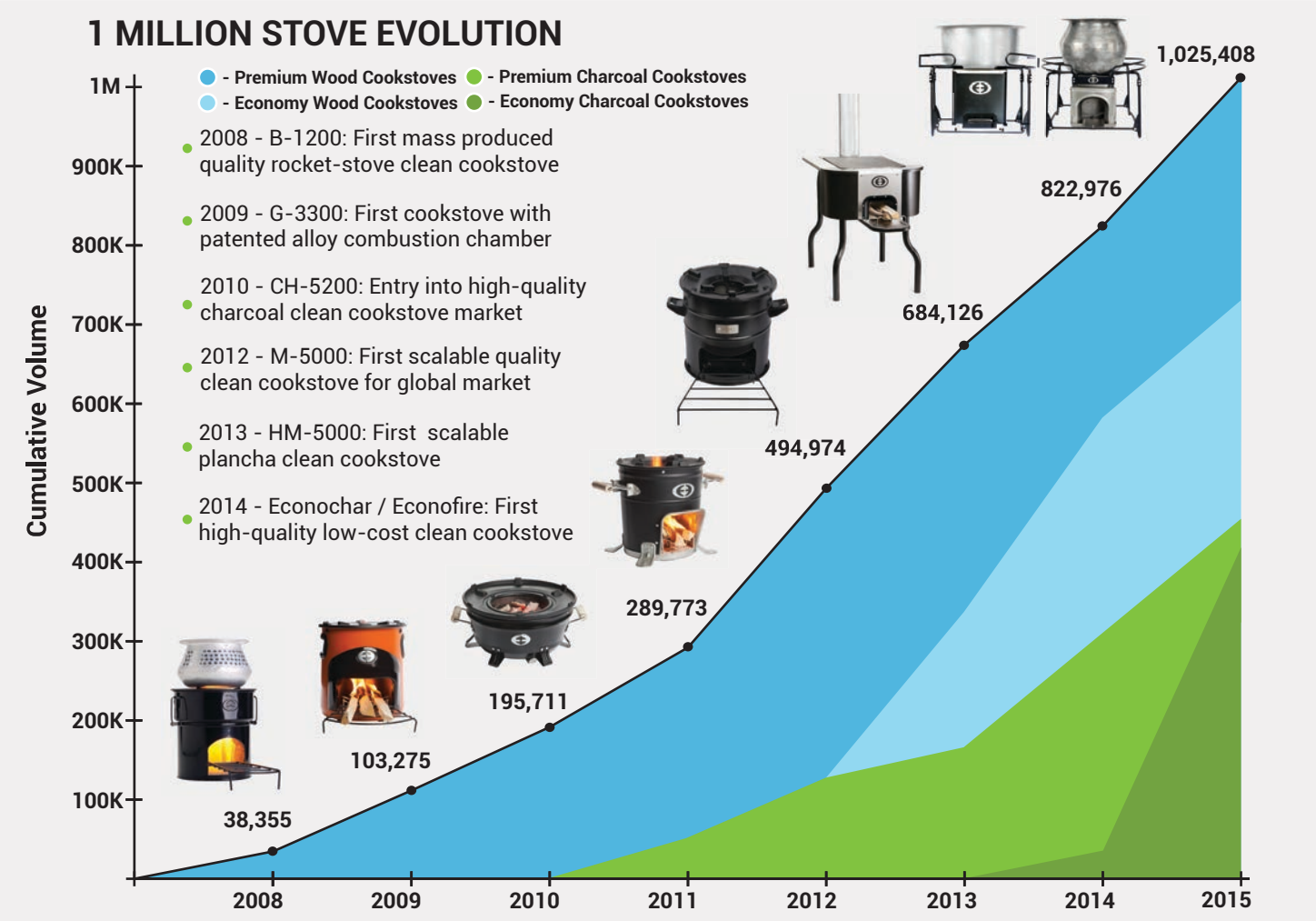
While offering multiple stove options appeals to more target groups, maximizing stove design to meet different cooking requirements is important in building a scalable clean cookstove business. When we first entered the charcoal market, we developed a range of three different charcoal stoves to appeal to different price limitations and family sizes. While these models succeeded in meeting the needs of the segmented target populations, scaling three different models proved to be too costly, so we had to go back to the drawing board and consider how we could scale and continue our path towards financial viability.

We thought about how we could maximize our stove designs by offering multiple features to make them more versatile. For example, families in Kenya cook with both round and flat-bottomed pots, so stoves were adapted to support both types. Optional pot-skirts, which cradle the pot, were added not only to increase cooking efficiency but also to overcome the perception barrier that a smaller stove couldn't support large pots. Through these efforts we developed a range of stoves that are maximized to appeal to a larger target population. Today, we offer a line of domestic stoves that range in retail price from $25-$50, with commercial stoves ranging from $200-$1000. With continued investment in consumer and laboratory research, Envirofit is still striving to improve existing models to lower the cost of premium quality cookstove technology to bring more efficient durable stoves to the masses and to increase cookstove adoption.

[4] http://cleancookstoves.org/country-profiles/51-india.html

[5] Dalberg. GLPGP,Kenya Market Assessment, August 28,2013

[6] http://cleancookstoves.org/technology-and-fuels/standards/iwa-tiers-of-performance.html



Conclusions:

A. Using a market-based approach shifts the perspective of cookstove users from beneficiaries to customers.

B. Building a sustainable cookstove market requires the investment in research and pilot stoves that consumers are willing to purchase.

C. The quality, durability, and performance of a stove are important components that consumers are seeking to purchase a stove.

D. Stove models have to be adapted and evolved to meet the various needs of different cultures and cooking traditions on an international, national, and regional level.

E. Segmenting the cookstove market by price, fuel, and product features can increase desirability of cookstoves.

F. Adapting the models with accessories and multi-use features can accommodate larger audiences for a lower cost.

Lesson 2: Centralized Manufacturing Ensures Quality and Creates Local and Global Jobs

Challenge: *How can a social enterprise adapt practices to maintain low costs while responding to increasing demand?*

There are many different methods to manufacturing clean cookstoves, but maintaining strict control over product consistency and efficiency standards is vital to the impact of the stoves created and the brand they represent. In exploring manufacturing options, we found that de-centralized manufacturing can limit the scalability and broad access to cookstoves. To create a scalable method while maintaining high quality standards, we created a centralized manufacturing model. However, we faced challenges in employing this new method, and having to overcome import duties and taxes that varied in different countries and could affect the cost of the stove. In addition, we wanted to be conscious of creating new local job opportunities without taking business away from local artisans. We had to grow and adapt a model over the past eight years to scale manufacturing capacity in a way that sustained low costs while meeting growing local demand and which used a multi-stage approach that mirrored the growth of the local cookstove market.

Thinking Global, Building Local

After finalizing an efficient stove design, every effort is made to keep the production and supply costs as low as possible. Minimizing cost is important in creating affordable products for different target markets. Beginning with our first market in India, we learned a three-phase approach to reduce costs during each stage of capacity development: entry, core functionality, and expansion.

> *"When we recently committed financing to Envirofit, we chose to support one of the few companies with the potential to materially expand the availability of quality clean cookstoves around the world."*
>
> - Overseas Private Investment Organization

Phase 1 - Entry: When we initially entered the first phase of market development, there was very little awareness, thus demand, for highly efficient clean cookstoves in the Indian market, and initially sales of stoves were less than 1000 per month. Given the limitations that this market represented, the best place to source materials and produce the stoves to the quality standards required was in China where materials, machinery, and skilled labor could be acquired without pricing target customers out of the market. Producing in bulk from China allowed us to consistently manufacture quality products in mass quantities, which could then be shipped in smaller quantities to India and other locations as demand grew.

Phase 2 - Core Functionality: Though shipping products from China is cost-effective for delivering consistent products in low volumes to multiple locations across the globe, it was not the most effective at delivering higher volumes in one region with increasing demand. Duties and tariffs greatly increased the cost of delivering fully assembled stoves across international borders, which became cost prohibitive as demand increased.

When we saw demand rise from hundreds of stoves per month to thousands, we entered the second phase of capacity development, in which costs were justified to develop a local assembly facility where individual parts were shipped and stoves were assembled on location before being distributed regionally. Shipping parts reduced tariffs but reduced the major need to invest in machinery and tool development at the centralized plant. By using different manufacturing and assembly operations, we were able to have the responsiveness and flexibility in our supply chain to fulfill smaller orders for small business owners while removing logistical barriers. This has allowed us to manufacture consistently high quality products that are affordable for end users the world over, with shorter lead times.

Phase 3 - Expansion: In the third phase of product development, demand rocketed from thousands of cookstoves to tens of thousands per month, which justified investing in developing a local production facility. These facilities enabled us to produce higher quality stoves on demand, reducing lead times for production from months to weeks. Through economies of scale, producing mass quantities of

stoves became cheaper on a local level. Also Envirofit India's transition from importing products to local production reduced the cost of stoves by 35%. Today, Envirofit has manufacturing facilities in China, India, Kenya, Honduras, and Mexico that have the capacity to produce 100,000 stoves per month.

We decided to grow manufacturing operations in these key target areas because of favorable economic and political environments that have markets primed to develop cookstoves. The Global Alliance for Clean Cookstoves has been working to increase awareness among local governments to prioritize clean cookstove initiatives. However, to expand into other regions of Africa, Asia, and Latin America, Envirofit along with the clean cookstove community, is collectively working to increase local knowledge, create incentives for clean cookstove businesses, and create a market ready to use the latest in clean cooking technology.

Manufacturing capacity of 100,000 stoves a month				
China	India	Nigeria	Kenya	Honduras + Mexico
50,000	15,000	10,000	20,000	12,000

Centralized Manufacturing Creates More, Not Less Jobs

We use a centralized manufacturing model which builds regional hubs with centralized facilities that can manufacture parts and stoves in an efficient assembly line. Traditionally, centralized manufacturing has been viewed as a process that takes jobs away from local artisans. However, it can create more permanent local job opportunities across the value chain. More than 50% of the population of Honduras still uses wood for cooking, and the country has one of the highest deforestation rates in Latin America.7.[7] When Envirofit first arrived in Honduras, locally built stoves were primarily constructed out of mud or cement in a time consuming process that produces stoves that vary in quality and efficiency. Constructing each stove at the point of distribution from mud and materials found around the household created manufacturing bottlenecks that limited the scale-up of production. The time needed for one person to build one stove was not an efficient process for producing mass quantities of stoves. In addition, local artisans were only trained on how to build stoves in their region, so once demand was fulfilled locally their jobs were no longer needed.

When we started working in the Honduran market, we saw that the most effective clean cooking solution would be to redesign our plancha stove into a freestanding appliance that could be mass produced with regulated quality standards. As demand increased, we invested in a regional centralized manufacturing facility in Honduras to develop a model that would support the large-scale production of cookstoves to sustain growing distribution. As a result of the increased volume, laborers in a centralized local facility are able to earn more money, attain benefits, and develop transferable skills that can be used in other facilities. By using centralized manufacturing, Envirofit was able to reduce manufacturing time in Honduras from two stoves per day (with up to a week of time for the cement to dry) to one stove per minute. Today, our factories in Honduras and Mexico directly employ 118 and 178 people respectively and indirectly employ 20 local installation agents, which can each supervise the installation of 25 units in a day. This demonstrates how the clean cookstove sector if supported can also generate wider economic benefits such as jobs.

[7]http://cleancookstoves.org/country-profiles/103-honduras.html

Conclusions:

A. **To be able to scale a product with consistent and reliable quality, stoves need to be centrally manufactured with stringent quality-controlled standards.**

B. **Localization of supply-chain in phases that grow with demand reduces costs**

C. **Manufacturing decisions are made based on market demand**

D. **Centralized manufacturing in regional hubs is necessary to overcome bottlenecks to scale cookstove programs**

E. **Centralized manufacturing can create more permanent jobs that develop transferable skills, pay higher wages, and offer more consistent hours.**

Lesson 3: Scale at The Right Pace to Maximize Impact

Challenge*: How can social enterprises both scale and innovate new distribution models and partnerships to distribute a "push product" with restricted funding and a large need for working capital?*

As cookstoves are still a "push" product with low levels of awareness, distribution is possibly one of the largest challenges for building a successful cookstove business. It took Envirofit years of trial and error with different distribution partners and models to reach today's million stove milestone. Distributors often require working capital to begin cookstove distribution, and sometimes these new pilots fail to succeed. However investors are often unaware of the complexity of cookstove distribution and we have spent a lot of time educating them on the hard realities of what is actually required to scale clean cookstove sales. We have worked to expand local cookstove markets but encountered challenges in scaling each component of the business at the right pace. Limited funding and working capital needs of new distribution partnerships can limit the growth potential of clean cookstoves.

Syncing manufacturing, distribution, and marketing

To create a sustainable market for clean cookstoves growth, each segment of our company needed to scale at the right pace in different markets. In India, we began to develop a sales network in 2008, and we invested in a national marketing campaign to raise awareness of clean cookstoves and drive customers to sales agents. Customers responded with a flood of demand for clean cookstoves, but the distribution network was not mature enough to support new customers outside the existing sales network. Although we failed to respond to the demand, this led to a shift in businesses practices from a Business-to-Customer model to a Business-to-Business model. Through this new initiative, Envirofit developed partnerships with different distribution models from private companies like TATA (with their Corporate Social Responsibility program), to microfinance institutions like Fullerton and SKS with customers (who provided access to loan facilities), and non-profit organizations like World Vision, and Integrated Village Development

"World Vision has been very pleased to work with Envirofit in different countries of the world. This is a partnership we expect to grow. Envirofit's global reach is a good match for a large global NGO like World Vision, because it allows us to develop tailored solutions that fit the context in each country. Moreover, we appreciate Envirofit's continuing focus on top quality design, production excellence, and superb customer service."

– Chris Shore, World Vision Fund

Project (who have strong community-based programs). By changing priorities to build new partnerships, Envirofit reduced operations costs by over 75%, reduced marketing expenses alone by 85%, and doubled sales in India.

Another challenge was addressing affordability. While customers were interested in purchasing a stove they were unable to afford the $25-$30 cost of buying the stove. To overcome this barrier, Envirofit worked with SKS's clients to innovate a financing mechanism for clean cookstoves. Through this partnership they were able to market stoves to SKS's customers with monthly installments and have been able to successfully sell over 50,000 stoves with financial support to customers.

When entering the cookstove market in East and West Africa, we learned from our experience in India and started with a Business-to-Business approach, which focused primarily on building a distribution network and tailoring materials and support to the needs of distributors. Using a Business-to-Business approach lowered the cost spent per stove, and allowed for the supply chain, sales, and marketing to develop in parellel.

Reaching Scale Requires A Blended Funding Approach

At each stage of Envirofit's development, it faced a new challenge with raising funds to support growth. As the cookstove market had not yet been proven as a viable business opportunity, grant funding was required for initial start-up funding. Long-term partner Shell Foundation was pivotal in providing the business support and funding to validate a market-based approach which could be scalable and sustainable. As we have grown, we have been able to obtain both equity and debt to scale proven business concepts. However, to continue innovating new technologies in new markets, grant funding is still needed to support initial growth and provide a strong track record to attract other investors. We have found funding difficult to access, as our experience has been that grant funding is being channeled towards early stage enterprises, which leaves a major funding gap for those entering their growth stage. The clean cookstove sector is still considered a nascent industry. To shift this perception with the investment community, more efforts need to be made in funding disruptive innovation for companies at the growth stage to demonstrate success and validate future investment into the sector.

For example, when we wanted to test an innovative women's empowerment training program, we ran into challenges from grant makers reluctant to fund a for-profit entity, reasoning that this could be funded with loans from a bank. However without proof of profitability of this new distribution model, investors were unwilling to risk investing in the program. Eventually, funding from the Global Alliance for Clean Cookstoves to pilot test the program, and a grant from The Energy and Environment Partnership Program to regionally scale this initiative and conduct a cost benefit analysis, allowed this innovative program to further develop and helps us make a case with future investors.

Funding innovations in product development as well as the market research for new products is also an area that requires great support from investors to move the clean cookstove industry forward. The cookstove industry has mostly been focused on developing solutions for household cookstoves where little information is known about the market for institutional cookstoves. With support from both Vitol foundation and the OPEC Fund for International Development (OFID), Envirofit was able to conduct market research that informed both the technology development and value proposition for institutions to adopt clean cookstoves and bring the stove to market. From this research, Envirofit was able to learn that schools in Kenya that cook for 300 children can spend up to $3,300 a year in fuel costs. By providing blended funding for market research (from Vitol Foundation), technology development, and pilot testing (from OFID), Envirofit was able to bring a new product from concept to market in less than 15 months.

Conclusions:

A. **Building a cookstove market requires a careful balance of growing production, distribution, and marketing synchronously.**

B. **Supply chain needs to be developed before sales can initiate, which requires investment.**

C. **Grant funding is required for supporting innovation in technology development as well as distribution and marketing development.**

D. **During the initial growth stage, a mixed model of funding is required, and each component of the business requires grant funding before an investment case can be made.**

Lesson 4: To Reach the Last Mile, Behavior Change Needs to Be incorporated From Design to Delivery

Challenge: *How can a business develop to reach communities with products that people will use, and which are affordable, and desirable?*

Many of the nearly three billion people that cook on traditional stoves live in some of the world's most remote and difficult to reach environments. We are committed to finding solutions for all communities who cook in the traditional method. However, reaching families who live in rural environments has been a challenge for us as well as for the cookstove industry as a whole. While charcoal users in urban environments are more immediately accessible, families living in rural and remote areas are at the highest risk from diseases related to Household Air Pollution. In communities that cook with wood, access to alternative fuels such as gas or LPG is not only unaffordable but non-existent and unreliable in many areas. Developing a rural cookstove supply and distribution chain takes more time and innovative solutions, but is important in reaching the populations in the greatest need.

Female Sales Agents are Pivotal in Reaching the Last Mile

To develop a scalable approach, we used a hub and spoke model when establishing a new market in Kenya in 2011, but later learned it needed to develop regional networks to reach remote populations. The hub and spoke model served to set up a base of operation to coordinate the production and distribution of clean cookstoves for urban and peri-urban markets. While this model was successful in creating access for charcoal users, reaching rural populations who cook with wood was a greater challenge.

To reach rural communities, we evaluated regional distribution channels and found that men comprised the majority of the last-mile entrepreneurs. We saw the opportunity to diversify our last-mile sales agents as a potential disruptive business innovation. In 2012, we pilot tested an improved cookstove women's empowerment training program for clean cookstove entrepreneurs in Kenya. The pilot investigated the impact of male vs. female entrepreneurs after completing an empowerment-training program. The one-week training curriculum used an agency-based training model that was developed from a program by the Empowerment Institute and further adapted in partnership with Johns Hopkins.[8] This program worked to develop motivational capacity while equipping women with the business acumen to sell cookstoves to their target customers.

After completing the empowerment training, women who participated in the program sold three times as many stoves as men, after completing the empowerment training. Additionally, customers who purchased stoves from program participants reported higher rates of cookstove adoption and correct use. While this pilot contributed to make the business case for investing in women as last mile entrepreneurs in Kenya, continued funding is still needed to demonstrate that this model can be implemented at scale in different countries where women have different levels of autonomy and responsibilities. Envirofit is hoping to expand this training opportunity in Nigeria, India, and Honduras in the next five years.

> *"As a leader in the clean cooking sector, Envirofit is demonstrating that a gender-informed approach can strengthen cookstove business models, leading to increased sales and adoption of clean cookstoves, as well as increased impacts for women. The Alliance has been proud to support Envirofit as it has piloted women's empowerment approaches – first by contributing to an Alliance-commissioned research study to build the evidence that women are effective cookstove entrepreneurs and then through its Women's Empowerment Fund grant. I am thrilled that Envirofit is now scaling this work throughout its global operations."*
>
> *– Corrine Hart, Global Alliance for Clean Cookstoves*

Increasing Adoption Rates Requires End-User Behavior Change

Designing the right product for a target market is an important step in behavior change, but it is only the first step in achieving higher rates of cookstove adoption.[8] In 2008 we designed our first marketing campaign in India to raise awareness about the dangers of Household Air Pollution. This campaign was based around increasing awareness of clean cookstoves, with health improvement-based messaging. After running the campaign, it became clear that health focused messages were not a strong enough value proposition for convincing people to change their behavior.

Over the past seven years we have refined this message across markets in Kenya, Nigeria, Ghana, India, Guatemala, and Honduras with detailed focus groups, and sales and market testing. We found that similar messages resonate with customers across different cookstove markets. Regardless of location, customers most value the cost savings they will realize from reduced fuel consumption, and the time savings offered by a product that cooks as fast or faster than their current stove. Thus, our messages primarily focuses on the 60% cost savings they will experience in using the stove as well as the increased productivity/earning opportunities due to time saved in cooking and in gathering wood.

Demonstrating these key value propositions is useful in increasing the number of people who purchase the stove, but communicating how to use the stove properly is required for consumers to adopt the new technology. Even with the same fuel type and minimal changes in cooking technique, altering cooking behavior requires an instructional demonstration.

Envirofit first approached consumer education by including detailed instructions both on the outside and inside of the product packaging. Envirofit also produced instructional videos to train distributors how to use the product. As stove sales began to increase in Kenya and in India they found that even with these instruction materials available, there was an educational gap, and users still faced challenges to using the stove correctly. People often added too much wood during the lighting process, or stored the stove in the rain where it would rust more quickly.

To combat this eductional problem, we invested heavily in training agents entrusted to communicate across the distribution chain to show customers how to best use the stove. In Honduras, many training agents were hired to install stoves in the customer's kitchen and train them how to light and maintain the stove during the installation process. In Kenya, where installation is not required, we found we had to invest additional resources into training all last-mile entrepreneurs who interacted with customers on how to properly use and store the stove. While this requires a large investment in funds and doesn't

[8]Shankar, A., Onyura, M., Alderman, J. Agency-Based Empowerment Training Enhances Sales Capacity of Female Energy Entrepreneurs in Kenya. Journal of Health Communication: International Perspectives Volume 20, Supplement 1, 2015. Special Issue: Advancing Communication and Behavior Change Strategies for Cleaner Cooking

directly impact sales, it improves the user experience, which indirectly leads to greater adoption. Investing heavily in behavior change at the last mile ensures that customers have a good experience with the product, which is essential in establishing a sustainable market for clean cookstoves. While investing in training resources increases costs, it also increases adoption, which is important in maintaining a good reputation for Envirofit clean cookstoves.

Conclusions:

A. Engaging and training female entrepreneurs can increase sales and adoption of wood cookstoves in rural communities.

B. While using a market-based approach is ideal for scaling profitability, grant funding is still needed for developing new technology and pilot testing new distribution approaches.

C. Convincing users to change their cooking practices is a multi-step process that requires investment at all stages of a cookstove program.

i. Design: A product based on consumer insight, that performs well and consumers are attracted to.
ii. Marketing: Tailor messages that motivate consumers and appeal to their needs
iii. Training: Live instruction on how to use the stove correctly

Lesson 5: Clean and Efficient Cookstoves are a Tool to Reach Programmatic Impacts

Challenge: *How can social enterprises create more partnerships and better collaborate with development organizations to include market-based cookstove solutions into implementation programs?*

The clean cookstove industry is still viewed as an aid-based sector that has failed at commercial viability. The limitation of this perspective inhibits the establishment of partnerships and opportunities that could lead to environmental, health, and economic impacts. Development organizations often do not have an understanding of how more efficient and clean-burning stoves can result in meeting their broader health, economic, and environmental objectives. While the use of a market-based approach takes more up front investment to demonstrate viable impacts, supporting this approach is more cost effective in leading to sustainable impacts. Envirofit has been working to not only communicate the impact potential of stoves but also to better align the impacts of how using a market-based approach to clean cookstoves can help to unify the sector.

Communicating the Clean Cookstove Impact

In the development sector, creating access through the distribution of stoves is often viewed as the end goal. However, narrowly focusing on giving a family a stove can limit the access of cookstoves. Market-based cookstove programs have the potential to make a multi-level impact both directly on the customers who purchase them and indirectly on the surrounding community where the business is developed.

Using a clean cookstove directly benefits consumers by improving health and household wellbeing. Reducing smoke and toxic emissions by up to 80%, the effects of smoke such as painful coughing and watery, burning eyes are quickly and noticeably alleviated. Our HM-5000 plancha stove has shown to reduce household air pollution to 46% below the WHO standard. Since a family spends up to four hours each day gathering fuel, or spends up to 35% of their income on purchasing fuel, reducing fuel requirements by at least 60% has an immediate impact on their daily life and family economics by saving time and money. Consumers reported fundamental quality of life improvements, including having more income and having more time for income generating activities and education.

IMPROVING THE KITCHEN

Cooking over an open fire is the equivalent to burning 400 cigarettes an hour - 100x more than WHO recommended levels.

Families can spend up to 1/3 of their annual income on cooking fuel. Families can spend up to 4 hours a day collecting cooking fuel.

An unimproved cookstove produces 5 tons of CO_2 in a year. More than the average car emits in a year.

Women, who carry the primary burden of cooking and collecting wood, are the people most affected by improved access to clean cookstoves. Not only does using a clean cookstove have a direct impact on their wellbeing, but opportunities to develop a clean cookstove enterprise can create income earning opportunities that affect the whole community.

Using an Envirofit stove also has greater indirect community benefit on the environment and for job creation. Employing a market-based approach to cookstove distribution creates employment opportunities at each stage of the value chain, and provides opportunities for women and youths at the last mile. Per year, per stove, Envirofit cookstoves save approximately 3.4 tons of CO2, 23kg of Carbon Monoxide and 1kg Particulate Matter, significantly reducing overall greenhouse gas emissions. In addition, the 60% reduction in fuel use decreases the resource burden on forests – especially in arid environments where fuel wood is more scarce.

The development of an efficient institutional stove has also created opportunities to impact schools who are burdened with the high expense of fueling a fire to feed their students. Institutional stoves, which reduce fuel use by 80%, can save money and greatly reduce their carbon footprint.

Developing Innovative Partnerships that Support a Market Based Approach

Building from existing distribution networks can expedite the market penetration of cookstoves. When we began selling cookstoves in India in 2008, we used a Business-to-Customer sales model in order to break away from the traditional model of give-away programs and prove that people were willing to pay for high quality cookstoves. While using a Business-to-Customer model established an opportunity for a market-based approach, Envirofit found it could reach more customers by transitioning to a Business-to-Business sales model if other partners could understand the clean cookstove value proposition.

Demonstrating that the sale of cookstoves could be a tool to accomplish greater programmatic objectives such as reduced greenhouse gas emissions, improved household prosperity, and job creation, we were able to establish unique partnerships with businesses, community-based organizations, and government programs. These partnerships helped increase access to cookstoves while allowing partners to achieve their

program objectives. In India, Grameen Koota established a loan facility for their customers to purchase stoves. Partnering with Envirofit helped them to expand their client-base through innovative product offerings in line with their development services. Since then, we have worked with 31 different microfinance institutions and have demonstrated capacity to develop partnership structures that meet a wide variety of circumstances.

Working with South Pole Carbon in Kenya, Envirofit was able to use carbon programs to reduce the cost of stoves for rural customers while generating reduced carbon emissions for South Pole's clients. In Nigeria, Envirofit's Women's Empowerment Programs help community-based organizations generate jobs while delivering cleaner, more efficient stoves. Through partnerships, Envirofit is able to innovate unique solutions that create access to cookstoves while enabling partners to use a sustainable market-based approach to reach their development objectives.

Finally, governments can also play a major role in supporting a market-based approach to cookstoves that can build sustainable programs that will be viable in the future. For example the Honduran government worked in partnership with Envirofit and a local non-governmental organization called FUNDIEH to build a sustainable cookstove industry with local manufacturers that will support the development and long-term market creation of clean cookstoves. This leadership demonstrated new ways that governments can work together with the private and social sector to invest in market-based solutions.

INSTITUTIONAL COOKING

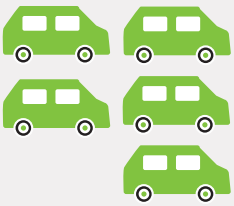
AN URBAN SCHOOL IN KENYA WITH 300 STUDENTS REPLACED THEIR OPEN COOKING FIRE WITH AN EFI-100L FOR 1 YEAR

$2,400
SAVED ON FUEL
enough to feed 100 students

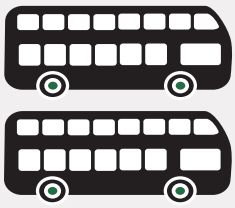
VS

$3,300
SPENT ON FUEL
up to 50% of the annual food budget

14,400 KG
WOOD CONSERVED
equal to 5 fewer cars on the road



VS



16,300 KG
WOOD WASTED
the same weight as 2 double decker buses

80% REDUCTION IN FUEL USE

$1,400 FUEL SAVINGS IN THE FIRST YEAR

FUEL SAVINGS OFFSETS COST OF STOVE IN 5 MONTHS

80%
REDUCTION IN SMOKE
chimney reduces pollution to 46% below W.H.O. limits

VS

100%+
OVER W.H.O. LIMITS
smoke equal to 2 packs of cigarettes per day

Conclusions:

A. Clean cookstoves have a direct impact on consumers, improving household wellbeing

B. Clean cookstoves have an indirect impact on the environment and economy – reducing greenhouse gases and fuel wood requirements while creating job opportunities.

C. Institutional stoves represent an opportunity to reduce expenditure on school lunch programs.

D. A market-based approach can provide win-win solutions for social, public, and private institutions that can increase access and adoption of cookstoves.

E. Cookstoves distribution is not a goal but a tool to reach programmatic outcomes in health, environment, economic improvement, and energy security.

F. Cookstove programs need to shift priorities from supplying stoves as an end goal to viewing stoves as to a tool that helps a wide range of thematic programs reach their impact objects – such as improved health, ecosystem regeneration, gender inclusion, improved livelihoods and reduced climate change.

Journey to Financial Sustainability: Scale, Profit Expansion and Diversification

Envirofit learned early on that building a profitable business would require scale, margin expansion, diversified revenue streams, and attracting investment capital. It is very challenging to find the road to sustainability selling a single product in a single market – especially one that requires investment in customer education and support. But this challenge naturally leads to scale and diversification. Whether scaling through market segmentation, introduction of new products, or entering new markets, millions of customers need to be served. Supporting this scale by engineering new products or trail-blazing new distribution territories, requires investment for R&D, marketing, production, and distribution equipment to increase capacity. In addition, working capital is also required to acquire and transport more goods and distribute them more broadly. Cash reinvestment is mandatory to keep systems fueled and scaling; but it is rarely sufficient in the initial phases of growth.

Profitability and positive cash flow remain challenging in all expanding enterprises and it is no exception for clean cookstove manufacturers. Innovation in pricing structures has assisted in allowing resource-challenged consumers to acquire the value they perceive in technology goods geared to their needs. Whether "pay as you go" financing, micro-credit, or pairing "buy one get one" purchasing for impact minded consumers to support consumers in emerging markets, creating financing programs to overcome the purchase hurdle are important for market success. Inflationary pressures and emerging middle class consumers are also driving the ability to scale prices and develop product segmentation to secure, if not slowly expand, margins.

Conserving cash through cost management, particularly focused on supporting sales growth while constraining overhead growth, is a constant. Envirofit has been able to capitalize on its global footprint, and has diversified its product line, because doing so lowers the risk that singular product or market failure events will be catastrophic. These events would not just affect us or our investors, but would also affect the reputation of the industry. In regions where political and economic risk is high, this is a very import security assurance for capital providers. As a business, paying attention to cost control and profit expansion provide the requisite potential for successful investment returns.

The Path Forward to Reaching Five Million Households

Over the past eight years, Envirofit has encountered obstacles and has overcome unique challenges in every market while developing regional infrastructure across the globe to support a growing cookstove market. After years of development and support from funders, investors and distribution partners, Envirofit's regional business units are sustainable and use their profits to reinvest back into the business. With a projected compound annual growth rate of 32% for product sales over the next five years, Envirofit intends to accelerate penetration in local markets to reach five million households. And we would like to see other manufacturers continue to grow, so that together we can demonstrate that clean cookstove businesses are investment worthy..

We plan to continue refining cookstove products to meet the desires of consumers living in energy poverty and expand our product portfolio to deliver other household energy technologies. The development of these complementary products will be able to add more product offerings to our expanding distribution network and deliver greater opportunities for household energy advancement to existing and new customers. While we have developed a Tier 4 wood fueled clean cookstove, investment is needed to take this technology to commercial scale in a way that is affordable, attractive, and adoptable by consumers. Envirofit also hopes to expand our institutional stove offerings with different cooking capacities to serve different sizes of institutions. To achieve these goals, more financial investment is needed to further improve the quality and performance of clean cooking technologies. Mixed models of funding, working capital, and investment are needed to support market research, technology development, and pilot programs that will bring these products more quickly to market.

As local demand rises, we will continue to shift towards local production, expanding the capacity of existing manufacturing operations in East Africa, West Africa, Asia, and Latin America. Regional offices will develop larger distribution partners and last-mile entrepreneurs to reach customers in more remote locations. Envirofit is working to develop products that can be assembled on location, building on the success of the low cost Econochar and Econofire, and HM-4000 Plancha stove models to create more local jobs at the last-mile. To be able to continue to scale, and to bring the latest technology to remote locations, efforts are required at the international level to lower value added taxes, and tariffs on clean cookstoves. This will help the cookstove industry increase access to technologically advanced products and make clean cookstoves more affordable for customers at the base of the economic pyramid.

With the goal to reach five million households, Envirofit aims to regionally expand distribution networks in Africa, Asia, and Latin America. After working with microfinance organizations for over eight years, using different distribution models, we plan to expand this network to make financing options available to customers. To reach more families in rural communities, Envirofit intends to expand the Women's Empowerment Program. We currently offer training in Kenya and Nigeria and are looking for partners and pilot funding to start programs in India and Latin America.

A combination of working capital to support distribution and investment capital to support expansion and new market penetration will be employed to reach these goals. Our 2015 goal of raising equity and debt working capital are directed toward turning footholds into thriving marketplaces in Africa, the Americas and South Asia. If a program can be successful in Honduras, there is no reason it cannot be equally employed in Nicaragua. The need for clean cookstoves in Bangladesh and Nepal is no less than in India; and the Sub-Saharan stretch from Senegal to Sudan is no less attractive for sales as Liberia or Malawi. It is a matter of having the right product, meeting the challenge of finding key distribution partners, and effectively employing capital to drive sustainability. With sales revenue over the last five years growing from $0.7 million in 2010 to a projected $20 million in 2015, the next five years will propel Envirofit to sales estimates of $50 million annually.

Progress to achieve universal access to clean cookstoves cannot be made without new innovative distribution solutions as well. Within each new

partnership an opportunity exists to transform cookstoves from a push product to a pull product. Clean cooking is about more than a stove; it is also about improving household wellbeing, reducing deforestation and CO2, as well as increasing economic opportunities and energy access. Non-profit organizations can help bring these impacts to their beneficiaries, whilegovernment institutions can invest in sustainable cookstove growth operations on a national scale. Additionally, corporate CSR programs can offset carbon credits that will create jobs, improve health, and empower women. These new opportunities can be realized when the development and investment community can understand the potential for the commercial sector for clean cookstoves. When commercially available cookstoves can be viewed as a means to deliver social impacts, the cookstove sector will remembered as a pioneer for shifting the paradigm of development.

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