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Article

A National Strategy Proposal for Improved Cooking Stove Adoption in Honduras: Energy Consumption and Cost-Benefit Analysis

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Abstract: The high consumption of firewood in Honduras requires the search for alternatives that reduce its negative effects on health, economy, and the environment. One of these alternatives has been the promotion of improved cooking stoves, which achieve a large reduction in firewood consumption. This paper shows a cost-benefit analysis for an improved cooking stove adoption strategy for Honduras. The methodology uses the *Long-range Energy Alternatives Planning System*, LEAP, a tool globally used in the analysis and formulation of energy policies and strategies. The energy model considers the demand for firewood as well as the gradual introduction of improved cooking stoves, according to premises of a National Strategy. Hence, it is demonstrated that the costs of implementing this adoption strategy are lower than the costs of not implementing it, taking into consideration various scenarios up to and including the year 2030.

Keywords: energy strategy; improved cook stoves; Honduras

1. Introduction

Firewood is a very important source of energy in Honduras [1]. Many households with access to electricity still use firewood as the main source of energy for cooking food. Firewood is also used in micro and medium enterprises dedicated to the sale of food, salt extraction, brick production, bakeries, tortilla manufacturing, and coffee mills, among others. In urban and peri-urban areas, 29% of households use firewood, while in rural areas firewood continues to predominate in 88% of households [1].

About half of Honduran households (approximately one million) cook with traditional wood-burning stoves [1], [2]. These stoves are not only inefficient, but also highly detrimental effects on the user health and the cost of collecting or buying firewood also have a huge impact in the economy and social welfare of families. Additionally, in order to obtain the firewood, people must either collet or purchase it.

Consequently, the high consumption of firewood in Honduras requires the search for alternatives that reduce its negative effects. In the country, one of these alternatives has been the promotion of improved stoves. This adoption achieves large reduction in firewood consumption, as the improved stove spends 71.2% less wood than the traditional stove [2]. Additionally, families cooking with a traditional stove in zones where it is difficult to find firewood (peri-urban areas) spend about US $ 20.00 per month on firewood purchase. Likewise, there is also an opportunity cost for families who spend time on its collection. Furthermore, it is necessary to take into the account the health expenses of respiratory diseases associated with the traditional stoves [3], [4]. As a result, the use of improved stoves is more than justified.

However, in the country programs that introduced improved stoves have traditionally been isolated efforts with few resources for technological development and with a lack of follow up on the adoption of new technologies [4]. Additionally, the adoption of improved stoves in the Honduran households have been affected by the lack of public policies or strategies with a long-term vision for the development of a value chain that integrates the different links such as design, manufacturing, financing, marketing, and post-sales services, as well as sustainable supply of wood [5].

In this way, a change of direction is call for; it will require a comprehensive and joint strategy that allows the use of improved stoves to be expanded under different conditions. This strategy must be economically viable; and prior to its development, it is essential to perform a cost-benefit analysis of the strategy implementation. Similar analyses, using another methodology and in another country, have shown that the implementation of improved stoves is viable [4], [5]. This paper reinforces the conclusion of the feasibility of technology presented in [4] but using a different methodology and the assumptions of a National long-term adoption strategy.

Thus, the proposed methodology included a review of bibliography and interviews with stakeholders of the improved stoves value chain in Honduras. For the cost-benefit analysis, the *Long-range Energy Alternatives Planning System*, LEAP ® tool was used [6]. This tool is widely used in the analysis and formulation of energy policies and strategies worldwide. This tool considers the demand for firewood as well as the gradual introduction of improved stoves for cooking food, according to the assumptions of a National Technology Adoption Strategy.

This paper is organized as follows: Section 2 gives a background of the current status of improved stoves delivery and postulations of an adoption strategy in Honduras; Section 3 describes the methodology used; Section 4 describes the obtained results and finally Section 5 presents the policy conclusions when an adoption strategy is considered.

2. Current Status of Improved Stoves Delivery and Postulations for a National Strategy Adoption in Honduras

2.1. Stakeholders and Projects

In recent years, joint efforts have been made to coordinate activities to strengthen the value chain of improved stoves. In these efforts, the Government of Honduras (GoH), international cooperation, academia and private sector have participated [4], [5]. Fig. 1 shows the relationships of some stakeholders, as well as other agents, currently present in the delivery of improved stoves.

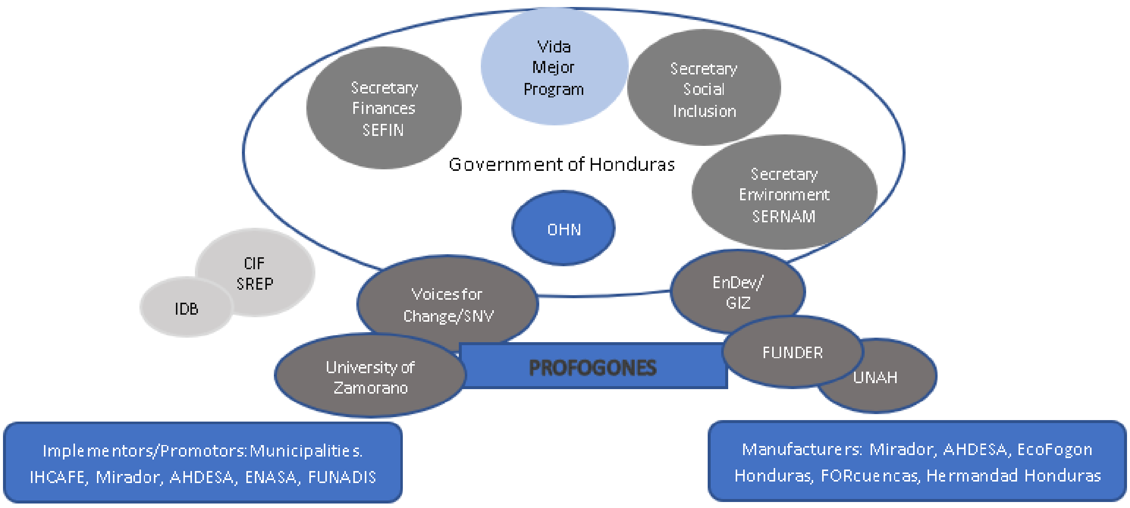

Fig. 1. Stakeholder mapping of the clean cookstove sector in Honduras (modified from [7]).

Despite the existence of such structure, a strong leadership becomes necessary to achieve the objectives related to the support of the value chain in the process of adopting improved stoves.

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Thus, the designing and executing a National Strategy requires an institutional framework that considers not only the progress obtained so far, but also the challenges in the future. This requires a leadership that actively promotes the different components of the strategy with a long-term vision. In this way, the need to have an integral policy was detected and it should be implemented under the leadership of the GoH, given the need to coordinate efforts with different stakeholders.

Programs for production, distribution and adoption of improved stoves in Honduras date back to the end of the last century, but their greatest momentum has been noticed during the current decade. International cooperation, together with Honduran non-governmental organizations, initiated small scale programs during the previous two decades [5], [7]. These programs proved the advantages in health, forest conservation and energy efficiency in replacing the traditional stoves with improved ones.

The Honduran government joined these efforts in 2013, with a comprehensive manufacturing and distribution program, under the name of *eco stove* [5]. Up to the end of 2017, around 600,000 improved stoves had been distributed in the country [5] (see Table 1). However, this number does not necessarily mean that stoves are currently being used, this is because not all people, who received them, adopted the technology yet.

The information available leads to the conclusion that there is a small number of suppliers of improved stoves in the country. The GoH stands out with a 44% share in the production and distribution of stoves, through *Envirofit* and *Fundeih*[1] program, since 2013. The second most important program is *Mirador*, an NGO that has been working in Honduras since 2004 and has distributed about 180,000 improved stoves (equivalent to 29.3% of the total). Additionally, *Adehsa*, *Fundeih* and *Endev / Focae* are also suppliers with 8.6%, 5.9% and 5.7%, respectively. Other smaller programs are participating as well [5].

Table 1. Producers and improved stoves installed to December 2017 (modified from [5]).

No	Producer	Quantity of improved stoves	% of share
1	ENVIROFIT (GoH)	256,679	44.0
2	Proyecto Mirador	170,767	29.3
3	AHDESA	50,000	8.6
4	FUNDEIH (GoH)	34,407	5.9
5	EnDev/FOCAEP	33,000	5.7
6	PROFOGONES	11,346	1.9
7	Proparque	7,404	1.3
8	ORNADER	6,030	1.0
9	Funda AHPROCAFE	6,000	1.0
10	GEMA/USAID	4,270	0.7
11	Acceso	2,240	0.4
12	Clifor	1,152	0.2
	TOTAL	**583,295**	100

[1] Envirofit Honduras and Fundeih are part of "Vida Mejor" Goverment Program. Envirofit build the stove and the Goverment pay to Fundeih, which make the stoves distribution.

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The goals and characteristics of these programs have not been homogeneous, although all are based on the benefits of replacing the traditional stove with an improved one. One of the main differences is whether the objectives include the creation or expansion of the market for improved stoves or not. There are three market segments identified: 1) Families in extreme poverty that are not able to pay for an improved stove and therefore they require a total subsidy; 2) a second segment of limited economic capacity that requires a partial subsidy; and 3) a third segment that operates in the free market of improved stoves.

For the first segment programs should be aimed for those in extreme poverty, in such cases the improved stove would be donated. On the other hand, the *Mirador project*, although highly subsidized, also requires a counterpart in local materials and labor [5]. This would be the case of the second segment, the program *EnDev / FOCAEP* seeks to create a market for improved stoves through attention to the different components of the value chain. In the same way, *PROFOGONES* project promotes a sustainable business model of improved stoves. The latter is linked to the *Vida Foundation*, with the Inter-American Development Bank (IDB) as the project administrator.

In practice, these programs could be considered complementary, due to the market segment they seek to fulfill. However, the way in which the government program is executed, i.e. with political objectives, distorts the rest of the market segments.

2.2. Nationally Appropriate Mitigation Actions (NAMA)

Another effort to coordinate actions is the Appropriate National Mitigation Actions (NAMA), whose objective is to increase the adoption of improved stoves in low-income households in Honduras [8]. In the same way, the NAMA will promote coordination and communication among stakeholders, generating comparable and transparent information, as well as the common report of national advances in the reduction of greenhouse gases.

On the other hand, NAMA can contribute to the strengthening of micro, small and medium enterprises that manufacture improved stoves and the supply chain, due to the increase demand in the market. Thus, with the NAMA of stoves, it would be possible to reach 1,126,000 families by 2030 [8].

Considering the need to unify and create synergies among multiple initiatives, the coordination of stakeholders and various programs of improved stoves will be one of the main challenges of NAMA and the National Strategy. For the latter, it is proposed to establish a National Bureau of Improved Stoves that will allow the coordination of the different stakeholders in the NAMA [8].

2.3. Towards a National Strategy for Adoption of Improved Stoves

Among the different postulations for a National Strategy, the following must be included:

a. National Standard for Improved Stoves

Honduras officially launched the standard of improved stoves OHN 97001.2017 [9], as part of the *PROFOGONES* project, the country became the third country in Latin America to establish the performance requirements to categorize improved stoves. Implementation of this standard promotes the dissemination of improved stoves for a sustainable development in terms of health for users, reduction of pollutant emissions, an adequate use of natural resources, and economic benefits for users.

The OHN 97001:2017 standard establishes the minimum requirements of efficiency, safety, and quantity of intra-household emissions captured from an improved stove by categorizing models according to their performance. Its aim is to provide the limit values that indicate the performance of these technologies in comparison to a baseline that corresponds to the traditional stove operated under controlled conditions.

b. Training Programs to Improve the use of Stoves and the Firewood Efficient Use

One of the main goals of the National Strategy is to make users aware of the benefits of using improved stoves. Training is also important, as the potential users are not aware of the damages and ailments that smoke produces derived from the use of firewood, they will not be able to understand the need to change technology. This technological change implies strong behavioral changes regarding fuel, technology, and cooking. Therefore, it is necessary to accompany users in this process so that in the face of difficulties, they do not abandon the technology [10].

c. Promotion of Financing Mechanisms

The few companies dedicated to the promotion and construction of improved stoves are small, they are non-profit or growing social enterprises, with minimum capital, which basically depend on sales through contracts signed with non-governmental organizations, who in turn depend mainly on donations, from small local or international initiatives. There is not a large market for improved stoves, and the government´s program makes more difficult its creation given the policy to give away the improved stoves without any discrimination among segments of potential users.

A case to highlight is the *Mirador* project, which finances part of its activities with carbon credits [9], [10]. However, putting into practice an experience under this certification process is costly, although it is different from other initiatives for its funding source, since it includes a component to monitor and evaluate the installation and use of improved stoves [10].

However, evidence shows that it is better to have an open market, stratify the target population who will be involved, know the material benefits, consider the subsidy according to the stratification of the participating population, and boost a market of pieces and parts. In the case of subsidy, there is a high percentage of population that does not have the capacity to pay the total cost of an improved stove, but they could be asked to contribute to cover a part of the cost and participating with their work in the installation process. It is important to consider this participation of the people, due to this improves the new technology adoption.

For the user who can pay, financing mechanisms must be created through local and / or regional credit institutions, i.e. rural savings banks, cooperatives, among others.

d. Monitoring and Evaluation

Currently, most programs that promote the establishment of improved stoves in Honduras are measured by the number of stoves built, distributed, and/or sold. However, this does not mean that the technology has been adopted and stoves are in effect being used. Few programs carry out monitoring and evaluation [11], [12]. Therefore, in a National Strategy, it is important to broaden the approach of evaluating the process of building, distributing, and selling stoves to one methodology that includes monitoring and evaluation of their use as well.

e. Certification and Applied Research

Certification indicates that those improved stoves which do not comply with the provisions of the regulations must not be used in projects, whether with public or international funds. The certification will be used to evaluate the different types of stoves based on three characteristics [13]: 1) Reduction of fuel use, 2) Capacity to capture particles, and 3) User safety; as it is established by the Honduran OHN 97001 standard for improved stoves. The foregoing will ensure that all stoves that are put into service meet the minimum standard criteria of fuel efficiency, indoor air quality, particles emissions and carbon monoxide, durability, and safety.

f. Stove Users and Producers' Associations

The main stockholders to consider in the organization will be users from low-income households in urban and rural areas that use firewood with traditional stoves. Women and children are the most exposed to air pollution inside the house. For this reason, female leaders must be trained in rural communities and neighborhoods in peri-urban areas as promoters responsible for coordinating demand and monitoring. Similarly, the training of master builders, i.e. builders of improved stoves, is needed.

3. Methodology Used in the Cost-benefit Analysis of a Strategy for Adoption of Improved Stoves in Honduras

The methodology used to evaluate the cost-benefit of implementing a National Strategy for the adoption of improved stoves is based on using the LEAP software.

LEAP is an integrated, scenario-based modeling tool that can be used to track energy consumption, production, and resource extraction in all sectors of an economy. It can be used to account for both energy sector and non-energy sector, and greenhouse gas emission sources and sinks. In addition, LEAP can also be used to analyze emissions of local and regional air pollutants, and short-lived climate pollutants making it well-suited to studies of the climate co-benefits of local air pollution reduction [2], [6].

LEAP is not a model of a particular energy system, but rather a tool that can be used to create models of different energy systems, in which each requires its own unique data structures. LEAP supports a wide range of different modeling methodologies [6]. On the demand side, these range from bottom-up, end-use accounting techniques to top-down macroeconomic modeling [6].

LEAP's modeling capabilities operate at two basic conceptual levels. At one level, LEAP's built-in calculations handle all the "non-controversial" energy, emissions and cost-benefit accounting calculations [6]. At the second level, users enter spreadsheet-like expressions that can be used to specify time-varying data or to create a wide variety of sophisticated multi-variable models, thus enabling econometric and simulation approaches to be embedded within LEAP's overall accounting framework [6].

So, in this study, LEAP is used in the calculation of cost-benefit to evaluate the implementation of a strategy for the adoption of improved stoves in the urban residential sector (electrified and non-electrified), rural and commercial sector, with and without share of LPG. The base year is 2016, and the target year is 2030. Variables were also established as the most representative for the analysis of the energy sector: Population, GDP, income, households, GDP growth, population growth and demand growth.

According to the 2016 Honduras Energy Balance, the final energy consumption is 56.33% primary energy and 43.67% secondary. The final consumption of primary energy was divided into the main consumption sectors, residential, commercial and industrial sectors.

With data, the share of each sector in the primary energy consumption was determined as follows: industrial sector with 13.17% energy consumption share, commercial sector with 4.76% energy consumption share and residential sector with 82.07% energy consumption share. The latter value represents most of the share.

The residential area was divided into urban and rural areas with a share of 54.1% and 45.9% of energy consumption share, respectively. This energy consumption is driven by characteristics of both, rise households and the population.

Therefore, for both areas previously mentioned the firewood consumption was taken. For the urban residential sector, 25% of households, the firewood consumption represents 77.96% of the rural residential area. It is established that the traditional stoves accounts for an approximate yearly consumption of 7.45 m^3 per household, and the improved stoves accounts for only 2.13 m^3 per household.

For secondary energy consumption in the residential sector, the sector was divided into urban and rural areas, and each of these areas was classified into electrified and non-electrified.

In the category of electrified are the ultimate uses of electricity, such as lighting, cooling, and cooking. In the cooking section the LPG was added, which represents 42% of it; an average value of 300 pound per year was assumed considering that a 25-pound container per month is consumed in each home.

On the other hand, it is assumed that under the reference scenario, the consumption of LPG for households will grow 18.4% per year.

For the non-electrified area, only the kerosene for lighting and the LPG for cooking are considered. In this scenario, only the LPG consumption for food cooking are analyzed, mainly in the peri-urban area of Tegucigalpa, the capital of Honduras. The use of LPG will rise 36.8 % to 2030 in this category. It is considered that there will be no increase in the use of LPG in the rural area.

3.1. Scenarios

Three scenarios were used in the analysis, as follows:

- The Business as Usual (BAU), a scenario in which the strategy is not implemented. This scenario does not consider the implementation of measures to adopt the new

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technology. Under this scenario, the government continues giving away the improved stove as it was mentioned in the previous section.
- The scenario with a strategy. Under this scenario, improved stoves are introduced in the urban and rural households.
- The final scenario analyzed is the introduction of improved stoves plus LPG.

By 2017, 583,295 improved stoves had been delivered, of which 20% have not been adopted by users (116,659 stoves). It is expected that by 2030, 1,125,000 improved stoves would have been already been installed, which implies that 658,364 improved stoves should be installed.

3.2. Manufacture Costs

The manufacture costs of improved stoves are as follows:
- Residential Urban: *Justa* portable stove: 61.78 USD
- Residential Urban: *Justa* 2x3 stove: 59.5 USD
- Commercial: *Justa* stove with flatiron: 22x22:108.16 USD

These costs are introduced into the LEAP model, in such a way that they were annualized throughout the analysis period. Thus, the following figures (No.1 to No.3) were obtained, which show the costs behavior from the base year up to 2030. It is assumed that a traditional stove has a cost of 34.00 USD.

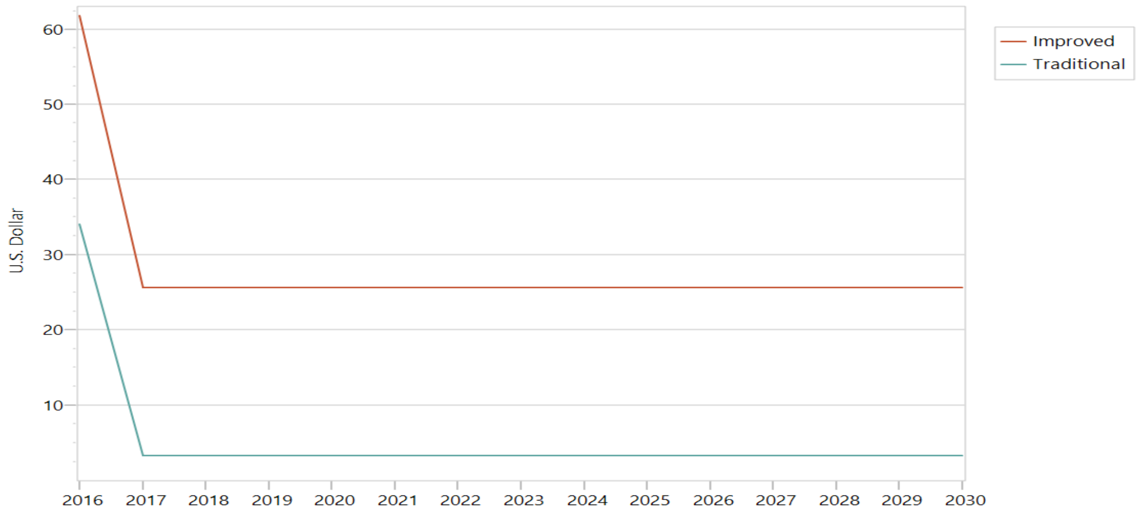

Fig. 1. Annualized cost of improved stoves for urban households.

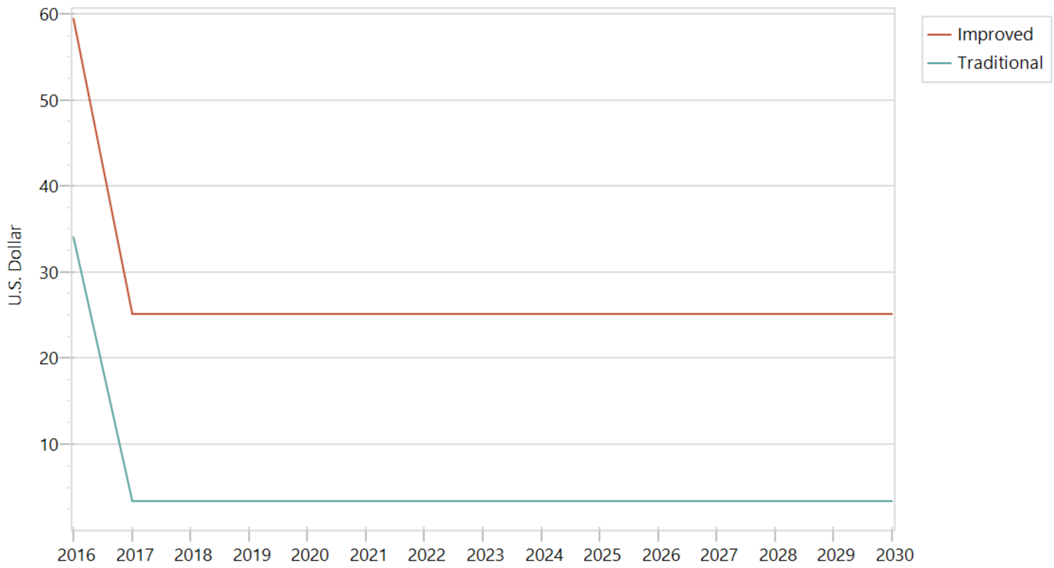

Fig. 2. Annualized cost of improved stoves for rural households.

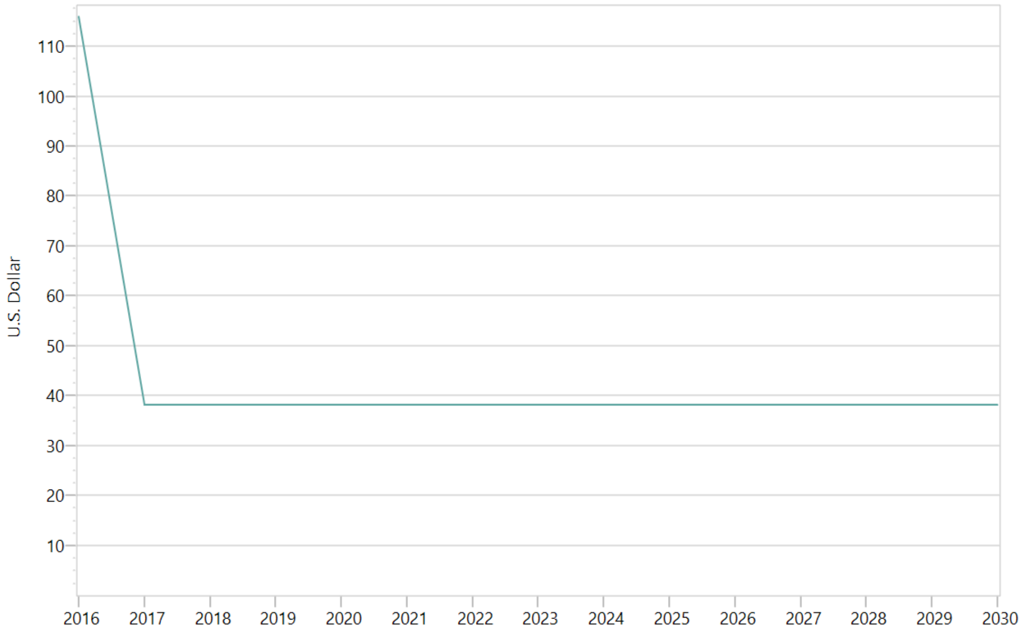

Fig. 3. Annualized cost of improved stoves for the commercial sector.

Before analyzing the cost-benefit of each scenario in comparison to the reference scenario, it is important to observe the energy consumption behavior of each scenario and contrast that behavior with the reference scenario, in order to have a better idea of what the implication of energy use is in the cost-benefit analysis is.

Hence, the results of the energy consumption dynamics of each scenario are shown first. Then, the results of the cost-benefit analysis are presented.

4. Strategy Implementation Results

4.1. BAU scenario

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As mentioned earlier, in this scenario, the same things are still being made under the same procedures throughout the study period. Figure 4 shows the household growth in Honduras up to 2030. This growth is 2.62% per year, according to official data.

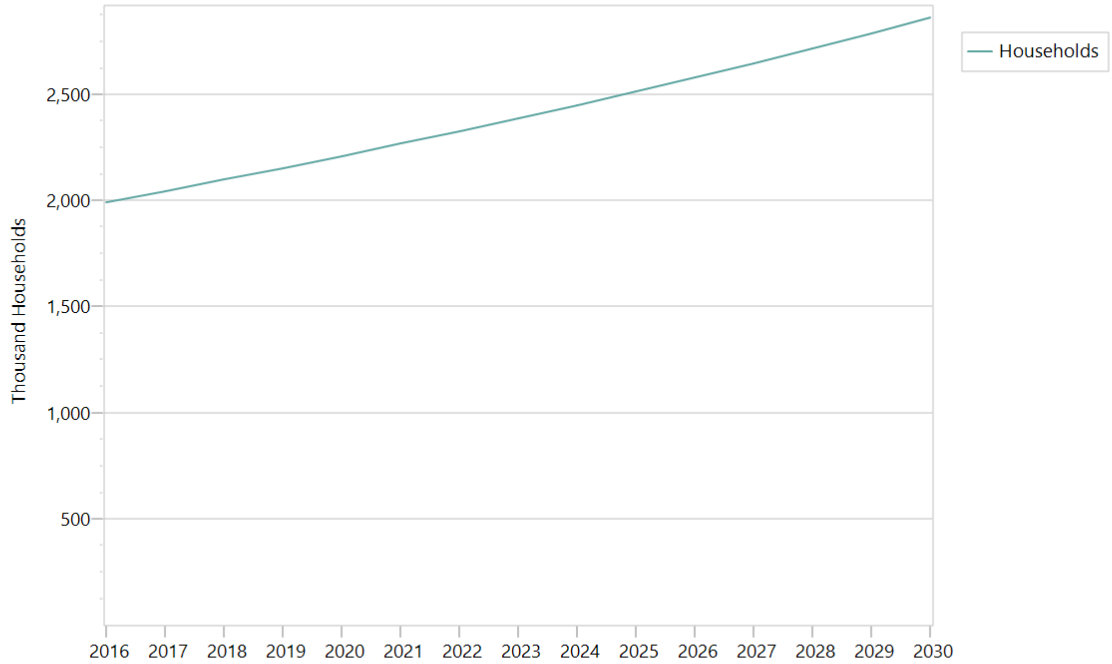

Fig. 4. Household growth

Fig. 5 shows that under the BAU scenario, energy consumption is constantly growing throughout the analysis. This figure only shows the primary energy consumption, which in this analysis considers solely firewood and bagasse. Bagasse is used in industrial demand, but this is not subject to the analysis for the implementation of an improved stoves strategy in energy demand, mainly for cooking food.

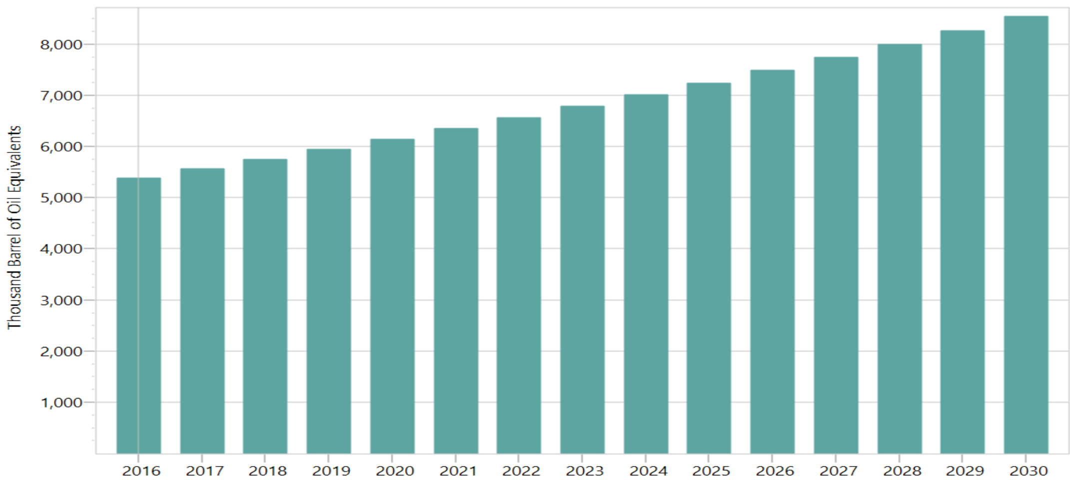

Fig. 5. Total primary energy demanded under the BAU scenario

Fig.6 shows that the implementation of improved stoves in urban area would follow a slow growth throughout the analysis period. Under this scenario, traditional stoves would be the main sources for energy needed for cooking food. Such stoves are based on burning firewood. The same behavior in energy consumption is shown in the rural area, as depicted in Fig. 7. However, in the rural areas, firewood consumption is higher.

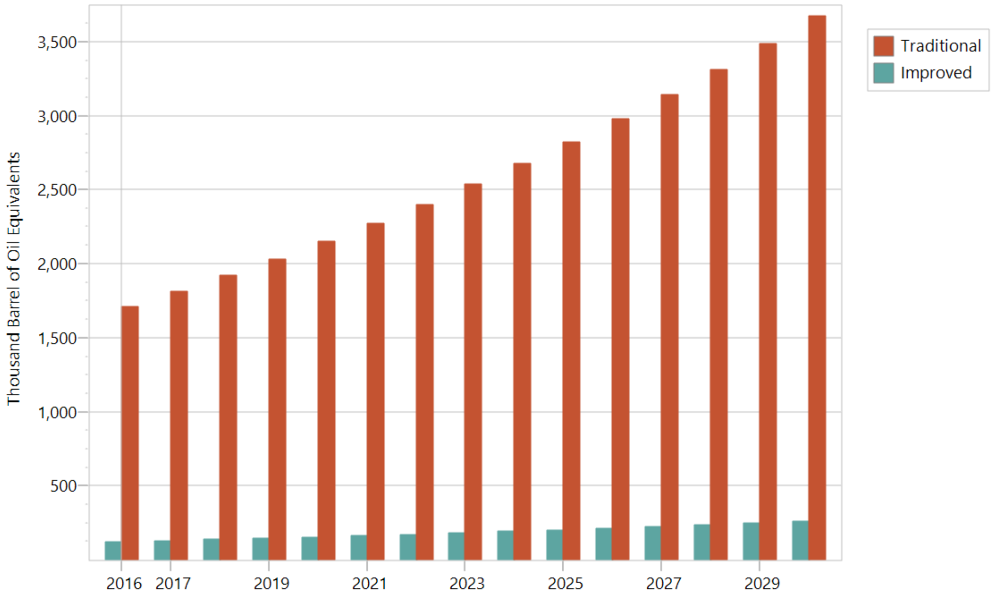

Fig. 6. Firewood demand in urban households under the BAU scenario

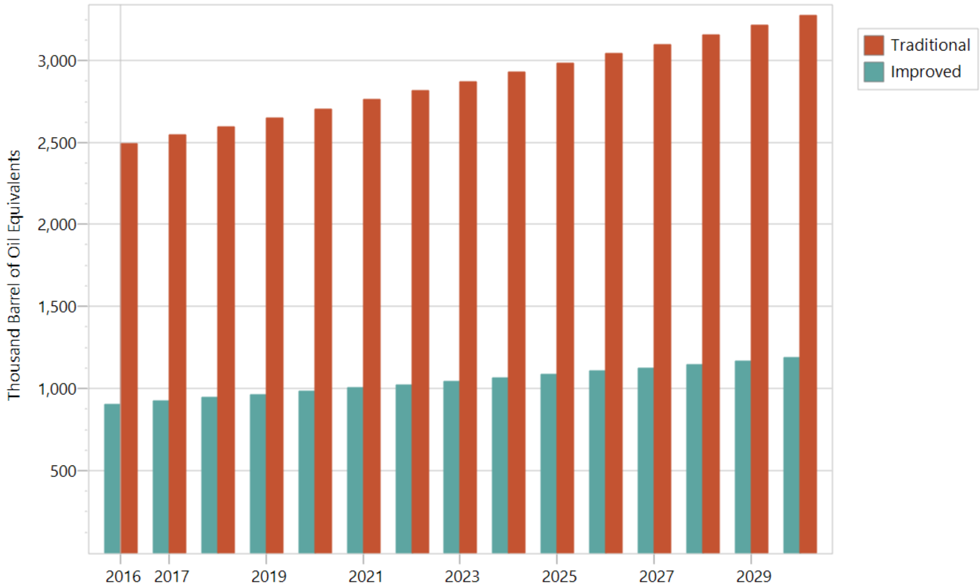

Fig. 7. Firewood demand in rural households under the BAU scenario

4.2. Introduction of Improved Stoves vs BAU Reference Scenario

Under this scenario, the introduction of improved stoves in the Honduran energy sector is analyzed according to a National Strategy whose goal is the installation and adoption of 1,125,000 improved stoves for cooking food.

Fig. 8 shows that for the urban residential sector, the sharing of improved stoves implies a lower energy consumption throughout the analyzed period, in relation to the reference scenario (bars without color). In the same way, it is shown that traditional stoves reduce their sharing at the end of the same period.

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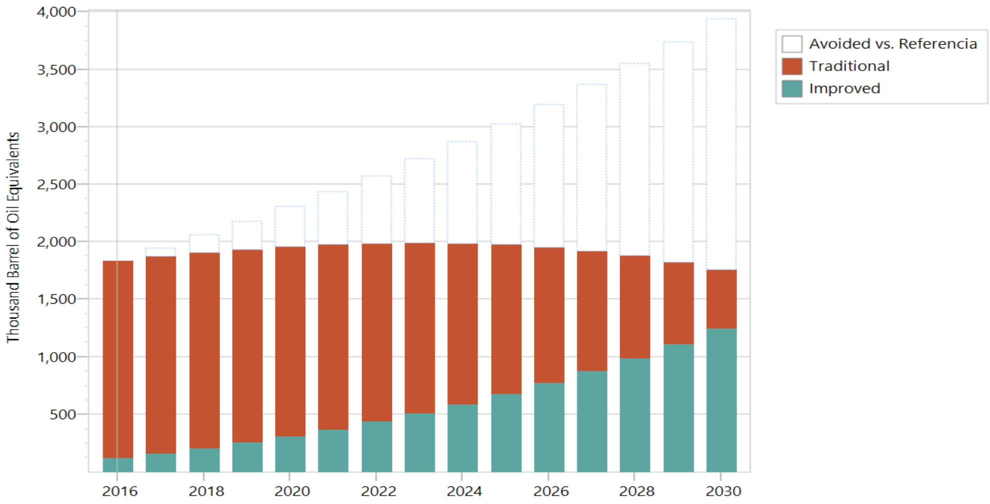

Fig. 8. Firewood demand in the urban area according to the annual introduction of improved stoves until 2030

Fig. 9 shows that for the rural area, the energy avoided is less than for the urban (bars without color). However, the introduction of improved stoves decreased energy consumption throughout the analyzed period. This makes the sector more efficient in the consumption of primary energy (firewood). It should be noted that when observing the scales in both figures, more wood is consumed in the rural area. The latter is verified by observing Fig. 10, which shows the consumption of firewood for the urban and rural areas considering both improved and traditional stoves.

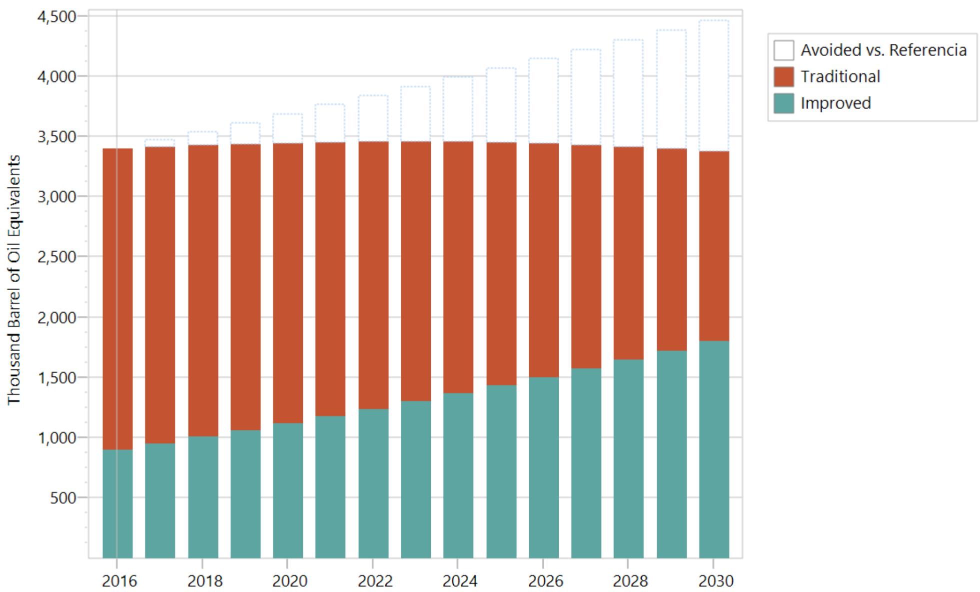

Fig. 9. Firewood demand in the rural residential area according to the annual introduction of improved stoves until 2030

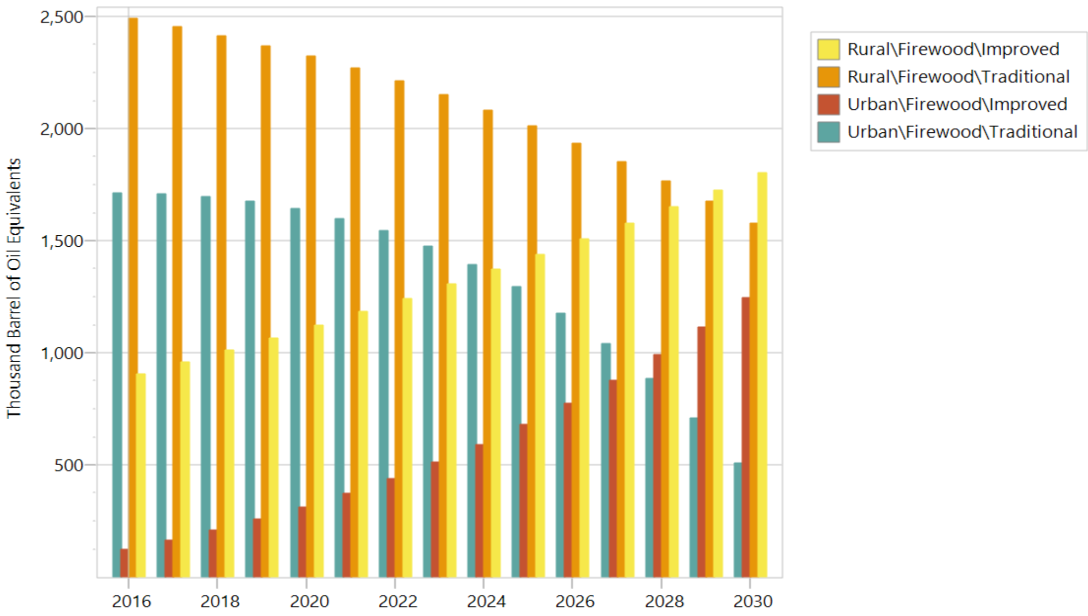

Fig. 10. Energy demand in the urban and rural residential areas according to the annual introduction of improved stoves until 2030

Fig. 11 shows that if improved stoves are introduced in the commercial sector under this scenario, the consumption of firewood would be reduced throughout the analyzed period. For that reason, 22,000 barrels of oil equivalent (BEP) approximately would be avoided, and that is only in 2030.

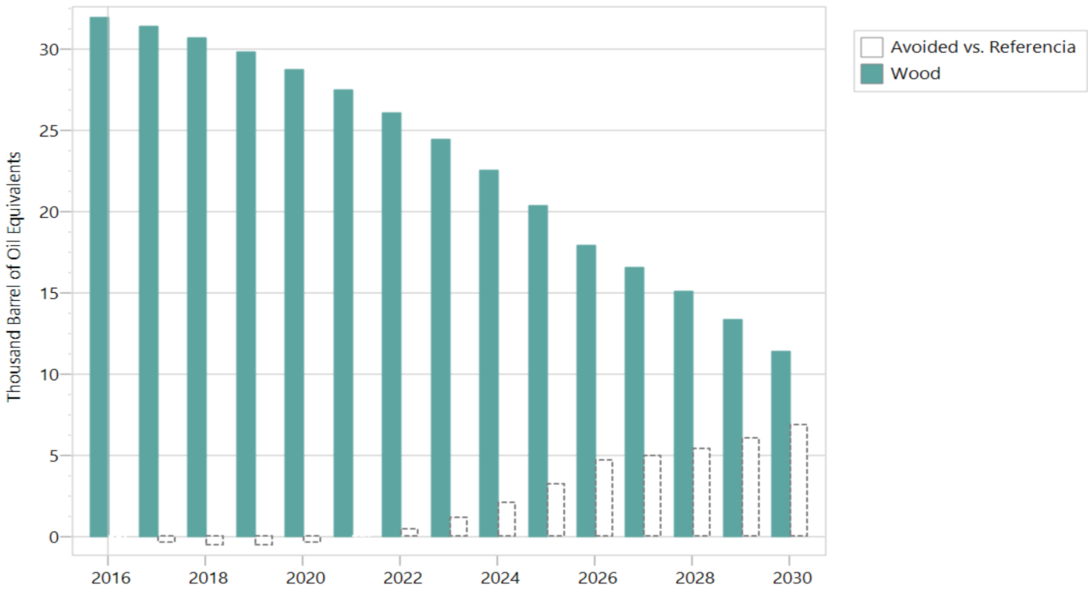

Fig. 11. Firewood demand in commercial sector vs. what would be avoided according to BAU scenario

4.3. Introduction of Improved Stoves and LPG vs BAU Scenario

Figure 12 shows that under this scenario, the LPG consumption increases throughout the analysis period. This observation is noticeable for the urban, electrified and non-electrified residential

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areas, as well as for the rural electrified households. These results are consistent with the fact the LPG consumption will increase in peri-urban areas of the urban sector.

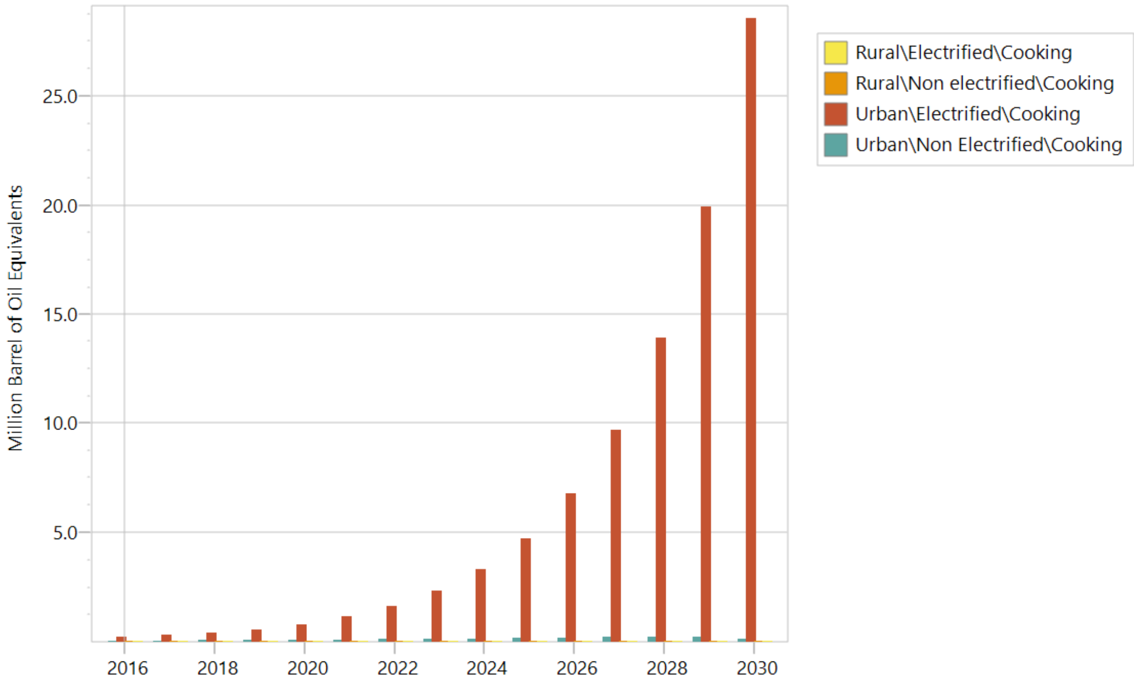

Fig. 12. LPG consumption for the stoves plus LPG scenario

On the other hand, Fig. 13 shows that in the rural non-electrified area, it is expected that the low consumption will be reduced even more. The latter as a result of it being expected that having no electricity increases the consumption of firewood.

Fig. 13. LPG consumption for the stoves plus LPG scenario. Rural residential area NOT electrified

Figures 14 and 15 shows that under this scenario, more LPG is consumed, both in the urban electrified and non-electrified areas.

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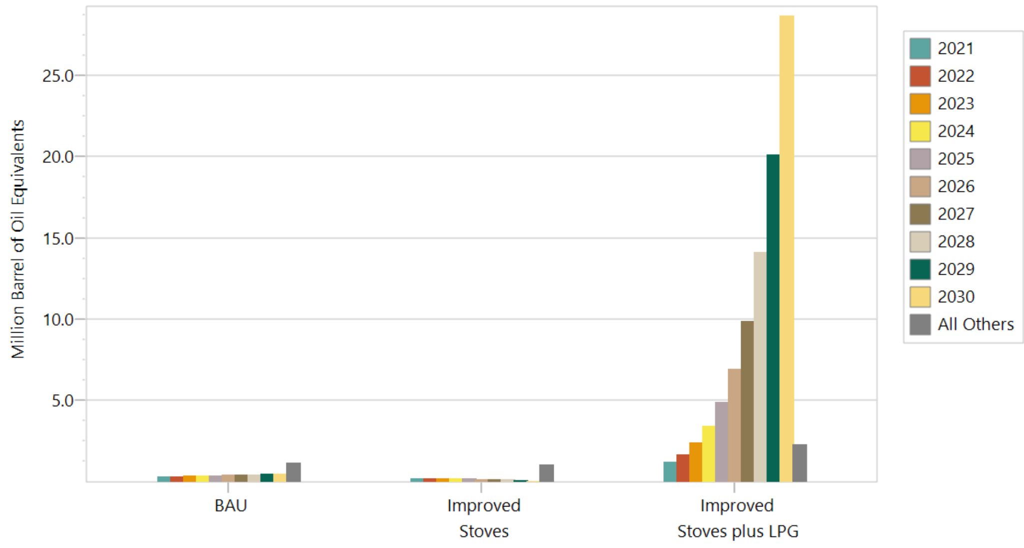

Fig. 14. Comparison of the different scenarios in the LPG consumption for the stoves plus LPG scenario. Period 2021-2030. Electrified urban residential area

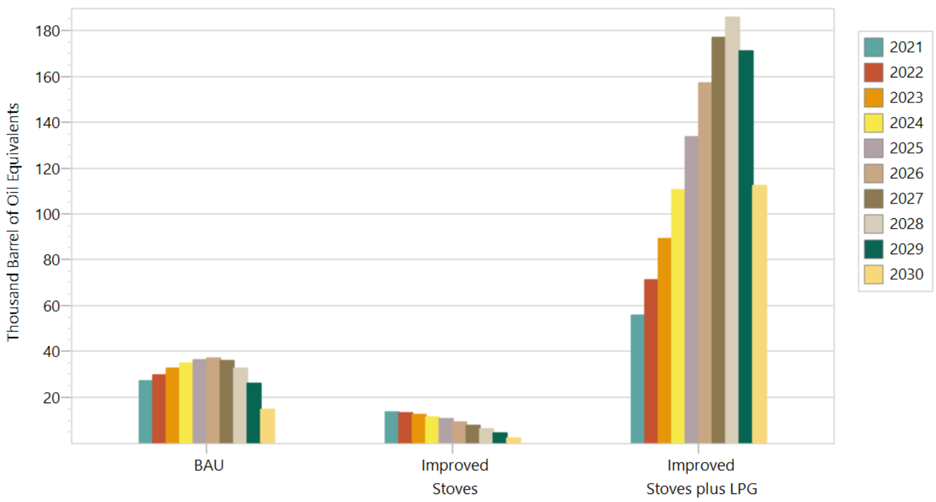

Fig. 15. Comparison of the different scenarios in the LPG Consumption for the stoves plus LPG scenario. Period 2021-2030. Urban Residential area Not electrified

4.4. Environmental Burden for the Different Scenarios

The following figures show the emissions observed in the different scenarios. According to Figures 16 and 17, emissions resulting from a BAU reference scenario are greater than a scenario under which a strategy of "Introduction of Improved Stoves" is implemented. On the other hand, under the scenario of LPG and improved stoves, emissions are higher (see Fig. 18) than the emissions from the BAU scenario.

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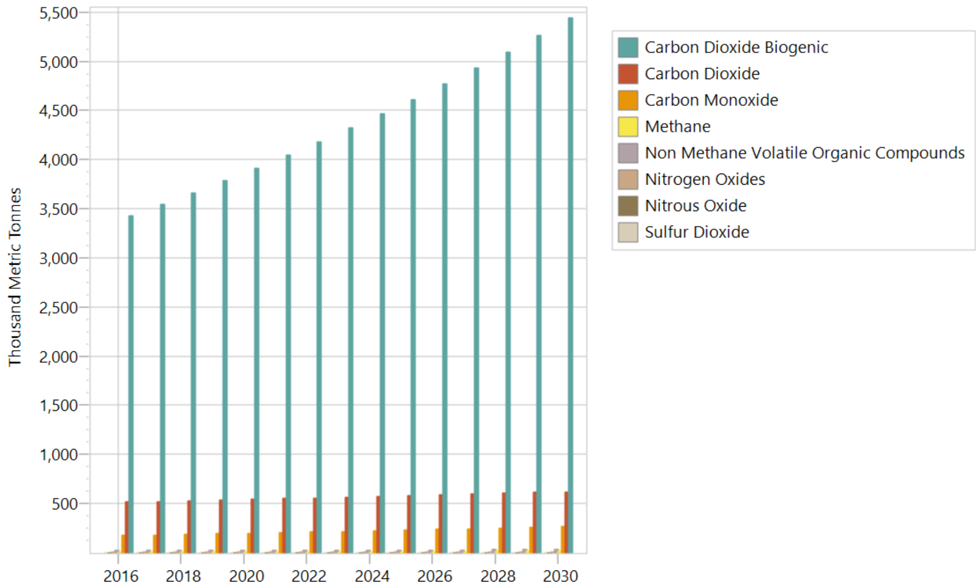

Fig. 16. Emissions under BAU scenario

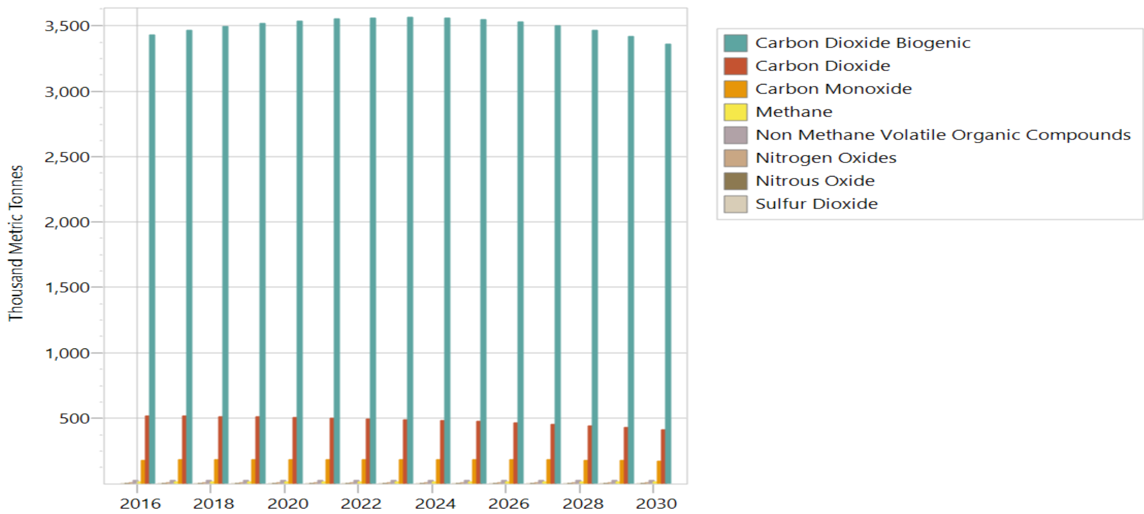

Fig. 17. Emissions under improved stoves scenario

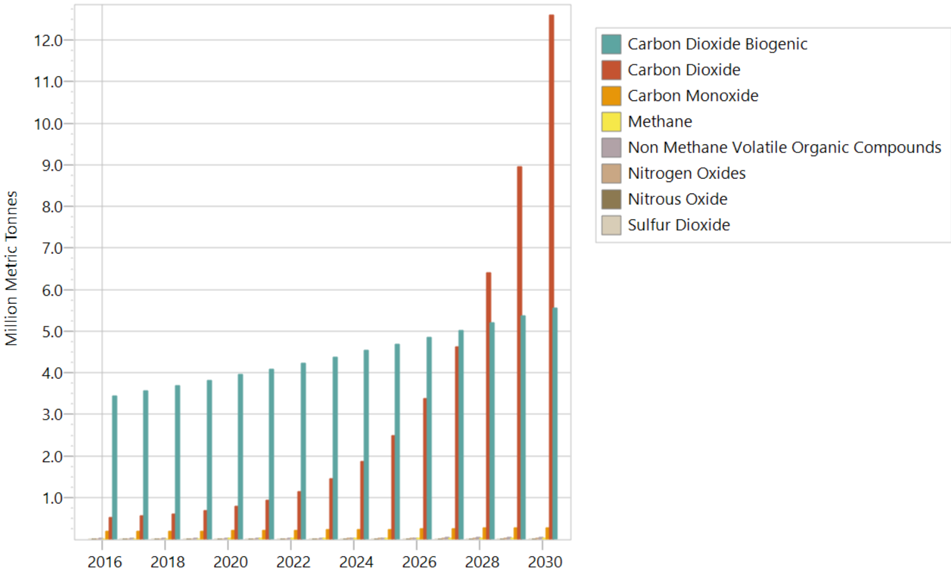

Fig. 18. Emissions under LPG and improved stoves scenario

4.5. Cost-benefit of the Implementation of a Strategy for the Adoption of Improved Stoves in Honduras

The LEAP tool shows that the improved stoves and LPG plus the improved stoves scenarios (Table 2) are cheaper than the reference scenario. This is concluded from the Net Present Value, which for the improved stoves scenario is 1,253.8 million dollars cheaper than the BAU scenario. For this reason, if an improved stove adoption strategy is carried out in the Honduran energy sector, it would be cheaper than a scenario under which the proposed strategy is not carried out. This conclusion includes the direct manufacturing costs of improved stoves as well as the dynamics of its use and sharing of the cooking in Honduras.

The cost of implementing a strategy, considering the consumption of firewood (Primary Energy) is USD 844.3 million cheaper than non-implementation.

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Table 2. Cost-Benefit Analysis of the different scenarios for the implementation of an Improved Stoves Strategy in Honduras.

Cumulative Costs & Benefits: 2016-2030. Relative to Scenario: BAU.		
Discounted at 5.0% to year 2016. Units: Million 2016 U.S. Dollar		
	Improved Stoves	LPG plus Improved Stoves
Demand	-1,253.8	376.7
Primary Energy	-844.3	-185.9
Secondary Energy	-409.5	562.6
Transformation	-	-
Resources	-	-
Production	-	-
Imports	-	-
Exports	-	-
Unmet Requirements	-	-
Environmental Externalities	-	-
Non Energy Sector Costs	-	-
Net Present Value	-1,253.8	376.7
GHG Savings (Mill Tonnes CO2e)	2.5	-38.8
Cost of Avoiding GHGs (U.S. Dollar/Tonne CO2e)	-496.7	

On the other hand, the LPG scenario plus improved stoves show a positive net present value of 376.7 million USD, so this scenario is more expensive than the reference scenario. The reason for this is that the share of LPG implies importing of a fuel that is not produced in the country.

On the other hand, the cost of avoiding emissions is lower in the scenario of improved stoves, at 496.7 USD per Ton, in relation to the reference scenario. Hence, the implementation of an "Improved Stoves Strategy" in Honduras would reduce the emission of greenhouse gases more economically than the non-implementation of the strategy.

5. Conclusions and policy implications

The cost-benefit analysis for the implementation of an Improved Stoves Strategy in Honduras was performed using the *Long-range Energy Alternatives Planning System* (LEAP) tool. The model shows the following results:

- A strategy for the introduction of improved stoves benefits the energy sector, since the consumption of firewood would be reduced.
- Implementation of an improved stoves strategy would be cheaper than continuing with the current scenario.
- The cost of avoiding emissions is lower if an improved stove strategy is implemented. The latter compared to continuing with the current scenario of improved stove delivery.

There are many stakeholders interested in the value chain of improved stoves in Honduras, a strategy for the adoption of this technology would have an impact on the process improvement and the reduction of direct costs and environmental externalities.

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