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# Market Segmentation: Improved Cookstoves and Clean Fuels in Guatemala

Prepared by Fast-Track Carbon for the Global  
Alliance for Clean Cookstoves

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These are the building blocks to understand the market

Read these sections in any order

# Introduction and Context



The Global Alliance for Clean Cookstoves was launched in 2010 with a mission to catalyze the uptake of clean and efficient cookstoves through a market-based approach to save lives, improve livelihoods, empower women, and protect the environment.

This study is one of a series commissioned by the Alliance to develop a better understanding of the demand landscape for cookstoves and fuels. These studies aim to assess and prioritize consumer segments most poised for adoption of clean and efficient cookstoves and fuels in a given country, gather a baseline of current stove and fuel usage among prioritized segments, and identify key factors that drive current usage patterns and the barriers that currently impede these segments from transition to cleaner stoves and fuels. These insights are then used to inform strategies around key factors related to effective marketing and sales of stoves and fuels, including messaging and promotion, pricing and payment schemes and distribution channels.

This study focuses on Guatemala, one of eight Alliance focus countries that have demonstrated considerable potential to foster a robust market for clean cooking solutions. It builds from a market assessment of the Guatemalan stove and fuel sector released in 2013. The Alliance's activities in Guatemala are guided by a Country Action Plan (CAP) that was developed through locally-led consultations with national stakeholders and adopted in May 2014. A key intervention activity recommended in the CAP is a consumer segmentation study to define priority segments and identify suitable strategies for addressing them.

The Alliance commissioned Fast Track Carbon to execute the study.

## Goals and methods of the study



### Our study goals were:

Identify the segments of the Guatemalan population most poised to transition from traditional firewood cooking to cleaner cooking methods.

Characterize these segments and identify appropriate marketing strategies for each segment.

Design awareness messages to drive the purchase of improved cookstoves and clean fuels.\*

Assess consumer finance strategies to facilitate affordability of cleaner cooking products.\*



### To accomplish the goals we:

- 1 Analyzed existing data (mainly the National Survey of Living Conditions, ENCOVI 2011)
- 2 Conducted qualitative research: 8 focus groups and 24 in-depth interviews
- 3 Gathered quantitative data from 400 firewood-using households
- 4 Quantitatively segmented the market, and further analyzed our data to present our findings.

\* Separate presentation provided for these elements

## Fuel use for cooking in Guatemala



2.4 million households or **more than 70% of Guatemalan households<sup>1</sup>** regularly cook food with firewood.

The World Health Organization estimates **5,000+ premature deaths per year** in Guatemala due to household air pollution.

In Guatemala, as income increases households generally transition from firewood to liquefied petroleum gas (LPG) for cooking (other fuels, like charcoal, feature very weak penetration): Households in the **upper 2 income deciles are 11 times more likely to use LPG for cooking than those in the lowest 2 deciles.**

**LPG is widely available in urban areas.** For those who use LPG (including those who use both LPG and firewood), canisters are generally delivered to the household.

Incomplete transitions to LPG are common: **28.5% of the households that cook with LPG also cook with firewood** (often referred to as “fuel stackers”)

<sup>1</sup> Based on ENCOVI 2011 data

## Target population of the study



**We focused this study on those population groups most likely to adopt cleaner cooking technologies in the near future, which we estimate represents 34% of Guatemalan households.**

**Key socio-economic segments.** Previous analysis undertaken during a market assessment in 2013 grouped households in Guatemala into 3 socio-economic segments: Non-poor, non-extreme poor, and extreme poverty. The assessment recommended that extreme poverty segments are best addressed through subsidy programs.<sup>1</sup> Hence, the broad segments we considered were the non-extreme poor and non-poor. Among the non-poor, the upper two income deciles were excluded as households in this segment who have not fully adopted clean fuels (LPG and electricity) exhibit socio-cultural barriers against the adoption of clean cooking due to a strong preference for traditional methods.

**Target population further narrowed to purchasers of firewood.** Clean and efficient cooking alternatives will not provide monetary fuel savings to those who do not purchase firewood. Firewood collectors can be a segment to further explore in the future, but because of their reduced incentive to purchase clean cooking technologies, this population group was not explored in detail as part of this work.

**A large portion of firewood purchasers also use LPG as a secondary fuel, so our target population includes both exclusive firewood users and fuel stackers (LPG+ firewood).**

*All Guatemalan households*

3,319 K households

100%



*All firewood using-households*

2,450 K households

74%



*Key socio-economic segments*

1,857 K households

56%



*Firewood purchasers; key socio-economic segments*

1,134 K households

34%

<sup>1</sup> Global Alliance for Clean Cookstoves Guatemala Market Assessment, July 2013



# THE CONSUMER PERSPECTIVE ON COOKTOVES AND FUELS IN GUATEMALA

## The consumer perspective



The consumer perspective was derived from a series of focus groups, in-depth interviews and 400 household surveys conducted throughout Guatemala<sup>1</sup>. During these sessions we explored cooking and spending habits, and consumer perceptions of the 2 predominantly used fuels in Guatemala: firewood and LPG. We also exposed the consumers to the concept of the improved wood cookstove. In some focus groups we presented awareness messages for cleaner cooking (LPG and improved cookstoves).

Our aim was to see the products and offerings through the lens of the consumer and thus gather insights that would allow us to define strategies that make sense to the cultural norms and perceptions and motivations of our target markets.

We later grouped the target population into 7 distinct segments (presented later in this report), but throughout we also analyzed differences between 2 broader groups: “fuel stackers”, or households who use both wood and LPG for cooking (with LPG as their secondary fuel) and “exclusive wood users”.

The following section presents these consumer insights.

<sup>1</sup> See Annex 2 for locations of randomly sampled municipalities

# General firewood perceptions



**How is firewood perceived?** Firewood is an ally of the women to fulfill her household obligations, it is natural (vs. chemical like LPG), generously provided by nature (and hence sacred), and signifies abundant fire to cook. It is noble, as it accommodates limited budgets while providing abundant fire. Firewood is tradition.

## General firewood perceived attributes



### Price

- It is economical, at the reach of limited budgets
- Its fire is abundant and hence thought to be quicker to prepare meals



### Cooking

- Heat can be retained and hence food is warm and ready when males arrive from work



### Other uses- Highlands

- Serves to heat home as well and to light traditional sweat baths (indigenous highland areas)



### Other uses- Coastal areas

- Drives away insects and prevents decomposition of thatch roofs (coastal areas)

### Space

- Requires ventilated space to store wood

## However, the consumer feels firewood has important disadvantages



### **It is inconvenient and uncomfortable:**

- Needs large storage (if bought in bulk), hard to light, needs tending, blackens pots and walls, need to dispose of ash, and is smoky and physically demanding (needs to be carried).

### **It impacts health:**

- Physical injuries while carrying, lighting, tending, and splitting.
- Respiratory system: pneumonia, tuberculosis, asphyxiating (especially when lighting fires), allergies.
- Eyes: irritates eyes and need to spend money on eye drops
- Temperature changes (from exposure to heat and then washing in cold water) produces arthritis and muscular pain.

*It should be noted that women often claim that health impacts are a result of careless management of firewood, but not a result of using firewood per se.*

### **There is social pressure against firewood use in urban areas:**

- In urban areas neighbors complain about smoke
- Landlords do not allow cooking with firewood in many rented homes

## General LPG perceptions



### How is LPG perceived?

LPG is aspirational, conveys modernity, comfort and convenience as it saves time. But at the same time can be dangerous (due to explosions; is also considered a “chemical” product and potentially poisonous).

### General LPG perceived attributes



#### Price

- Expensive and variable cost
- Expenditure commitment, as needs to be bought every time it runs out



#### Cooking

- Lights immediately
- Good for small cooking tasks (not good for keeping food warm)



#### Other

- Practical (fast to cook)
- Comfortable (no smoke, easy to light, doesn't blacken pots and walls)
- Healthy



#### Safety

- Can explode and be toxic if inhaled

#### Space

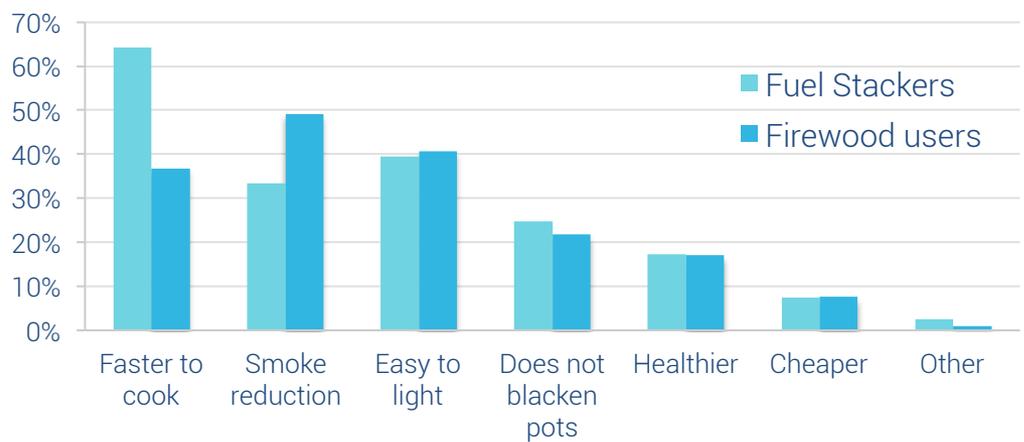
- Can be placed in small spaces



## LPG perceptions in numbers

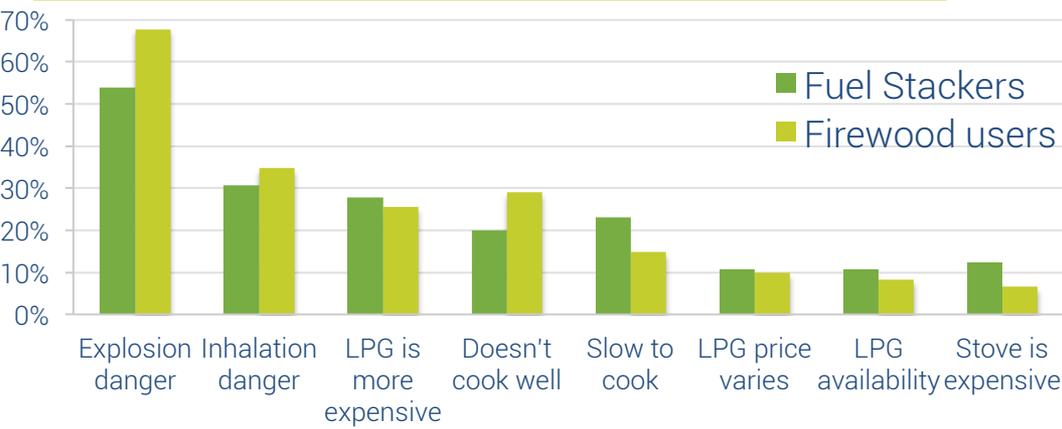
Quantitative research shows that fuel stackers and exclusive firewood users show similar perceptions around LPG, but differences among groups indicate that LPG delivers better in some aspect than others

### What are the advantages of LPG?



- Fuel stackers and exclusive firewood users show statistically significant differences in the two main perceived advantages of LPG.
- Fuel stackers perceive speed of cooking as the main advantage, which may respond to a need they already had and where LPG does deliver.
- Reduction in smoke was stated as the most important advantage of LPG for those who have not already adopted it, an important consideration for promotion efforts.

### What are the disadvantages of LPG?



- **Explosion danger dominates the disadvantage list** (differences are statistically significant between groups). Fuel-stackers are very fearful of gas stoves, but less so than exclusive firewood users.
- LPG expenditures are a relatively important barrier for both groups. However, upfront cost of the stove is listed as a disadvantage by few respondents.
- Larger samples may reveal significant differences in "doesn't cook well," but is not one of the main disadvantages cited by either group.

## How consumers compare LPG to firewood



**Firewood**



**LPG**

Suited for traditional diets: beans, tortillas, tamales, large stews.

Works with Westernized and quicker-to-prepare diet (urban lifestyles): Pasta, eggs, rice, or for those who have to buy tortillas.

Suited for large low-income families (as firewood is generally perceived as economical).

Suited for small families, who do not have to heat large pots which would otherwise be too expensive to do with LPG. Also for people with money, who can afford the comfort.

Firewood is welcoming to men coming back from work, who sit around fire to warm and eat.

LPG is "cold" and associated with a more convenient kitchen where the cook works and does not have time to tend the fire.

It also brings family together around warmth of fire.

## LPG is a solution to firewood but with disadvantages



**LPG solves the convenience, health, and comfort disadvantages of firewood.**

### However,

- LPG is perceived as *expensive* (recurrent expenses, maintenance, upfront equipment costs).
- Some respondents stated that LPG would entail a *change in diets* (from traditional to urban/ Westernized). Hence, low-income people that switch to LPG are “forced” to do it because they have limited time to cook or because their landlords do not allow the use of firewood.
- LPG has *limited secondary uses*: does not heat homes (highlands), nor drive away insects nor prevent decomposition of thatch roofs. Cannot be used for traditional sweat baths.
- *LPG stoves can fail and have limited lifespans.*

**The REACTION is:**

To keep both fuels (for those who can afford it) to take advantage of LPG convenience and firewood economy.



## Improved firewood cookstove: the product in the middle



### How are improved cookstoves perceived?

ICS is a product whose identity draws from firewood and LPG. It has weak flames and reduces smoke like LPG. It retains the firewood economy and flavor, but also the discomfort and inconvenience. The concept of fuel savings competes with women's self-perceived ability to use firewood wisely. In the consumer's mind, the ICS can help firewood last longer, *but firewood savings are the women's domain.*

### General ICS perceived attributes



#### Price and acquisition

- Likely long payment periods erode money savings prospects in consumer minds. Hence, economy is secondary.
- Not seen as commercial products; rather, many cooks know of their existence through donation programs.
- Cooks feel they would be cheaper if they commissioned their construction: *"Nowadays construction workers can build anything"*



#### Cooking

- Fire is small and weaker and hence not suited for large families or traditional diets.
- Smaller combustion chambers not suited to keep food warm for long periods.



#### Other uses

- As with LPG, secondary uses like heating and repelling insects are limited.



# Summary of product comparisons

Element	Firewood	LPG	ICS
<b>Diet</b>	Traditional	Westernized	Keeps flavor for traditional meals, but weak flames not suited for traditional diet
<b>Convenience</b>	Inconvenient	Convenient	Inconvenient, but slightly less than open fires.
<b>Comfort</b>	Uncomfortable	Comfortable	Uncomfortable, but slightly less than open fires.
<b>Health</b>	Unhealthy	Healthy, but dangerous	Can be healthy as reduces smoke
<b>Family</b>	Warm welcoming, gathering place	Not a gathering place	Not a gathering place
<b>Secondary uses</b>	Heating (highlands), repelling insects and protecting thatch roofs (Coastal areas)	None	Few, but non-essential (e.g. use of ashes as fertilizers and soaps)
<b>Price</b>	At reach	Expensive	Expensive product, but fuel at reach. Believe construction can be easily commissioned.
<b>Household characteristic</b>	Large households	Small households; working women	Small households
<b>Cooking</b>	Retains heat; large fires = quicker cooking	Easy lighting, but doesn't keep food warm	Doesn't keep food warm nor light easily.

## Other products: Pressure cookers

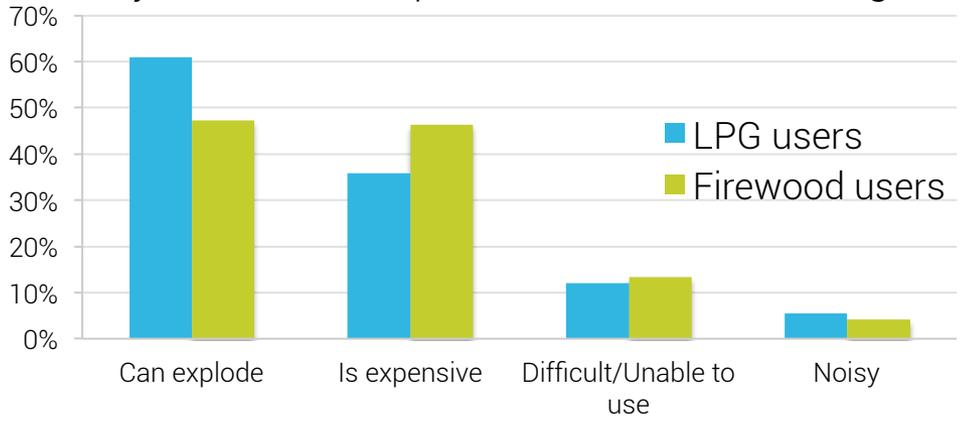


**We investigated pressure cookers because of their potential to increase LPG adoption** (they allow cooking of traditional foods like beans with LPG, with a lessened concern of wasting fuel) **and reduce fuel expenditures.**

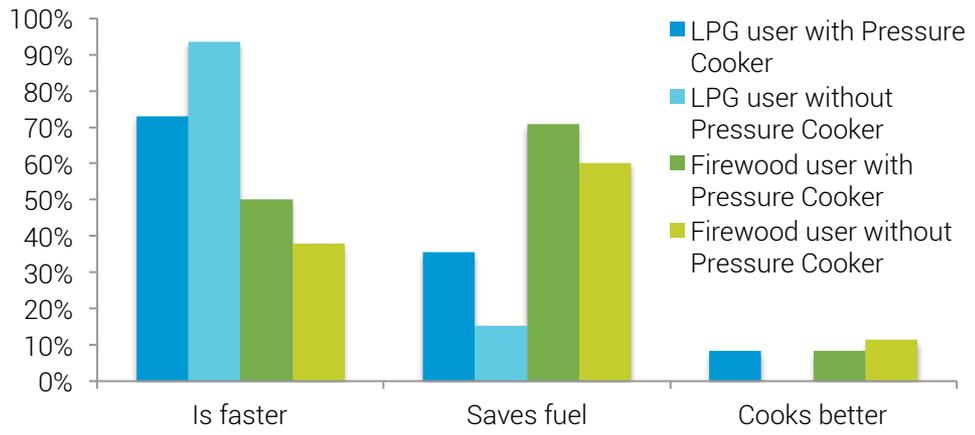
**18% of our sample owned a pressure cooker**, but only 8% of exclusive firewood users own one as compared to 42% of fuel stackers (LPG users). Qualitative research indicated a fear to use pressure cookers over firewood since handles could melt and the cookers explode

- Our quantitative analysis confirmed that **fear of explosion and price are the main perceived disadvantages of pressure cookers**, with no significant differences between those who have pressure cookers and those who do not, but with significant difference for explosion risk among LPG users who may have been exposed to more stories and news about explosions. The price of pressure cookers could become significantly different across groups with mild increases in sample size.
- Fuel-stackers seem to prioritize the speed of cooking while firewood users prioritize fuel savings.
- **However, our analysis indicates that households with pressure cookers do not spend less on fuel than those who do not have one.**

What do you think are the pressure cooker disadvantages?



What do you think are the pressure cooker advantages?





# KEY BARRIERS FOR PURCHASE AND ADOPTION OF IMPROVED STOVES AND CLEAN FUELS (LPG)

# Summary: key barriers for purchase and adoption of clean cooking



Barrier	Description
<p><b>Management of financial risk through firewood</b></p>	<p>Our analysis among our target population (households purchasing wood) indicates that LPG usage could be cheaper than wood in many instances. However, firewood can be collected in periods of financial downturn. Cooks maintain the status quo to reduce the severity of economic downturns, despite giving away potential financial savings.</p>
<p><b>Liquidity</b></p>	<p>LPG usage requires having enough cash on hand to pay for full canisters, something that many cooks feel they cannot consistently do.</p>
<p><b>Gender decision-making imbalance</b></p>	<p>Women suffer most from the burden of firewood cooking, yet men often have (at least some) control over household decisions. Women are held accountable by men for purchases of durable items. Men may reduce household allowances if they find “unnecessary” expenses or know of financial savings.</p>
<p><b>Price and present bias</b></p>	<p>The relatively long payback periods of improved cookstoves erode the sense of financial savings.</p>
<p><b>High penetration of “plancha” stoves</b></p>	<p>Stoves that have a chimney (even if they don't reduce firewood use) have a massive penetration, posing competition to more efficient and cleaner cookstoves.</p>

## Barriers: Management of financial risk through firewood



### WOOD USE ALLOWS FOR FLEXIBLE EXPENDITURES

Research revealed that under financial stress, cooks rely on many strategies to reduce firewood expenditures:

<i>Collect residues and wood</i>	<p><b>62% of our exclusive-firewood users</b> who purchase wood also engage in firewood collection.</p> <p><b>34% of our fuel-stacker sample purchases and also collects wood</b></p> <p>Focus groups conversations showed experience with residue burning: <i>"Sometimes neither your husband nor you have money, so there is no gas. On the contrary, there is always firewood because you can go get some"</i></p> <p><i>"You go out to the street [to collect trash]"</i></p> <p><i>"You can put in the fire clothes and shoes you no longer use"</i></p>
<i>Buy cheaper types of wood</i>	<p>Oak firewood is the preferred type of wood, but is sometimes out of reach.</p> <p><i>"Sometimes firewood is expensive and sometimes there is no [money] to buy, so one has to see how to make fire"</i></p> <p><i>"That is lasts because sometimes the Coast's firewood does not last"</i></p> <p><i>"And if you buy twigs, my God! Twigs are cheaper than chunks"</i></p> <p><i>"And oak firewood lasts for long"... "It leaves ambers and you can continue cooking with the ambers"</i></p>



A general feeling is that "With firewood there is always something there to eat [as opposed to with LPG]."

### Uncertainty surrounding how much LPG is being used for cooking generates anxiety among cooks

Wood enables cooks to manage usage and expenditures: *"You always know how much firewood you consume and how much is left."*



However, most current LPG products do not allow cooks to readily measure usage and corresponding expense.

Price variations add to the uncertainty: *"Who can assure that the price will not go up again to 140 [from the ~Q90 at the time of the interview for 25 lbs of LPG]?"*

## Barriers: Liquidity to purchase LPG canisters



### LPG demands having the money to buy a full tank when it runs out

The lack of discipline or occurrence of financial emergencies limits the capacity of households to save enough money to buy full LPG canisters, despite this option being cheaper than firewood in many cases. Paying for the canisters upfront means that the money cannot be used for other purposes in the near term, including emergencies (e.g. medical attention, paying husband's bad debts).

Our analysis indicates that lower- and more unstable-income groups spend the most in fuel, but firewood offers the flexibility to manage budgets in small incremental amounts. These segments know that LPG would be cheaper or at least equal to firewood but consciously decide not to account for the savings that would accrue from switching into LPG.

Woman from Mazatenango, spends Q150-300/month on firewood which she buys daily, often many times per day.

*" I used it [LPG stove she got for free] for about two months because gas was expensive, it was Q140. My daughter gave me some money, my son some other, and I as well put some and bought my gas, but only used it for 2 months because I could not afford the expense by myself."*

*"[Gas] is an expenditure that you have to put in a single [payment] and I could just not afford it. On the contrary, with firewood it is just Q10 or Q5 daily, but it does not feel as much because it is little. On the long run, it is probably the same [expenditure as LPG], but at the moment Q10 or Q5 does not feel as bad as having to pay lump sum."*

LPG purchases among fuel stackers often follow pay check cycles. Households will switch again to wood until they have the liquidity to afford LPG.

## Barriers: Gender decision-making imbalance



### Among many households, men have a ubiquitous role in decision making

#### Budget decision-making

Males provide periodic allowance to women who have discretion over household staple/non-durable goods (including cooking fuels). Men remain vigilant over durable goods expenditures. "Unnecessary" expenses may result in cutting the women's allowance. Likewise, women are afraid that their allowances would be cut if men know about savings or product purchases. Many women have to hide spare money away from men. This money is used to cover health emergencies, husbands' bad debts, unemployment, school fees, etc...

#### Cooking roles and tradition

Cooking is almost entirely in the women's domain. Men are detached from the discomfort in a wood kitchen. Women's perception is that *"Men don't care about [the cooking], if one is burning itself, has hairless arms because fire gets to them. The [come] eat and that's it."*

Men reinforce preference of wood with economic, flavor, and tradition arguments.

**Interviewer:** "So what would he have said if he got home and saw you cooking with LPG?"

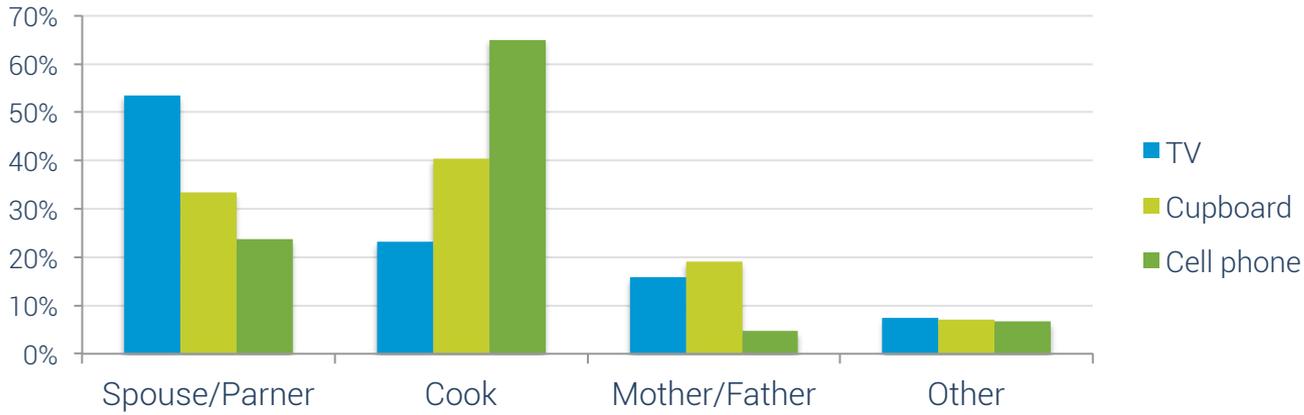
**Respondent:** "We would have probably had conflicts because when we dated I told him about what I wouldn't like [to cook with firewood] but he told me once and for all 'I like food cooked with firewood, I like for you to cook beans, rice, eggs, or whatever you are going to cook with firewood because since I was little they got me used to it.'"

Many women are aware that the ability to generate income could result in some discretionary spending but work is out of reach for many due to the lack of employment opportunities, childcare needs, and often the men's decision to not allow women to work.

***"If we could work, it would not matter as much what the husband would say."***

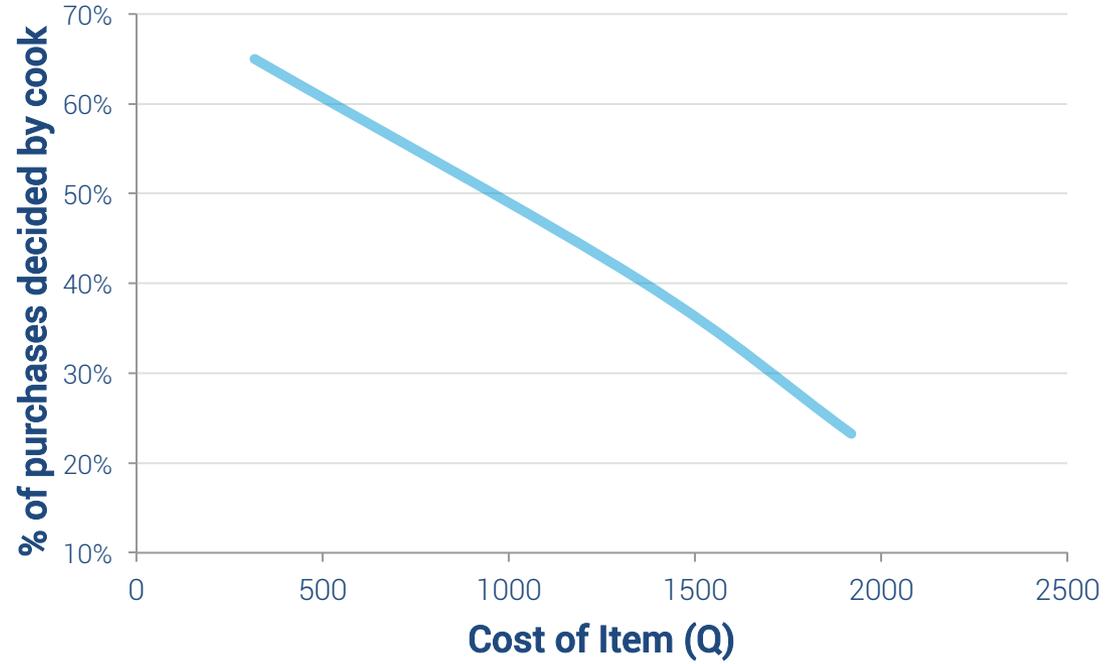


## Barriers: Gender decision-making imbalance



The decision maker varies by type of item

The cook's decision-making power is relegated to lower-priced items



## Barriers: Price and present bias

### Long ICS payback periods erode sense of financial savings

Most improved cookstoves sell in the market for prices above Q1,000. Under the common scenario of Q250/month on firewood expenditures, the payback period of ICS saving an average of 50% of firewood is longer than 8 months.

Under this scenario, the ICS purchase comes across as "*having to spend money to save*," which in their view does not make much sense for such a long payback horizon.

Likewise, the installment payments for ICS are similar to the spending pattern required for monthly LPG canister purchases, making LPG a competitive option.

## Barriers: High penetration of plancha stoves

Plancha stoves (stoves with a griddle and chimney) feature a massive penetration in most regions of Guatemala. **Penetration of stoves with a chimney among our target population is 46.6%** (38.5% among all firewood-users, including fuel stackers, in Guatemala<sup>1</sup>), most of which are plancha stoves.

Plancha stoves are generally built by the husband or a close relative with construction skills, and are adapted according to budgets and cash flows. In some areas, plancha stoves are a staple in households and women receive one upon marriage.

These stoves can take most of the visible smoke out of houses; hence, **ICS stoves need to find a niche to compete against plancha stoves.**



<sup>1</sup>According to ENCOVI 2011 data

## Negative product perception barriers: LPG



As outlined in the previous section, users have the following negative perceptions around LPG:

**Explosion danger perceptions.** Fear of explosion due to media articles or near misses. Cooks with children are especially fearful that children will play with valves and cause explosions. 54% of fuel-stackers and 68% of exclusive firewood users in our sample cite explosion danger as a disadvantage of LPG.\* The deteriorated appearance of many LPG canisters helps increase the perceived risk.

**Fear of toxic inhalation.** Many cooks know that gas inhalation is dangerous and fear leaks for the same reason. As such, LPG is not necessarily considered safer than firewood overall. 31% of fuel-stackers and 35% of exclusive firewood users in our sample cite inhalation danger as a disadvantage of LPG.

Cooks feel they can **better control fire intensity with firewood** and that LPG flames are generally weak. This perception is especially relevant for cooking in large pots and to speed cooking (perception that big flames heat faster). 23% of fuel-stackers and 15% of exclusive firewood users in our sample cite cooking speed as the main disadvantage of LPG.

On the margin, **wood is perceived as cheaper than LPG**. Cooking heavy pots for long time periods on LPG is perceived as wasteful, largely because cooks have no way of knowing how much money is being put into heating the pots.

\* Statistically significant difference

## Negative product perception barriers: ICS



As outlined in the previous section, users have the following negative perceptions around improved cookstoves:

**Improved cookstoves are a donation product** reducing the incentive to pay for them. Our research indicates that most ICS distributed to date have been through donation programs. However, in localities where few stoves were given for free and they have only been distributed once without expectation of future highly-subsidized distributions, these stoves can generate sales at full price.

Cooks feel many **improved cookstoves are a product that can be built locally** with widely available workforce (often times family members of friends). This implies that the cost can be lower and that community relationships are better fostered than if bought from an outsider.

As with LPG, **women feel that they lose control of the fire intensity** if ICS combustion chambers are small or that flames are too weak for cooking in large pots.

Cooks express regret over **ICS not having a sufficiently large combustion chamber** to maintain food temperature for long periods, take advantage of ambers, or heat the area around the kitchen.

**Poor product knowledge.** Only 35% of our sample would know where to purchase an ICS. However, people expressed confusion over what differentiates ICS from plancha models. Therefore, the 35% may be an overestimation.



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# KEY ENABLERS FOR PURCHASE AND ADOPTION OF IMPROVED STOVES AND CLEAN FUELS (LPG)

## Summary: key enablers for purchase and adoption of clean cooking



Our research revealed elements that could play in favor of cleaner cooking adoption:

Enabler	Description
<b>High firewood expenditures</b>	Firewood expenditures can be cut substantially by switching to clean cooking technologies, which provides (a rational) justification for clean cooking purchases that reduce fuel expenditures.
<b>Smoke nuisance and arduous labor to prepare and maintain fires</b>	Smoke is highly uncomfortable for cooks, especially when attempting ignition with wet wood. Women also feel tired and their aesthetics and health are impacted by smoke. In highly urbanized areas, the smoke from firewood is a source of tension with neighbors. Firewood also requires hard work to prepare (collect, carry, arrange in piles, dry, and split) and maintain.
<b>LPG is aspirational</b>	Many cooks feel that if they had the money and income stability, they would cook with LPG.
<b>Firewood cost inflation</b>	Inflation is mostly manifested through reductions in firewood quality and quantity (rather than overall price), making firewood cooking even more uncomfortable. Already people use LPG more heavily (still part time) in the wet season when wood is wet.
<b>Effective communication</b>	Our research suggests that communication may be effective in motivating households to make the transition to clean cooking products.



## Enablers: high firewood expenditures

Based on our sample, firewood-purchasing households are spending every month on average between Q140 (fuel stackers) to Q240 (exclusive firewood purchasers).

<b>Qualitative findings:</b>	Qualitative research shows that women intuitively know how much LPG they would use if they switched entirely to it, and in many instances suspect they would end up saving substantial amounts (Q150-Q200/month). Many consciously know they would at least break-even.
<b>In numbers:</b>	However, when asked "What do you think are the advantages of LPG?" only 7.5% of the sample cites cost as an advantage. The differences are not statistically significant for fuel stackers and wood users, suggesting that more complete conversions into LPG are necessary to convince women of the real cost advantages.
	A larger proportion of young income-generating women think LPG is cheaper (25%) and the difference with respect to other groups is statistically significant. This suggests that younger women may be more likely to be aware of cost accumulation over time and be inclined to switch to LPG for cost reasons.
	Among LPG users an overwhelming 70% mention they continue using firewood to save money. Although this seems like a contrast to qualitative research findings, women tend to group "saving money" as the diverse budgeting strategies to reduce financial risk and address liquidity constraints.

**Our analysis also indicates the poorest and those purchasing wood more frequently spend the most on fuel. In contrast, LPG can cut overall expenses, but requires a larger expense each time it is bought.**



This implies that successful **LPG** market penetration will require adapting sales propositions to households' budgeting strategies and is harder on lower-income segments who spend more, and more often on fuel.

**ICS** offer the possibility to manage financial risk and liquidity through continued use of firewood. However, at current ICS prices (>Q900) long credit payment periods are often needed. The long payment periods and monthly equal installments are equivalent to the purchase of LPG in the consumer's mind. Therefore, effectively commercializing ICS may require flexible credit (installment) models and a better understanding of the value of making a commitment to long-term financial benefits.

## Enablers: Smoke nuisance and arduous fire preparation



### Cooks consider firewood cooking over open fires as highly uncomfortable

- Fire lighting is the most arduous task of all "*I feel the smoke penetrates all the way into my brain [when I light the fire].*"
- Smoke is a source of tension with neighbors who feel bothered by it (e.g. when the smell from smoke penetrates clothes drying outside), especially in the metropolitan area.
- Cooks feel the health impacts, are often burned, and have their aesthetics impacted (e.g. burned hair, smell of smoke, "*construction worker hands*").
- Cooks feel that firewood cooking is arduous, as the fire requires close attention and preparing the fuel is physically strenuous.

### In numbers:

- Reduction in smoke was the most cited advantage of LPG among exclusive wood users in our sample (49% of exclusive wood users mention it versus 33% among fuel stackers\*), with cooking speed coming in second place (37% of wood users versus 64% of fuel stackers\*).
- Fuel stackers cite the reduction in smoke from LPG usage less often as an advantage, possibly because they still suffer from the smoke generated by their continued part time wood use. However, fuel stackers cite cooking speed as an advantage more often than exclusive firewood users, indicating that this can be an attribute where LPG delivers.

\* Differences are statistically significant

## Enablers: LPG as aspirational product



Our qualitative analysis revealed that most **women would use LPG if they felt they had the means to do it.**

- Low global LPG prices are already motivating fuel-switch:

*"Not long ago LPG became cheaper and I said 'that's great!' because now LPG is like at Q95." It is just a matter of getting organized to save and buy a gas stove, because honestly it is very tiring and difficult to deal with firewood smoke, and it is also complicated"*

*"It would be easier to use gas, just if it didn't use as much gas"*

- LPG is seen as a luxury product:

*"[LPG] is for educated people, doctors, those who have long nails. Look how the hands become after working with firewood, you get construction worker hands, look."*

### In numbers:

**The upfront cost of the gas stove is mentioned as a disadvantage by only 8.6% of the respondents** (10.3% of fuel stackers mention upfront costs as a disadvantage). Therefore, we presume the main barrier stems from the required monthly payments required to buy gas tanks, which cooks do not feel able to maintain because of their uncertain economic situation.

## Enablers: Firewood cost inflation



### **Firewood inflation is felt through reduced quantities and quality**

Our analysis indicates that price inflation of firewood in Guatemala is relatively low (50% of our sample did not see increases in price from the previous year).

However, this information may be hiding inflation patterns that the price alone does not capture. Our qualitative research revealed that inflation is felt through decreasing quantities of wood provided at the same price and increases of non-desirable wood (e.g. wet or less dense wood) in the firewood mix.

**These patterns increase the pain and difficulty of using firewood. Both ICS and LPG adoption may be favored by these trends.**



## Enablers: Communication that resonates with the target population

We created a set of messages together with the marketing firm Ogilvy to understand what communication might motivate users to adopt cleaner cooking technologies. The messages were developed in response to the insights gathered during the first phase of our research and tested in focus group discussions. The reactions of the participants were analyzed to understand what messages resonated with them and generated interest in clean cooking.

We created different messages for women and men. The topics explored for women were care of women's health (as a means to protect children), financial savings, convenience, children's development and children's health. For men we tested the topics of modernity, financial savings, and care of children's health.

The messages and focus group findings are presented in the next slide.

## Enablers: Communication



Message	Gender focus	Reactions	Useful ?
"Firewood smoke makes my children born weak or catch pneumonia and other diseases. If I switch to a cleaner stove my children will be healthier"	♀	The message is not credible because throughout generations, kids have grown and developed despite firewood cooking. If the smoke were really an issue, the solution would not be to buy an expensive stove, but rather take children out of the kitchen while the mother is cooking.	✗
"I want my children to be successful. Firewood smoke keeps them sick and affects their academic performance. To help them, I should start using a cleaner cookstove"	♀	The cause of poor academic performance is not firewood smoke, but rather malnutrition, bullying, and problems at home. They cite examples of life success despite having grown with a firewood and the message is therefore not credible.	✗
"I have a tight budget. If with these stoves I will be able to keep some extra money to buy things for my children, I will tell my husband to buy one"	♀	Women are responsible for wisely and sparingly use money and already use many tactics to save on firewood. Because they feel in control of firewood expenditures, the idea of spending on a device to later save on fuel seems to compete against an ability that makes them valuable at home. Men may also cut expenses if they know of savings.	✗
"When I use an LPG stove I can finish my cooking chores faster freeing time to do other things and I can even look for a job or create a small business"	♀	The value of effective use of time is limited because of the lack of work opportunities in Guatemala. Hence, this message does not resonate with a current need.	✗
"I live to take care of my family. Firewood smoke causes many diseases, some of which are even chronic. If I am not healthy, who will take care of my children?"	♀ ♂	They see that in their absence, children could be left abandoned to their fate or less-caring stepmoms. Because of work responsibilities, men aren't able to take care of children. This message is a strong call to raise awareness about women's health and the cleaner cookstoves offer a solution to the tension created by the message.	✓
"I have the obligation to protect my children and their health. Firewood smoke produced many diseases. Because of that, I cook with gas at home"	♂	The responsibility of taking care of children is in the women's domain. Women should be the ones taking care not to expose their children to smoke. LPG is seen as dangerous if children play with valves and hoses.	✗
"I've realized that many neighbors are using cleaner stoves and are saving some money. I also want to start trying those stoves to have some extra money"	♂	The promise of savings is weak because you first have to spend money to save money over a long period. Savings are not guaranteed either as not many people have cleaner stoves to prove the case. However, saving money can provide a rational justification for the purchase <i>if</i> an emotional appeal for the product is established first.	✗✓
"I don't want my family to be seen with disdain; that my children are bullied because they smell like smoke or that my wife is told that she is one of the few that still cooks with firewood. In my house, we need to start cooking with gas."	♂	This message generated indignation. Firewood is an economic necessity and should not be a reason for discrimination.	✗



# INTRODUCTION TO MARKET SEGMENTATION: OPTIMIZING MARKETING EFFORTS



## Introduction: Market Segmentation

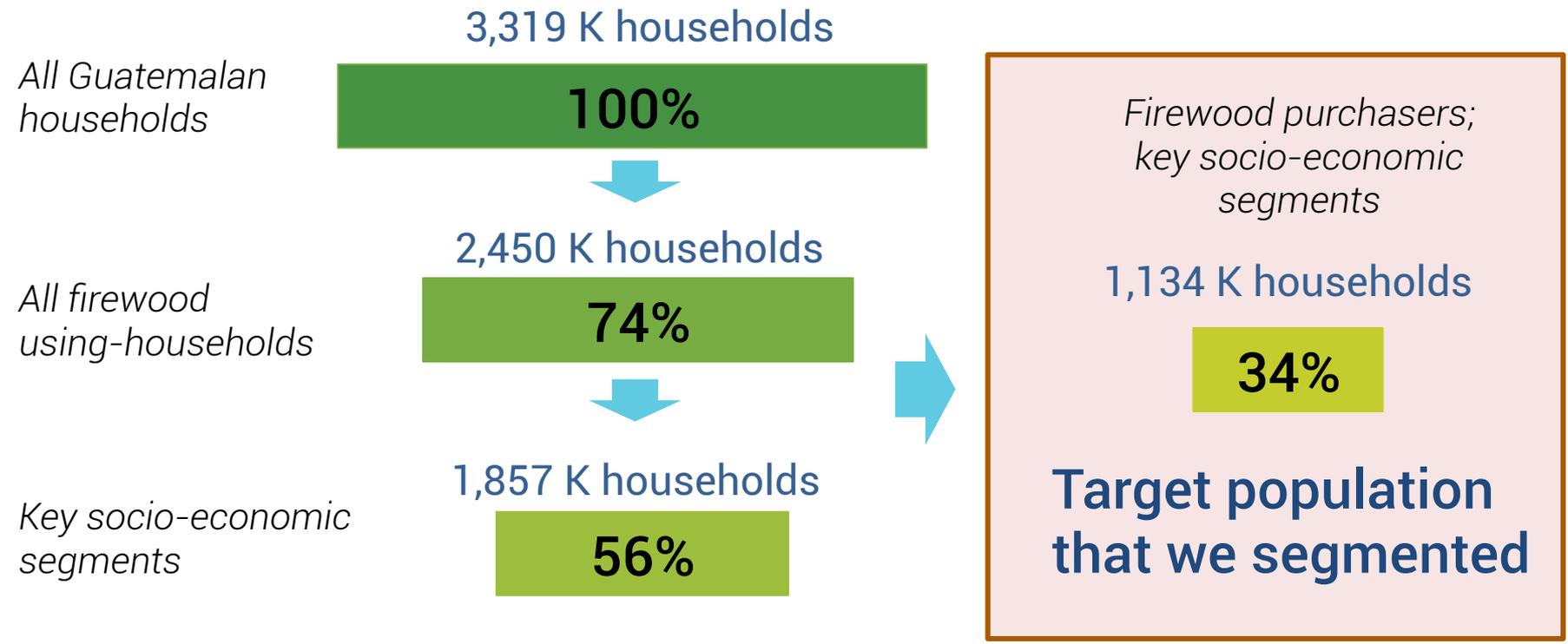
We further divided the target population we studied into distinct market segments.

### Some basic elements of market segmentation:

- Market segments are groups that are similar to each other and different to other groups.
- Segmentation is important because it allows for marketing strategies to be tailored for each segment.
- Defining market segments helped us to identify and prioritize those most poised to purchase clean cooking technologies.
- To identify segments we:
  - Derived segmentation hypotheses from existing data analysis and qualitative research
  - Used survey data and qualitative research to identify segmentation variables
  - Applied clustering algorithms to identify population segments



Our segmentation is based on a target population that includes firewood purchasers from the non-extreme poor and non-poor socio-economic groups



## Segmentation hypotheses



Qualitative research revealed the following segmentation hypotheses:

- Cooks who have the capacity to make or influence purchasing decisions that benefit them and their families are more likely to adopt clean cooking technologies.
- Women who aspire to better living standards will more readily adopt clean cooking technologies as firewood cooking is arduous and uncomfortable.
- Women will make clean cooking purchase decisions if they have the financial stability to make sacrifices today that benefit them in the future.
- Women who spend less time at home have less time to tend fires and will benefit from less labor intensive cooking technologies.

## Segment Identification

### *Key segmentation variables*



We identified 4 segmentation variables that affect the likelihood of adoption of clean cooking technologies (Improved wood cookstoves AND clean fuels):

Variable	Rationale	How it divides the markets
<b>Income</b>	<ul style="list-style-type: none"> <li>Women in higher-income households can make decisions that benefit them more easily, even if they do not contribute financially to the family.</li> <li>As incomes rise, the population is less financially risk-averse and can adopt LPG.</li> </ul>	Splits the market between fuel stackers, exclusive firewood users, and low and unstable income households
<b>Woman earns income</b>	<ul style="list-style-type: none"> <li>Income-earning women have more flexibility to use their budgets and make more purchasing decisions.</li> <li>Women who work for an income (especially outside the home) have less time to cook.</li> </ul>	Splits exclusive firewood users into income-generating and non-income generating women
<b>Age</b>	<ul style="list-style-type: none"> <li>Tradition weighs less heavily among younger women who would more often prefer to cook with cleaner fuels.</li> <li>Younger women are more educated and have a higher expectation for their standard of living.</li> </ul>	Splits exclusive firewood users between mature and young
<b>Current usage of LPG</b>	<ul style="list-style-type: none"> <li>Households are already cooking with clean fuels but could expand their use.</li> <li>This variable is also correlated with income.</li> </ul>	Splits populations between fuel stackers and exclusive firewood users



## Segments identified

Based on quantitative analysis validated through qualitative research, we found 7 different segments:

<b>Fuel stackers (LPG + wood)</b>	<b>Higher-income fuel stackers</b>	These are households with relatively good living conditions where gas is used for cooking on average more than half of the time. These households have fewer economic barriers to purchase durable goods as they often have more than one source of income.
	<b>Lower-income fuel stackers</b>	These are low-income households that have adopted LPG but use it more sparingly. Women often stay at home to cook and generally have less decision-making power than males.
<b>Exclusive firewood users</b>	<b>Mature income-generating women (&gt;32 years)</b>	These are households where cooks are breadwinners. They are more likely to own a house. They have stature in their communities and may feel some pressure to adhere to traditional norms.
	<b>Mature traditionalist women (&gt;32 years)</b>	Women have decision-making power constrained by males. They may have a house of their own and have accumulated some durable assets over time. Tradition weighs heavily on this segment.
	<b>Young income-generating women (18-32 years)</b>	These are young working women building an asset base to improve living conditions. Households often have dual incomes. Fertility rates are lower than other segments (including young traditionalist women). Women aspire towards a middle-class mode of living more than other segments.
	<b>Young traditionalist women (18-32 years)</b>	These women stay at home and their decision making power is constrained by heavily traditionalist men and often mothers-in-law. Women in this segment are often busy attending to their many children's needs.
	<b>Low and unstable income households</b>	These are households where incomes are not enough to cover the most basic needs. Men and women earn low and unstable incomes. Household sizes are very large and, ironically, this segment spends more on firewood than any other.

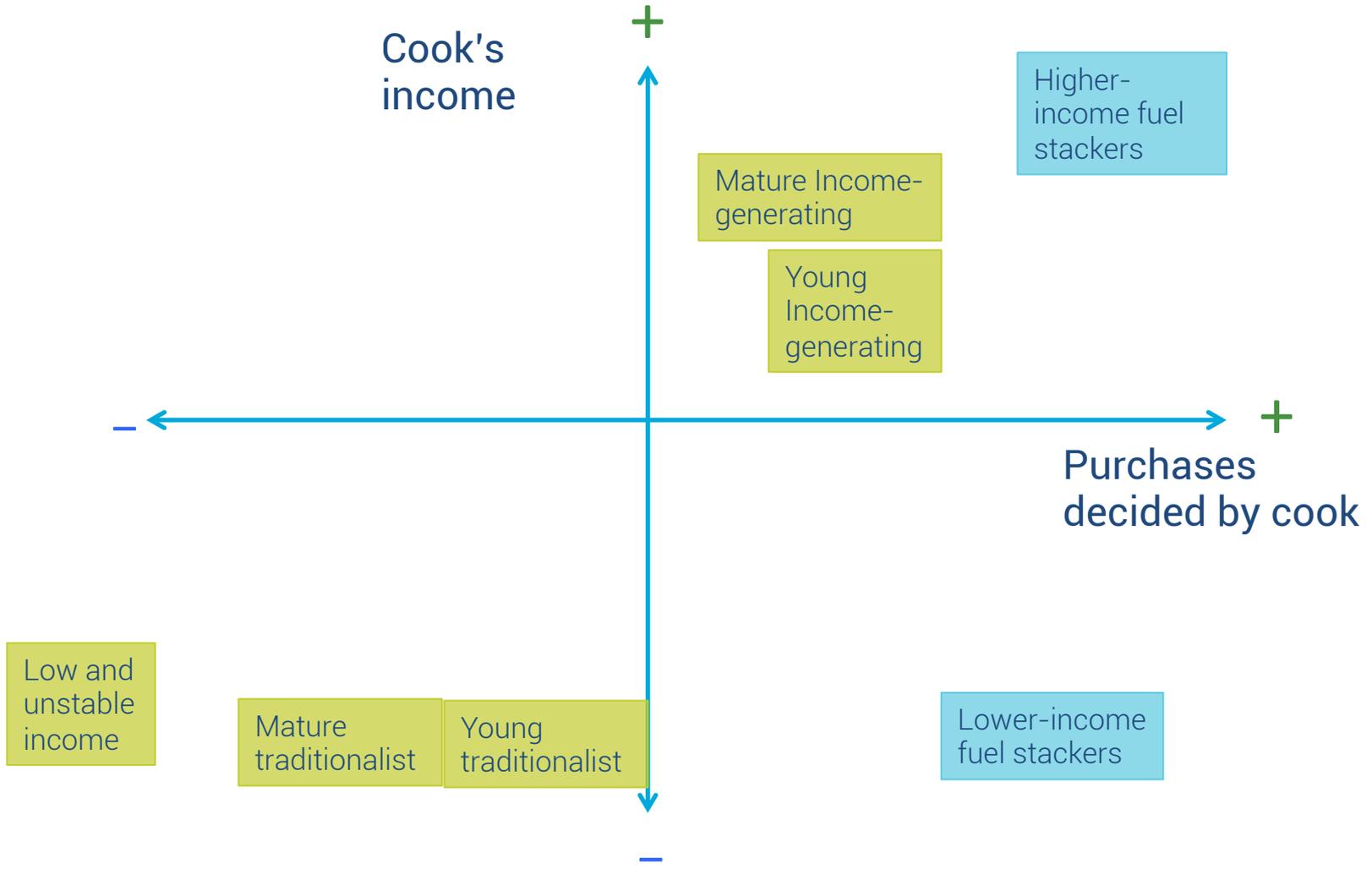
## Segment comparison



Segment	Cooks that work for an income	Household size	Fuel expenditures	Cookstove use
Higher-income fuel stackers	98%	4.5 people/household	Q235/month (Q79 on LPG)	51% of time on LPG 44% have a stove with a chimney
Lower-income fuel stackers	0%	5.8 people/household	Q187/month (Q65 on LPG)	43% of cooking time on LPG 44% have stove with chimney
Mature income-generating women	100%	5.5 people/household	Q265/month	41% have stove with chimney
Mature traditionalist women	5%	5.9 people/household	Q186/month	82% have stove with chimney
Young income-generating women	100%	4.6 people/household	Q231/month	41% have stove with chimney
Young traditionalist women	0%	5.6 people/household	Q223/month	61% have stove with chimney
Low and unstable income households	9%	5.8 people/household	Q268/month	15% have stove with chimney

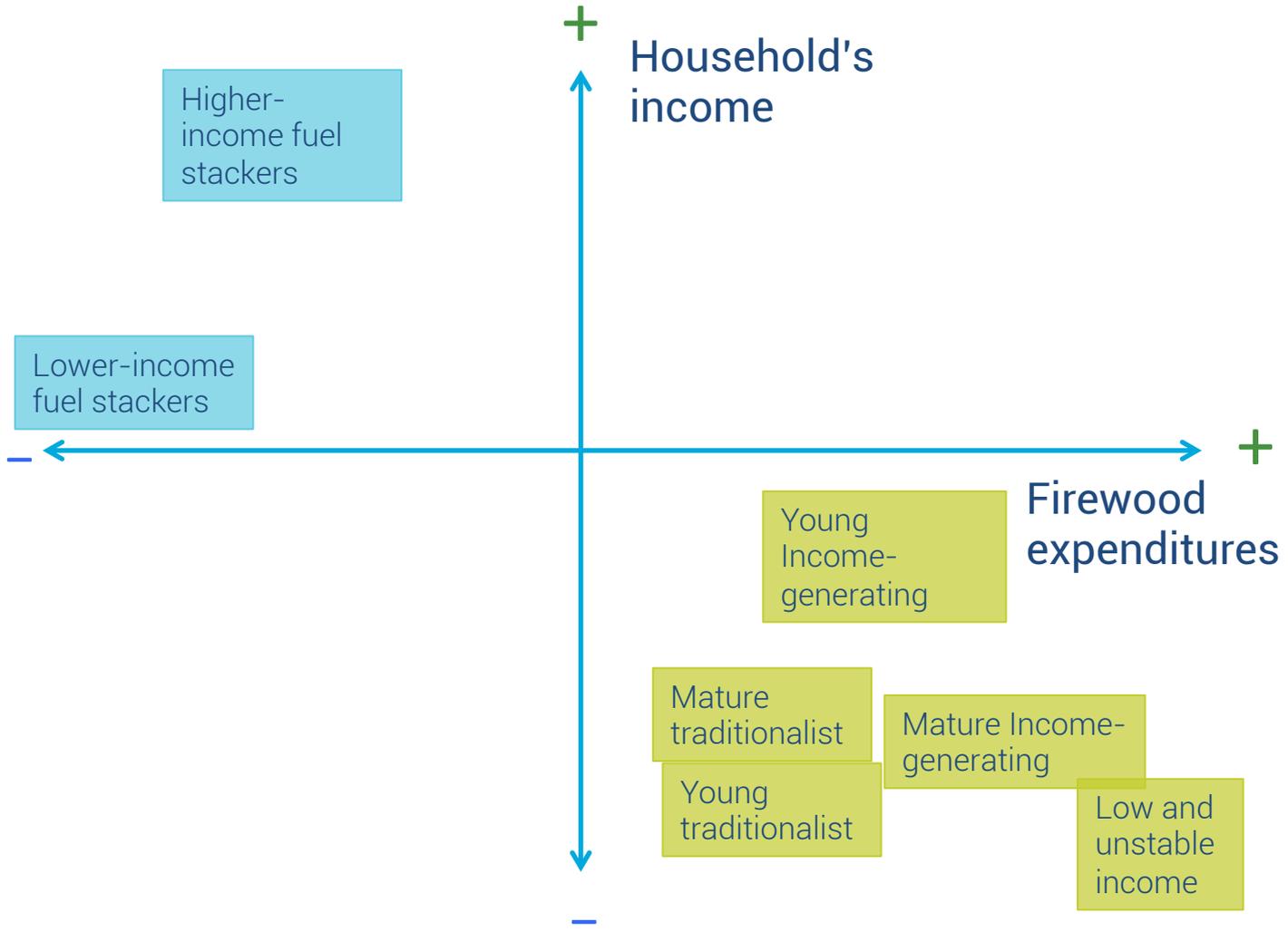


# Segments identified





# Segments identified



## Key barriers and segments

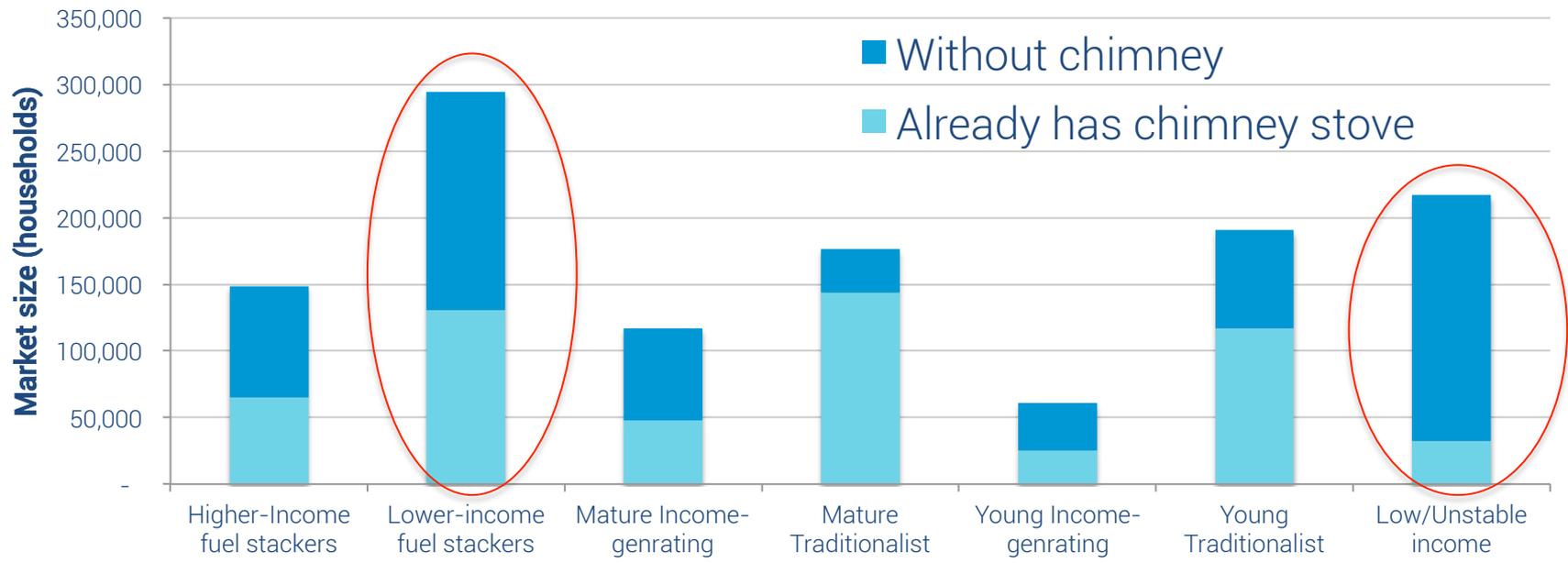
Barrier	Strongest among
<b>Management of financial risk through firewood</b>	All segments
<b>Liquidity</b>	All segments
<b>Gender decision-making imbalance</b>	Traditional women and low and unstable income households
<b>Price and present bias</b>	Exclusive firewood users
<b>Expectation of highly-subsidized improved cookstoves</b>	Exclusive firewood users in highlands
<b>Product perceptions and attributions</b>	All segments
<b>High penetration of “plancha” stoves</b>	Traditional women (especially the mature)



## Market sizes

**Low-income fuel stackers and the Low and unstable income segments present the largest market sizes**

As mentioned earlier in the report, many households in our target population already own a “plancha” or other stove with a chimney; chimney stove ownership was highest among the “traditionalist” segments.

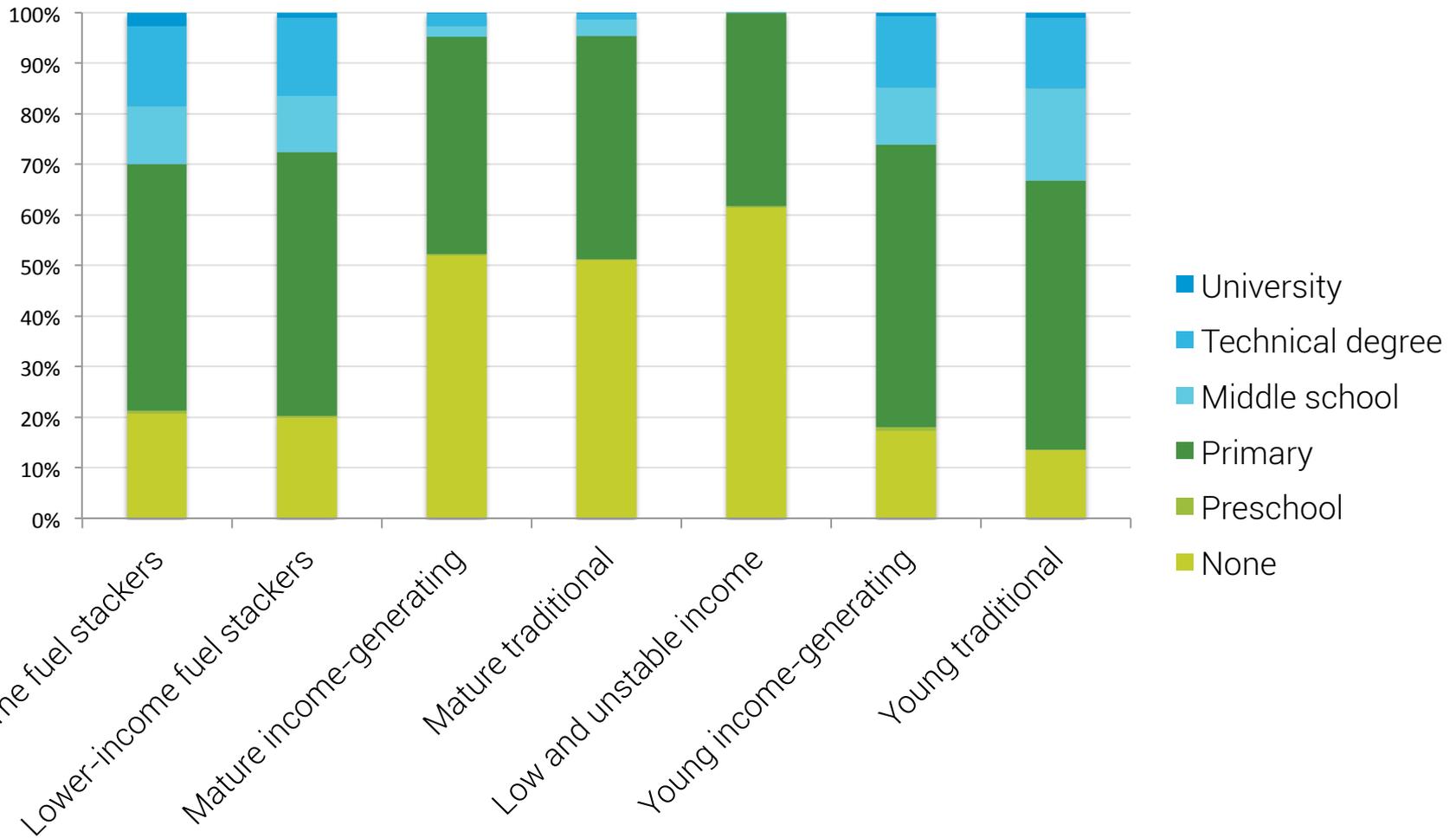


See details of market sizes by Department on the segment's detailed profile

## Educational attainment



Fuel stackers and the young segments present the highest educational attainment



## Segment Identification

### *Other segmentation considerations*



Another segmentation variable we explored was whether a household was considered an “indigenous household”. Our market segments capture to a great extent the this variable.

**34% of Guatemalan households are considered “indigenous households”** (*defined in the census as having a head of household whose mother language is indigenous*) **and our analysis indicated these households may transition more easily to improved wood stoves than to LPG.** The reasons are:

1. *Indigenous populations value the tradition of firewood cooking more than the non-indigenous.* Our qualitative research revealed that firewood is considered better for cooking among many indigenous families and has a valued meaning of abundance.
2. *A large proportion of the indigenous population lives in the highlands which presents a colder climate than lower-lying areas.* Wood stoves warm the home atmosphere.

Hence, indigenous populations tend to abandon firewood more slowly than the non-indigenous. Locally-built – and non-subsidized- wood stoves with chimney (“Plancha” stoves) have a higher prevalence in areas with stronger indigenous influence.

Our market size estimations therefore include estimates for indigenous versus non-indigenous households (see detailed market segment descriptions).

Note: certain coastal populations also value firewood because smoke drives insects away and prevents deterioration of palm-thatched ceilings.

# Segment prioritization



Our analysis showed that certain segments likely have a higher propensity to buy and adopt cleaner cooking technologies than others. We used the following criteria to prioritize those segments:

1. Likelihood to transition to clean cooking technologies
2. Market size without chimney stoves, as these stoves already reduce the discomfort of smoke and hence reduce the need for cleaner devices in the consumer's mind

Segment	Likelihood to transition to clean cooking	Market size (# of households)	Prioritization
Higher-income fuel stackers	High	83,664	Primary priority
Lower-income fuel stackers	Moderate	163,879	Primary priority
Mature income-generating women	High	69,075	Primary priority
Mature traditionalist women	Moderate	32,636	Secondary priority
Young income-generating women	High	35,878	Primary priority
Young traditionalist women	Moderate	73,639	Secondary priority
Unstable income households	Low	184,257	Deprioritized

**These priority segments and how to facilitate their transitions to clean cooking are discussed in more detail in the next section.**

Deprioritized and secondary priority markets are described in more detail in Appendix B

# Detailed Priority Segment Profiles: Fuel Stackers

## A note on key differences between fuel stackers and exclusive firewood users: Housing

### Fuel stackers

- Housing conditions are slightly improved as compared to exclusive firewood users due to higher incomes.
- 80% of households are constructed with cinderblock; the rest with metal sheets.
- Roofs are predominantly made of metal (78%) and concrete (15%).
- 92% of houses have floors covered with concrete or other ceramic.



### Exclusive firewood users

- ~50% of houses are constructed with cinderblock; the rest are a mix of metal sheets, adobe and wood.
- As with LPG users, 80% of roofs are made with metal, but 6% are made with concrete, while the rest are made with tiles (12%) and other (2%)
- Only 61% of floors are covered with concrete or other ceramics



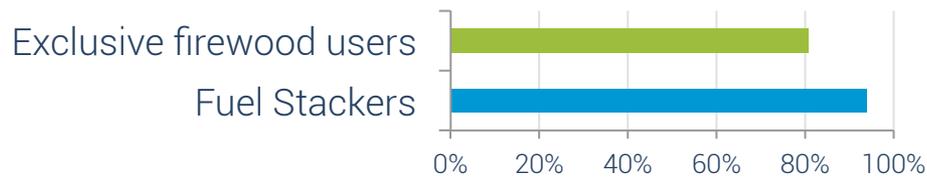
## A note on key differences between fuel stackers and exclusive firewood users:



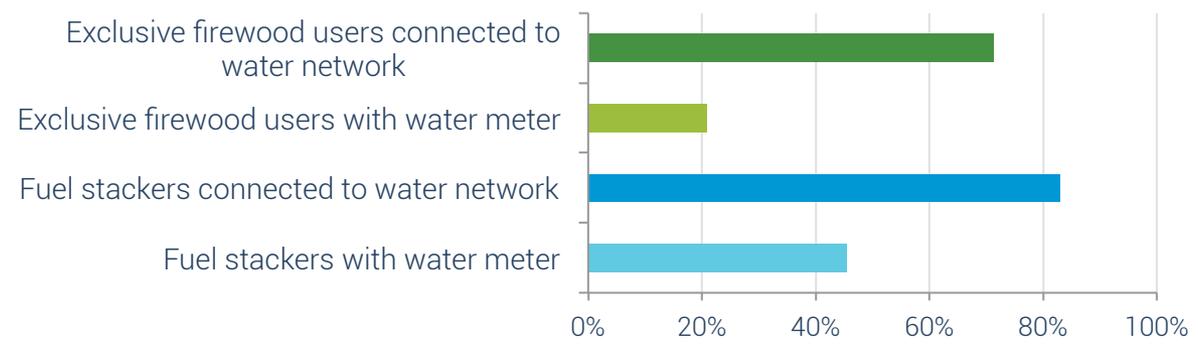
### Access to utilities

Fuel stackers have better access to utilities than exclusive firewood users

#### Access to electricity



#### Access to water



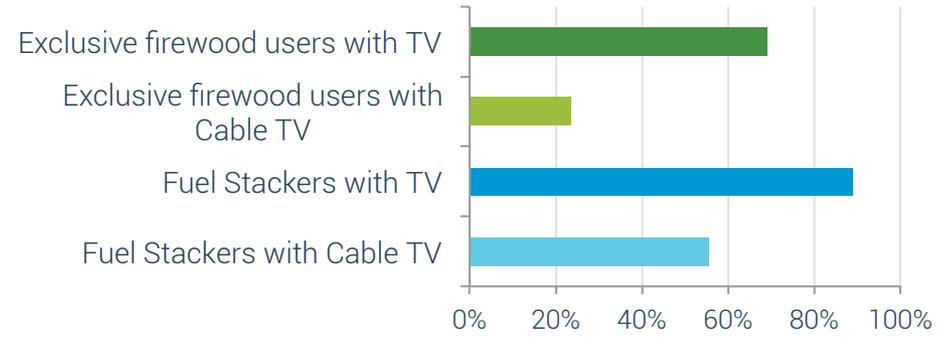
#### Access to sewage



## A note on key differences between fuel stackers and exclusive firewood users: Other household assets



### TV



### Cell phone



### % of houses that are rented



## Higher-income fuel stackers



Doña María, Villa Canales,  
Guatemala



## Who are high-income fuel stackers?

### Demographics

Doña María lives in the suburbs of Guatemala City. She is 36 and already a grandmother of 2. She lives with her 2 daughters aged 21 and 18 and their respective couples, who contribute to household income.

### Housing and appliances

The house in which they live is rented and made of cinderblock. The house has 3 rooms, TV and a washer. Doña María has a basic pre-paid cell phone.

### Cooking and fuels

She does about half of the cooking on an LPG stove, but continues to cook tortillas and beans on a metal barrel pollo for fear of consuming too much LPG. Firewood cooking is shared with her daughters who also have LPG stoves and do most of the cooking independently. She spends around Q 140/month buying firewood to cook at home which she purchases once or twice per month.

## Higher-income fuel stackers



Doña María, Villa Canales,  
Guatemala



## Who are high-income fuel stackers?

### Income

Doña María's husband long departed from the house to join another family. She is now the main breadwinner of the house and works full time in her own tortilla shop where she earns Q400/week.

### Aspirations and concerns

Her main aspiration is to own a house of her own, because she currently rents. She feels that if she could afford it, she would switch completely to LPG because it is more convenient and faster.

She is concerned that business competition will get tougher and that she will not be able to make a living if that is the case because she has no husband.



## Fuel Stackers - Higher-income fuel stackers: *Segment overview*

<b>Fuel Expenditures</b>	<ul style="list-style-type: none"> <li>The segment has low firewood expenditures.</li> <li>Most prevalent firewood purchase interval is approximately every 30 days.</li> <li>High usage of LPG responds to higher income levels and the fact that women work.</li> </ul>
<b>Cooking habits and appliances</b>	<ul style="list-style-type: none"> <li>51% of cooking is done on LPG stoves and 49% on firewood</li> <li>44% own a biomass stove with chimney (improved wood stoves or plancha stoves) for which they paid on average Q 800.</li> </ul>
<b>Housing</b>	<ul style="list-style-type: none"> <li>They live in solid houses (e.g. concrete floors and cinderblock walls), which they generally own.</li> <li>They have electricity, most have running water, and most have TVs.</li> </ul>
<b>Income Levels</b>	<ul style="list-style-type: none"> <li>Relatively high income levels with respect to other segments, but are still susceptible to economic distress; hence they have not fully abandoned firewood use.</li> <li>Living conditions are the best among all segments.</li> </ul>
<b>Women's empowerment</b>	<ul style="list-style-type: none"> <li>The vast majority of women in this segment work, often in more stable positions (e.g. low income wage workers). Consequently, they make more purchasing decisions for durable goods.</li> <li>Women are more frequently heads of household than in any other segment.</li> <li>Cooking is often less intensive than other segments. For instance, a large fraction purchase tortillas.</li> </ul>
<b>Demographics</b>	<ul style="list-style-type: none"> <li>This segment is slightly older and more established than the young segments.</li> <li>The population in this segment lives mostly in urban areas.</li> <li>The segment is mostly non-indigenous (74%)</li> <li>Educational levels remain low, although among the highest of all segments.</li> </ul>
<b>Market size</b>	<ul style="list-style-type: none"> <li>The size of this segment is 148,800 households and highly urban (72%)</li> <li>The highest concentration of this segment is in the Guatemala City metropolitan area.</li> </ul>

# Higher-income fuel stackers

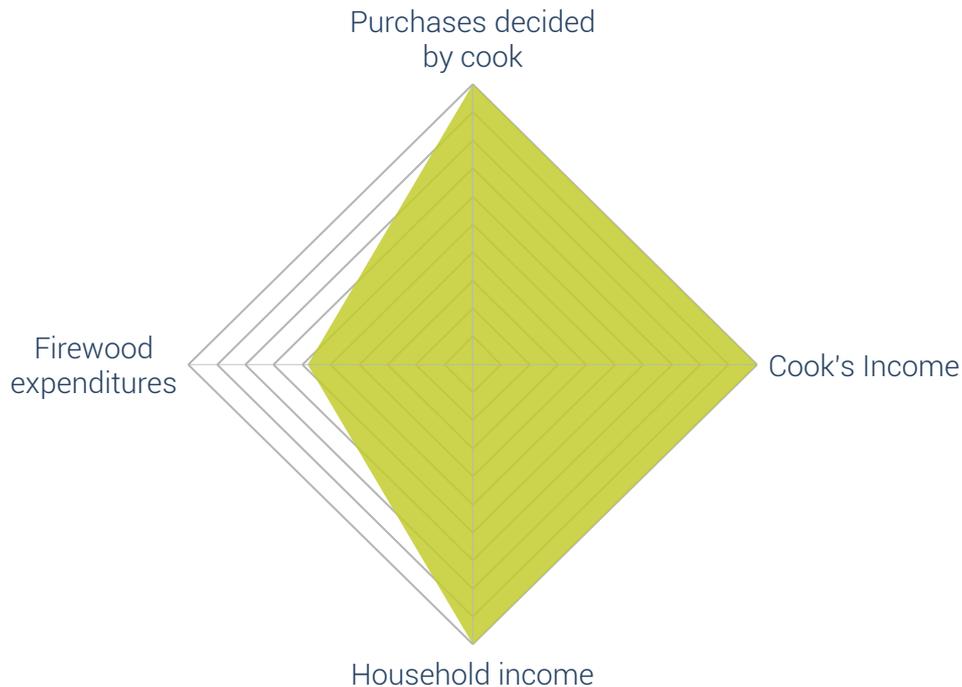
## *Fuel purchasing habits*



1	<b>Firewood purchase</b>	<p>Most households purchase firewood infrequently [median = every 30 days; average = every 60 days]. Some purchase it only once a year and others weekly, but never daily.</p> <ul style="list-style-type: none"> <li>➤ Households save some money by purchasing firewood in bulk. This purchasing habit reflects the capacity of the segment to commit to relatively large upfront investments.</li> </ul>
2	<b>Firewood expenditure</b>	<p>Their monthly firewood expenditures are relatively low as compared to other segments [median = 129 Q/month; average = 156 Q/month], reflecting a lesser need for wood and the bulk purchasing habits.</p>
3	<b>Firewood collection</b>	<p>Households in this segment may engage in fuel collection for convenience (near rural areas) and under temporary budget pressures. 23% of cooks in this segment purchase <i>and</i> collect wood.</p>
4	<b>LPG purchase</b>	<p>Most households purchase LPG every month or less, usually in 25 lbs tanks which are delivered at their door.</p>
5	<b>LPG expenditure</b>	<p>Monthly LPG expenditures at the time of the survey was the highest among all segments [median = 85 Q/month; average = 79 Q/month] (value when price of LPG was approximately Q 96/25 lbs cylinder)</p>
6	<b>Overall fuel expenditure</b>	<p>Overall fuel expenditures are higher than other segments except for the mature income-generating and young traditionalist [median = 216 Q/month; average = 235 Q/month]</p>

## Higher-income fuel stackers

### *Comparative analysis*



### How this segment compares to others

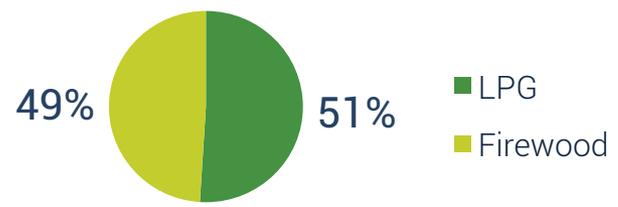
- This segment ranks highest in income and cook's empowerment variables.
- Purchases decided by cook rank highest as women in this segment work and the household's finances are better than other segments.
- Firewood expenditures are the lowest among all segments as a consequence of more intensive LPG usage and outsourcing of cooking chores (e.g. tortilla purchase).



# Higher-income fuel stackers

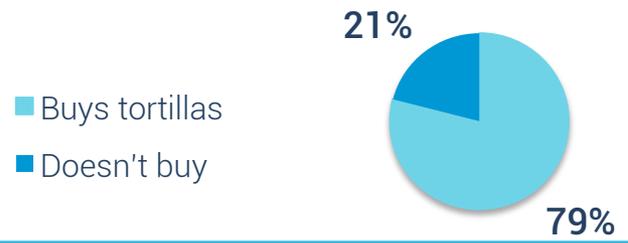
## *Cooking appliances and habits*

### Firewood stove with chimney penetration



### Proportion of time cooking in each type of device

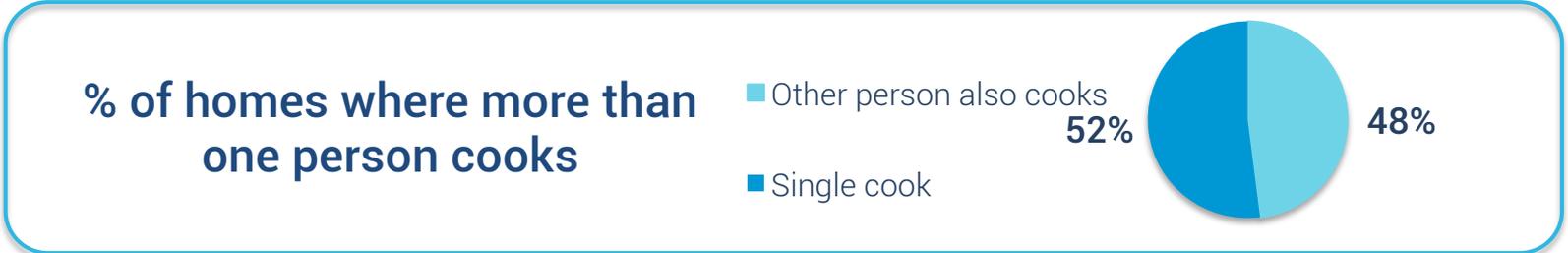
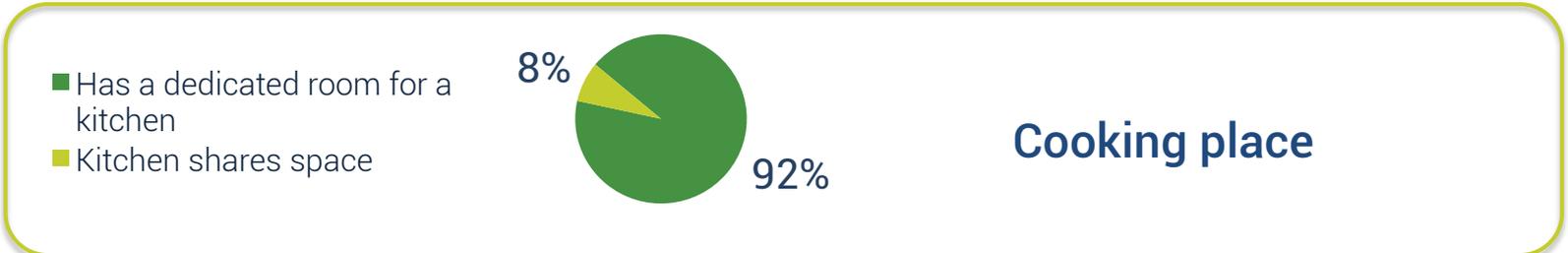
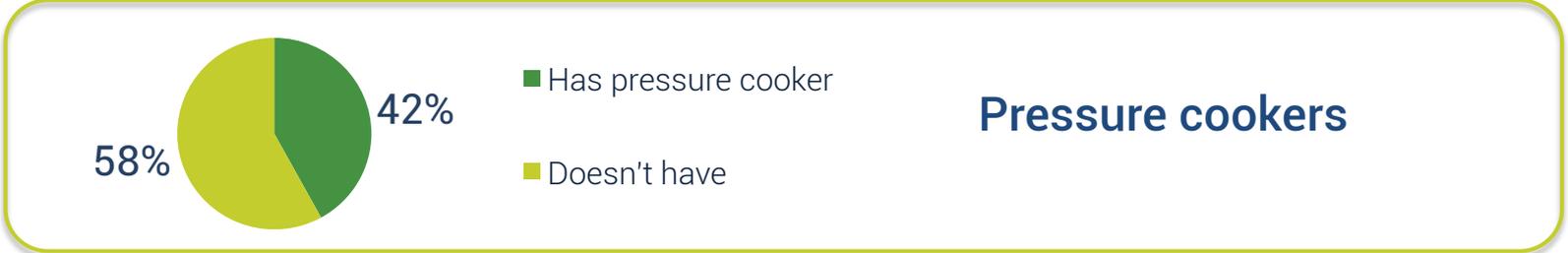
### % of people who buy tortillas





# Higher-income fuel stackers

## *Cooking appliances and habits*

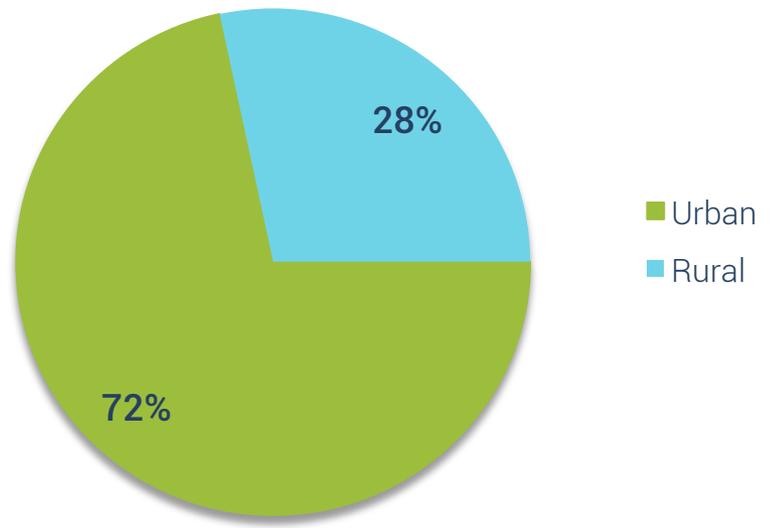


Cooking is more collaborative than in other segments, reflecting time pressures

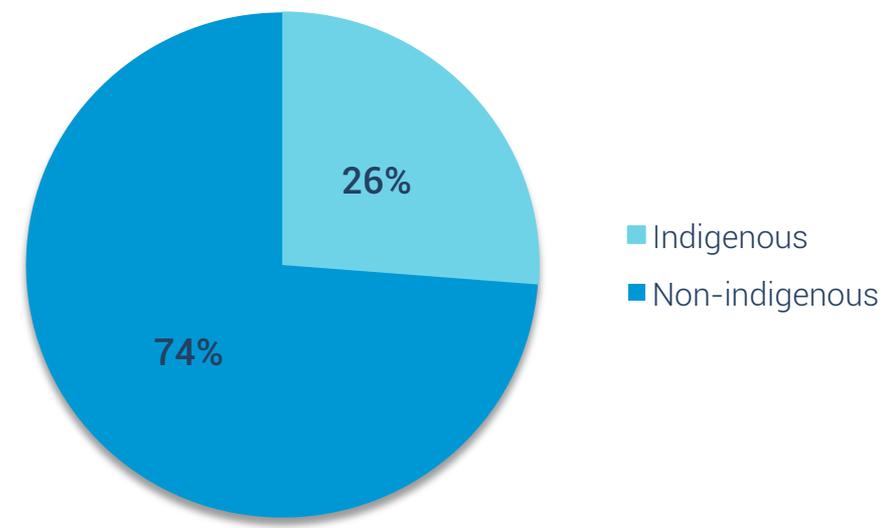


## Higher-income fuel stackers *Market size and distribution*

- The total market size for this segment is **148,800 households** and an estimated 98,200 (66%) lack firewood stoves with a chimney.



Most of the population in this segment lives in urban areas



The population in this segment is mostly non-indigenous



# Higher-income fuel stackers

## *Market size and distribution*

Department	# of households	% without chimney
Guatemala	48,920	76%
Quetzaltenango	12,533	32%
San Marcos	9,900	3%
Alta Verapaz	8,588	96%
Quiche	8,158	16%
Escuintla	8,013	74%
Chimaltenango	7,627	59%
Sacatepequez	7,369	83%
Huehuetenango	6,450	26%
Izabal	5,512	51%
Peten	5,085	50%
Jutiapa	4,170	51%
Santa Rosa	4,109	69%
Baja Verapaz	3,925	66%
Totonicapan	3,695	8%
Suchitepequez	3,279	82%
Chiquimula	2,992	54%
Solola	2,273	21%
Retalhuleu	1,997	52%
El Progreso	1,864	65%
Zacapa	1,263	30%
Jalapa	418	0%

## Needs of fuel stackers (lower- and higher-income)



**The segments continue cooking beans and tortillas in firewood because these staple foods require long cooking times which seem too expensive on LPG.**

- The segments can benefit from pressure cookers to reduce firewood use and ultimately transition bean cooking from firewood to LPG.
- The segments need clean options to cook tortillas. Corn cooking pots are usually considered too big for LPG stove burners and most LPG stoves that the segment has do not have griddles to cook tortillas.
- Under low LPG price scenarios, the segment needs ways to confirm LPG cooking is cheaper than firewood.



# General strategies for fuel stackers

## Short-term strategies to alleviate health burden of firewood cooking

Introduce niche clean cooking products that do not sacrifice LPG usage and that are cheaper than a complete improved cookstove:

- Improved nixtamalera/comalera
- Pressure cookers

## Long-term strategies to transition to clean fuels

Build confidence in LPG to facilitate full transitions:

- Get cooks in control of LPG expenditures (e.g. by showing how LPG can be measured in canisters)
- Demonstrate traditional cooking on LPG
- Stabilize or buffer LPG price fluctuations
- Ensure quality of LPG canisters (complete filling, security, and look and feel)
- Facilitate piece-wise increments in LPG stove capabilities (e.g. ability to add griddle to LPG stoves later in time to cook tortillas)
- Offer partial cylinder refills to address liquidity constraints.



## Strategic considerations for higher-income fuel stackers

- The segment could make full transitions to LPG more easily than any other segment.
- Cooks in this segment could gravitate more easily to LPG solutions that meet their needs rather than wood products which may consume more of their time.
- The segment is still relatively low income and males need an economic justification for full transitions into LPG.
- Pressure cookers offer the dual advantage of time savings and reduction in expenditures, but cooks need to be convinced of economics.
- Liquidity is still an issue, but under low LPG price scenarios, the segment could convert to larger than 25 lbs cylinders that are more likely to last for entire paycheck cycles.

## Lower-income fuel stackers



### Who are lower-income fuel stackers?

Doña Blanca, San Marcos, San Marcos



#### Demographics

Doña Blanca lives in the capital town of the department of San Marcos in Western Guatemala. She is 30 and lives with her husband and 3 children aged 8, 6 and 4.

#### Housing and appliances

Blanca and her husband own a 1 bedroom cinderblock house whose floor is covered with cement and tin roof. Blanca's husband made a 'polletón' for her to cook over. She also has a pressure cooker and a small gas stove which she uses for quick meals in the morning, heating water for coffee and tea, and occasionally making stews.

#### Cooking and fuels

Blanca spends about Q100/month on firewood which she buys once per month. She also collects fuel because some days she has to spend money on the doctor. She buys a 25 lb LPG canister about every 2 months. She cooks about 40% of the time on her LPG stove and uses her polletón to cook tortillas, boil corn, and make beans.

## Lower-income fuel stackers



### Who are lower-income fuel stackers?

Doña Blanca, San Marcos, San Marcos



#### Income

Her husband, the sole income-earner in the household, is a shoe smith. He occasionally takes other day jobs, such as driving a public bus when his brother in law cannot attend it. On average, he makes Q3,100/month, but varies month by month.

#### Aspirations and concerns

Her main aspiration is to be able to build another room for her children, which has made her consider obtaining a loan from her brother.

She is concerned about making ends meet financially, especially with school fees. She hopes to establish a small business in the future to have a second source of income.



## Lower-income fuel stackers

### *Segment overview*

<b>Fuel Expenditures</b>	<ul style="list-style-type: none"><li>• They have the lowest firewood expenditures of all segments. LPG consumption is less than higher income fuel stackers.</li><li>• Purchase firewood every 30 days approximately.</li><li>• LPG is used for convenience (cooking certain meals fast), but is used sparingly.</li></ul>
<b>Cooking habits and appliances</b>	<ul style="list-style-type: none"><li>• 44% of cooking is done on LPG stoves and 56% on firewood</li><li>• 29% own a biomass stove with chimney (improved wood stoves or plancha stoves) for which they paid on average Q 800.</li></ul>
<b>Housing</b>	<ul style="list-style-type: none"><li>• As higher-income LPG users, they live in solid houses (e.g. concrete floors and cinderblock walls), which they generally own.</li><li>• They have electricity and most have TVs, but only half have running water.</li></ul>
<b>Income Levels</b>	<ul style="list-style-type: none"><li>• Their income levels are relatively high with respect to exclusive firewood users, but ~20% lower than high-income LPG users.</li><li>• Living conditions are in general better than exclusive firewood users.</li></ul>
<b>Women's empowerment</b>	<ul style="list-style-type: none"><li>• Women in this segment seldom work. They have relatively high-earning husbands who provide enough for basic needs and for women to devote to children and household chores.</li><li>• Because they enjoy relatively high living standards with respect to poorer segments, they can make purchase decisions of durable goods.</li><li>• As with high-income LPG users, women frequently purchase tortillas.</li></ul>
<b>Demographics</b>	<ul style="list-style-type: none"><li>• This segment spans across age groups (median age =30)</li><li>• The population in this segment lives in urban areas.</li><li>• The segment is mostly non-indigenous.</li><li>• Educational levels remain low.</li></ul>
<b>Market size</b>	<ul style="list-style-type: none"><li>• This segment has a market size of 294,000 households.</li><li>• The highest concentration of this segment is around the major urban centers, such as in the Guatemala City metropolitan area.</li></ul>

# Lower-income fuel stackers

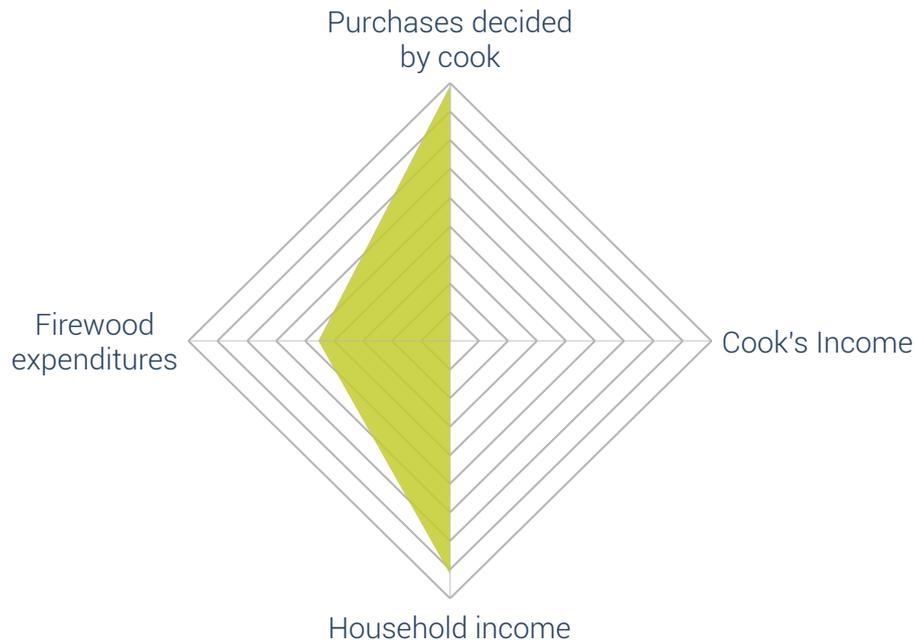
## *Fuel purchasing habits*



1	<b>Firewood purchase</b>	<p>These households purchase firewood infrequently, but slightly more frequently than high-income LPG users [<b>median = every 30 days; average = every 49 days</b>], although the range of frequencies is varied (ranges from 1 day to a year)</p> <p>As with high-income LPG users, this segment has the capacity to purchase firewood in bulk reflecting higher cash liquidity than exclusive wood users.</p>
2	<b>Firewood expenditure</b>	<p>Their monthly firewood expenditures are low as compared to other segments [<b>median = 100 Q/month; average = 122 Q/month</b>], reflecting bulk purchasing habits, sparing behavior and tortilla purchase.</p>
3	<b>Firewood collection</b>	<p>As with other segments, households in this segment engage in fuel collection under somewhat frequent temporary budget pressures. 43% of cooks in this segment purchase <i>and</i> collect wood.</p>
4	<b>LPG purchase</b>	<p>Households purchase LPG in general less frequently than every month (average= 60 days; median= 45 days). Canisters are usually in 25 lbs and delivered at their door.</p>
5	<b>LPG expenditure</b>	<p>Average LPG expenditures are around Q 65 (value when price of LPG was approximately Q 96 per 25 lbs canister)</p>
6	<b>Overall fuel expenditure</b>	<p>Overall fuel expenditures are statistically different from the higher-income LPG users and the mature income-generating (these latter two spend more), but equal to the rest of the segments [<b>median = 170 Q/month; average = 187 Q/month</b>]</p>

## Lower-income fuel stackers

### *Comparative analysis*



### How this segment compares to others

- Cooks make purchase decisions in this segment responding to relatively high income levels despite the fact that they do not work.
- Firewood expenditures are some of the lowest across segments responding to the combination of fuels, tortilla purchase, and financially conservative behavior.

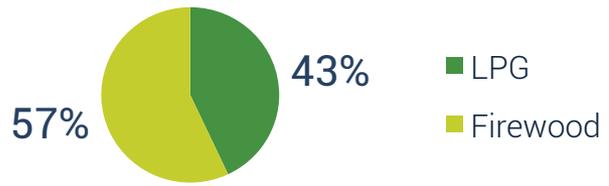
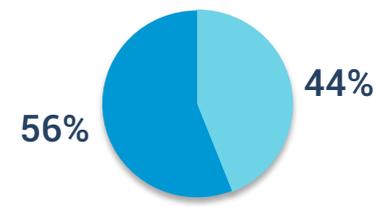


# Lower-income fuel stackers

## *Cooking appliances and habits*

### Firewood stove with chimney penetration

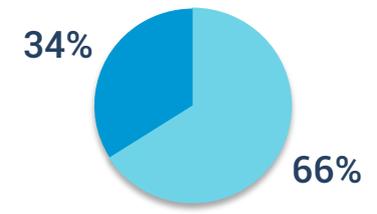
- Has chimney stove
- Doesn't have



### Proportion of time cooking in each type of device

### % of people who buy tortillas

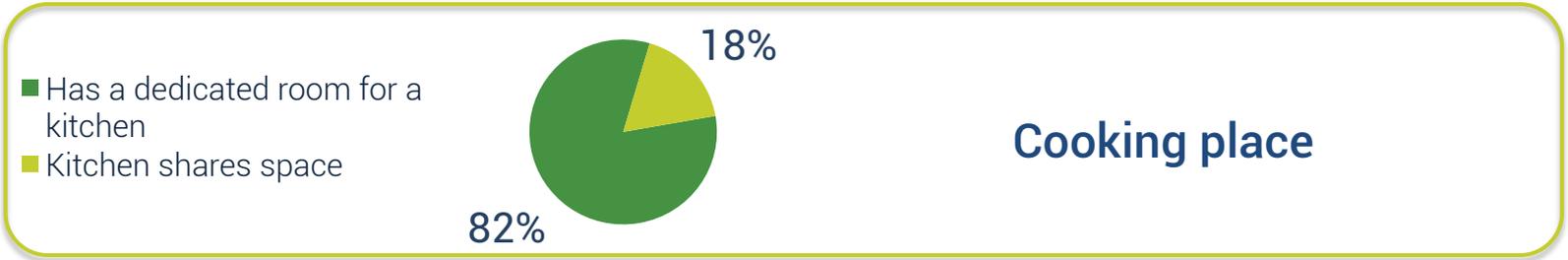
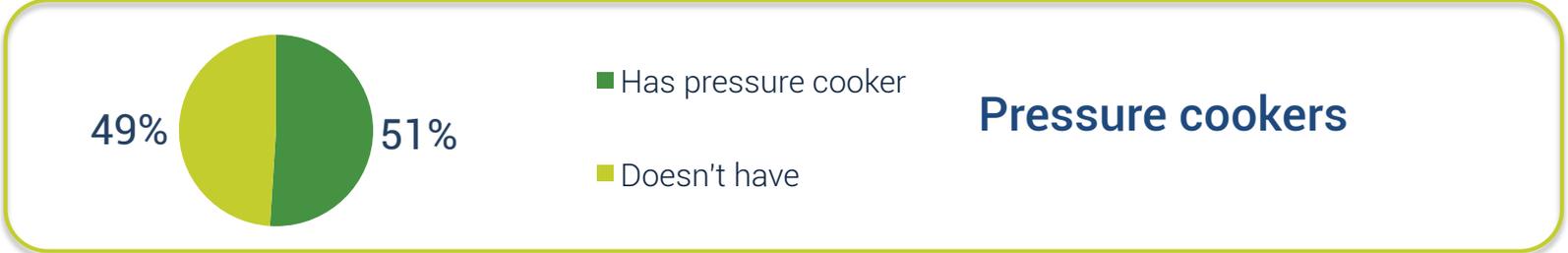
- Buys tortillas
- Doesn't buy





# Lower-income fuel stackers

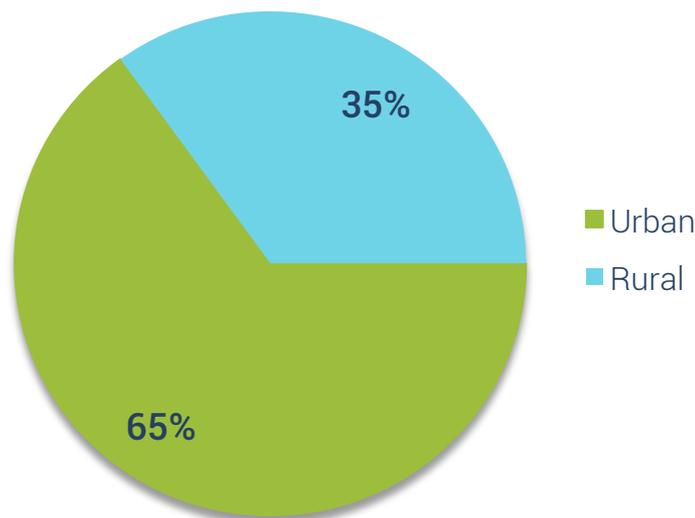
## *Cooking appliances and habits*



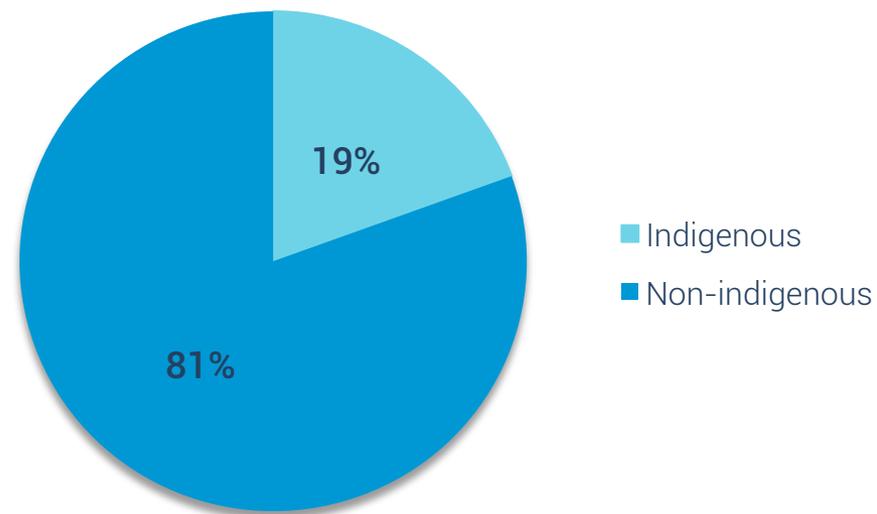
## Lower-income fuel stackers

### *Market size and distribution*

- The total market size for this segment is **294,300 households** and an estimated 194,200 (66%) lack firewood stoves with a chimney.



A large fraction of the population in this segment lives in urban areas



The population in this segment is mostly non-indigenous



# Lower-income fuel stackers

## *Market size and distribution*

Department	# of households	% without chimney
Guatemala	83,423	77%
Escuintla	29,976	81%
Quetzaltenango	23,132	42%
San Marcos	22,763	22%
Huehuetenango	21,815	15%
Chimaltenango	16,349	55%
Sacatepequez	12,241	71%
Santa Rosa	11,771	56%
Jutiapa	11,499	36%
Suchitepequez	10,882	83%
Peten	8,809	68%
Quiche	8,715	23%
Totonicapan	7,859	18%
Solola	7,394	9%
Izabal	7,299	58%
Retalhuleu	7,063	68%
Chiquimula	5,671	68%
Alta Verapaz	4,984	76%
Zacapa	4,035	54%
El Progreso	3,731	59%
Baja Verapaz	3,469	50%
Jalapa	2,379	53%



# Strategic considerations for Lower-income fuel stackers

- Because of lower-income levels and a small proportion of women contributing to household income, this segment needs stronger male engagement in clean cooking decisions than high-income fuel stackers.
- Lower income levels and women's time availability mean that the segment could gravitate more easily to wood solutions, including ICS.
- Conversions to LPG need males to convince themselves of favorable LPG economics.
- Niche products (nixtamaleras, comaleras) that do not compromise LPG use and whose assembly can be finalized by males in exchange for lower prices can resonate in this segment.

# Detailed Priority Segment Profiles: Exclusive Firewood Users

## Who are the Mature income-generating women?

Doña Rosa, Cabañas, Zacapa



### Demographics

Doña Rosa is 45 years old and lives in the outskirts of the town of Cabañas in Zacapa. She is married and mother of a daughter aged 22, three sons aged 20, 18 and 17. Rosa's husband had an accident 8 years ago and cannot work, so Rosa is the main breadwinner of the household.

### Housing and appliances

Doña Rosa and her family live in a cinderblock and metal roof home. They have TV, cell phones and radio. The house belongs to a relative who emigrated to Guatemala City.

### Cooking and fuels

Doña Rosa spends about Q250/month on firewood which she buys in bulk once per month. She also collects small twigs from nearby fields to complement fuel needs and save money to restock her small business inventories. She has learned to cook with a pressure cooker over firewood by interposing a metal sheet.

## Who are the Mature income-generating women?

Doña Rosa, Cabañas, Zacapa



### Income

Doña Rosa engages in several activities to make a living. She has a small eatery that she operates during weekdays. In the afternoons, she also sells produce and cosmetics around town. Every so often, she is hired in the mornings to clean houses. She earns around Q240/week and her income is complemented by sporadic earnings from her children. In total, she spends around Q2,000/month.

She often makes purchase decisions. Recently, she decided to replace her old mattress with her own money, she bought a phone, a pressure cooker, and a plate cupboard with her own money.

### Aspirations and concerns

Doña Rosa is concerned that her children will abandon school, the economic situation and her husband's drinking habits. She aspires to grow her business and build a small house to rent.

# Mature income-generating women

## *Segment overview*



<b>Fuel Expenditures</b>	<ul style="list-style-type: none"> <li>• Purchase firewood every 30 days approximately (average =51 days; median =30 days). Purchase frequency varies from 1 day to 1 year.</li> <li>• Households spend on average Q265/month on firewood (median = Q214/month)</li> <li>• Around 64% of these women purchase and collect firewood which is the highest rate excepting the unstable-income segment.</li> </ul>
<b>Cooking habits and appliances</b>	<ul style="list-style-type: none"> <li>• 36% own a biomass stove with chimney.</li> <li>• Only 5% and 7% of the segment owns a pressure cooker and microwave ovens respectively.</li> </ul>
<b>Housing</b>	<ul style="list-style-type: none"> <li>• This segment lives in cinderblock houses (62%), but also in houses built of adobe, wood and metal sheets (20%, 12% and 7% respectively)</li> <li>• 90% have electricity and ~70% have TVs, but only 30% have running water.</li> </ul>
<b>Income Levels</b>	<ul style="list-style-type: none"> <li>• Income levels are similar to other firewood users, but lower than fuel stackers.</li> </ul>
<b>Women's empowerment</b>	<ul style="list-style-type: none"> <li>• All women in this segment work which gives them decision-making power in the household.</li> <li>• Around 55% of these women are heads of household, the highest among exclusive firewood users.</li> <li>• Because of time demands, a large fraction of this segment purchases tortillas (88%)</li> </ul>
<b>Demographics</b>	<ul style="list-style-type: none"> <li>• Mature cooks are older than 32 years old.</li> <li>• All have studied but rarely beyond middle school.</li> <li>• Household sizes are relatively large (5.5 people/household), but smaller than traditionalist women.</li> </ul>
<b>Market size</b>	<ul style="list-style-type: none"> <li>• The size of this segment is 117,000 households distributed more or less evenly between urban and rural areas.</li> <li>• The population of this segment is spread across Guatemala.</li> </ul>

## Mature income-generating women *Comparative analysis*



### How this segment compares to others

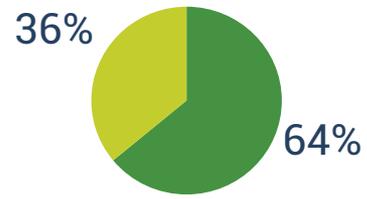
- Purchasing decisions are moderately high with respect to non-working women, reflecting the cooks' income.
- Firewood expenditures are some of the highest. Mature women tend to buy firewood more often than the young and spend more on it.
- Household income is relatively low with respect to fuel stackers but similar to other exclusive firewood segments



# Mature income-generating women

## *Cooking appliances and habits*

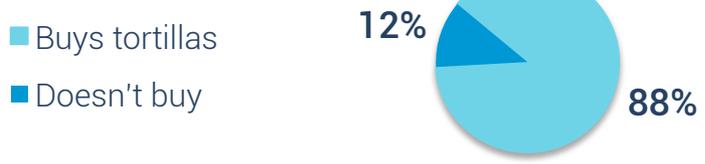
### Firewood stove with chimney penetration



- Has a dedicated room for a kitchen
- Kitchen shares space

### Cooking place

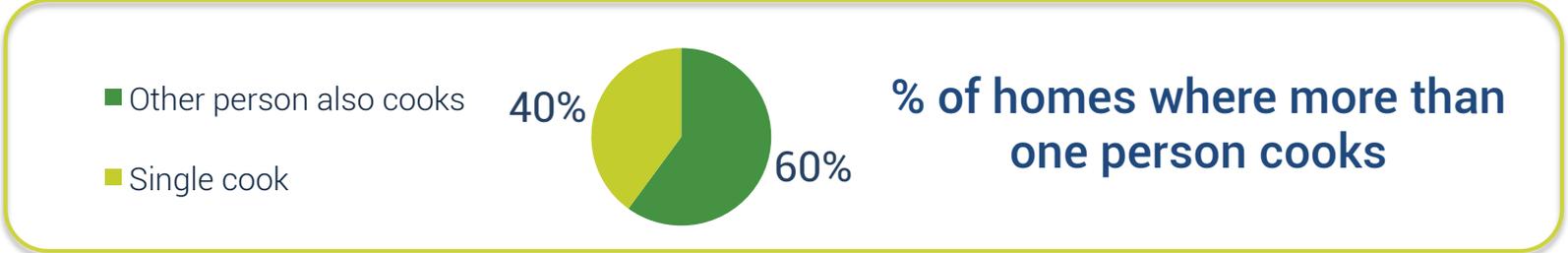
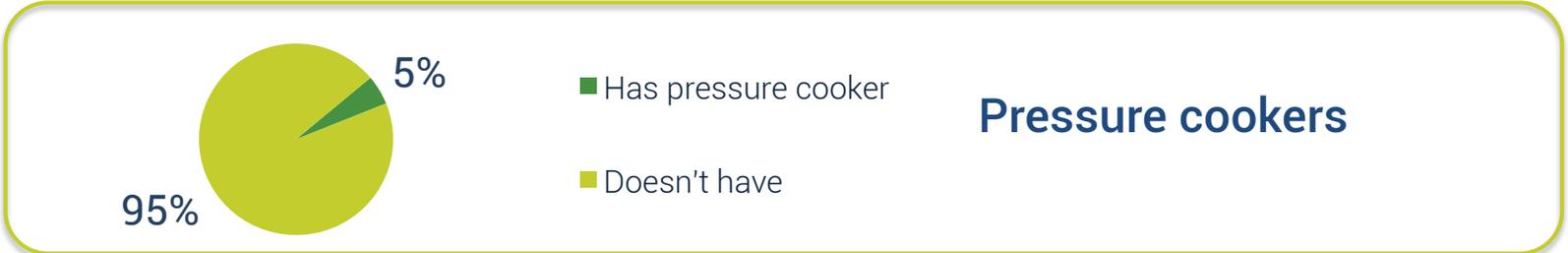
### % of people who buy tortillas





# Mature income-generating women

## *Cooking appliances and habits*

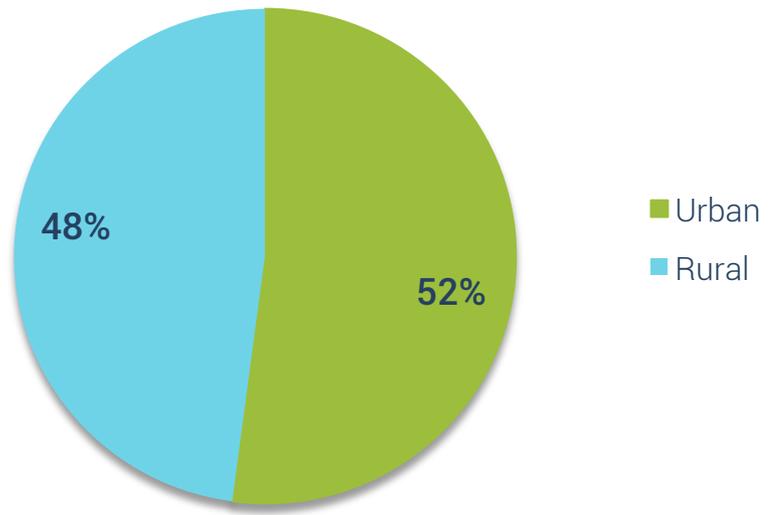


# Mature income-generating women

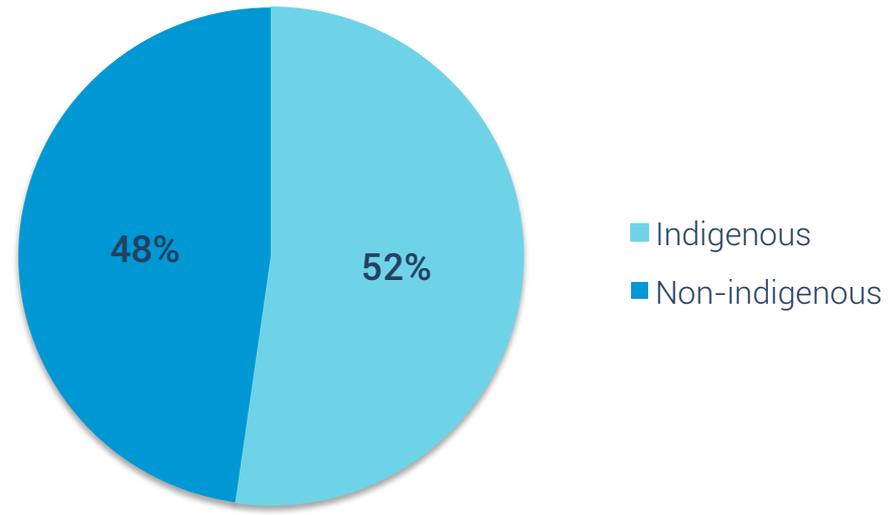
## Market size and distribution



- The total market size for this segment is **117,100 households** and an estimated 48,000 (41%) already use a stove with a chimney.



This population is evenly distributed between urban and rural areas



The population in this segment is evenly split between indigenous and non-indigenous

# Mature income-generating women

## Market size and distribution



Department	# of households	% without chimney
Guatemala	19,436	96%
Quiché	10,864	28%
Huehuetenango	10,790	25%
Suchitepequez	8,173	83%
San Marcos	8,031	37%
Totonicapán	7,157	39%
Quetzaltenango	7,134	46%
Petén	6,001	85%
Alta Verapaz	5,761	81%
Chimaltenango	5,580	52%
Solola	3,994	17%
Retalhuleu	3,796	61%
Santa Rosa	3,795	67%
Escuintla	3,621	75%
Baja Verapaz	2,516	70%
Sacatepequez	2,440	73%
Jutiapa	2,243	49%
Jalapa	2,216	75%
El Progreso	1,032	46%
Chiquimula	1,023	18%
Zacapa	974	59%
Izabal	555	67%



# Strategic considerations for mature income-generating women

- This group is well poised to switch into clean cooking technologies as women work for income.
- The segment could switch to LPG or ICS. Households in rural and indigenous areas are more likely to welcome ICS, while urban and non-indigenous areas could transition to LPG more easily.
- To smooth the transition to LPG, households could adopt the use of pressure cookers over firewood first to reduce LPG expenditure anxiety. Once using gas, households can use the fuel stacker strategies to fully transition into clean cooking.
- The segment is more likely than non-working women to purchase the technologies (as opposed to building themselves) because a larger fraction of women do not live as part of a couple.

## Who are the Young income-generating women?

Doña Isabel, San Jerónimo, Baja Verapaz



### Demographics

Doña Isabel is 26 years old and lives in the outskirts of the town of San Jerónimo in Alta Verapaz. She is married and mother of two boys aged 5 and 3 years. She lives in a house with her husband, her in-laws, and a married brother-in-law.

### Housing and appliances

The house is built with adobe and metal roof and belongs to her mother-in-law. Isabel's husband recently bought a TV on installments, but in general, they do not spend much money on durable goods to continue saving.

### Cooking and fuels

Doña Isabel cooks along with her mother-in-law and brother-in-law's wife. The entire household spends around Q350 on firewood every month, but the expenditures are split between her, the mother-in-law, and the brother-in-law's wife. She feels that having a gas stove would allow her more time to attend to her micro-business and rid her of the burden of firewood.

## Who are the young income-generating women?

Doña Isabel, San Jerónimo, Baja Verapaz



### Income

She works during the mornings selling greens in a stand of her own. Her husband is employed in a nearby agricultural field and occasionally does other labor. Their monthly income for her family is Q1,800.

### Aspirations and concerns

She aspires to be independent one day and have a house and kitchen of her own. She and her husband are currently saving to buy a property. Besides aspiring to have her own house, Isabel wants to grow her inventory and have her kids educated so they can become professionals. She is concerned about financial matters because employment is down in the community.

# Young income-generating women

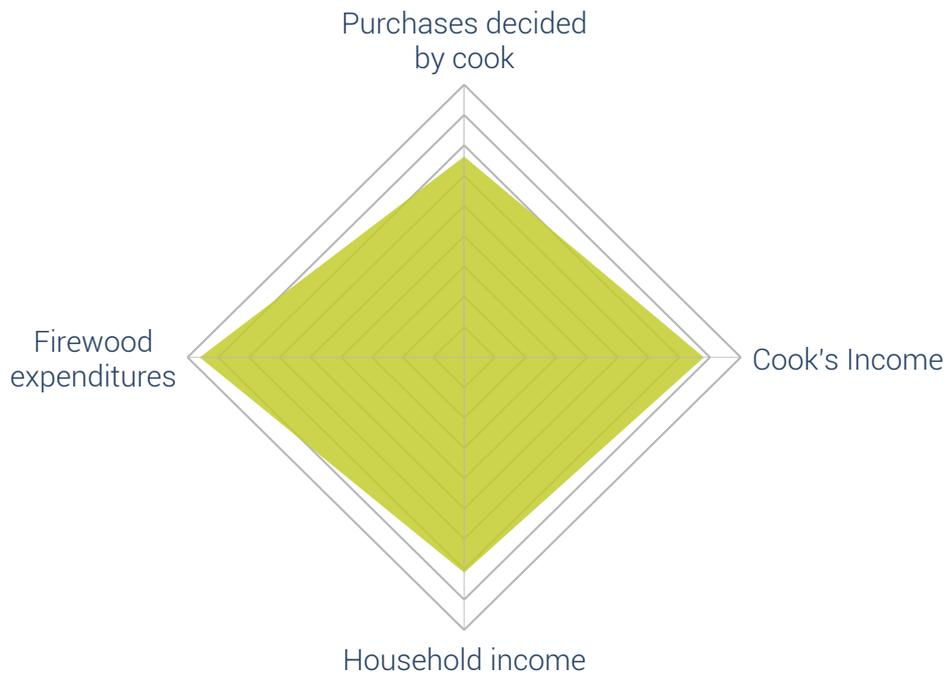
## Segment overview



<b>Fuel Expenditures</b>	<ul style="list-style-type: none"> <li>• Purchase firewood occurs at about the same rate as other segments (mean= every 49 days; median= every 30 days)</li> <li>• Households spend Q 231/month on firewood (median= Q166/month)</li> <li>• Around 55% of the households in this segment purchase <i>and</i> collect wood.</li> </ul>
<b>Cooking habits and appliances</b>	<ul style="list-style-type: none"> <li>• 41% own a biomass stove with chimney.</li> <li>• Around 12% own a pressure cooker and 10% own a microwave oven</li> <li>• Many (80%) buy tortillas at least occasionally.</li> </ul>
<b>Housing</b>	<ul style="list-style-type: none"> <li>• As with other exclusive firewood users, around 60% live in cinderblock houses and the rest in a combination of adobe, wood, and metal sheets</li> <li>• Most have electricity, 73% have TVs and a third have running water.</li> </ul>
<b>Income Levels</b>	<ul style="list-style-type: none"> <li>• Per capita income levels are slightly higher than those of other exclusive firewood segments (responding to smaller household size), but still lower than fuel stackers.</li> </ul>
<b>Women's empowerment</b>	<ul style="list-style-type: none"> <li>• All women in this segment earn an income.</li> <li>• Because they oftentimes live in the parents or in-laws' houses, there are fewer expenditures on durable goods.</li> </ul>
<b>Demographics</b>	<ul style="list-style-type: none"> <li>• This segment is younger than 32 years of age and older than 16 (mean age= 25 years)</li> <li>• Women in this segment enjoy higher levels of education than all other segments, except fuel stackers. 30% complete education beyond primary school.</li> <li>• Household size is the smallest of all segments (4.6 persons/hh).</li> </ul>
<b>Market size</b>	<ul style="list-style-type: none"> <li>• The size of this segment is 61,000 households split between urban and rural areas.</li> <li>• The highest concentration of this segment is around provincial cities.</li> </ul>

# Young income-generating women

## *Comparative analysis*



### How this segment compares to others

- This segment ranks relatively high in all dimensions.
- Higher household incomes reflect smaller household sizes and dual incomes.
- Firewood expenditures remain high as a result of more flexible budgets to spend in the kitchen, as the cook can decide on cooking expenditures.

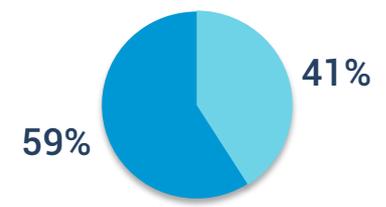


# Young income-generating women

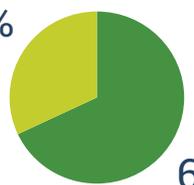
## *Cooking appliances and habits*

### Firewood stove with chimney penetration

- Has chimney stove
- Doesn't have



32%



68%

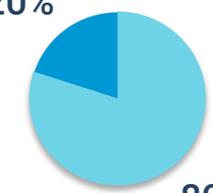
- Has a dedicated room for a kitchen
- Kitchen shares space

### Cooking place

### % of people who buy tortillas

- Buys tortillas
- Doesn't buy

20%

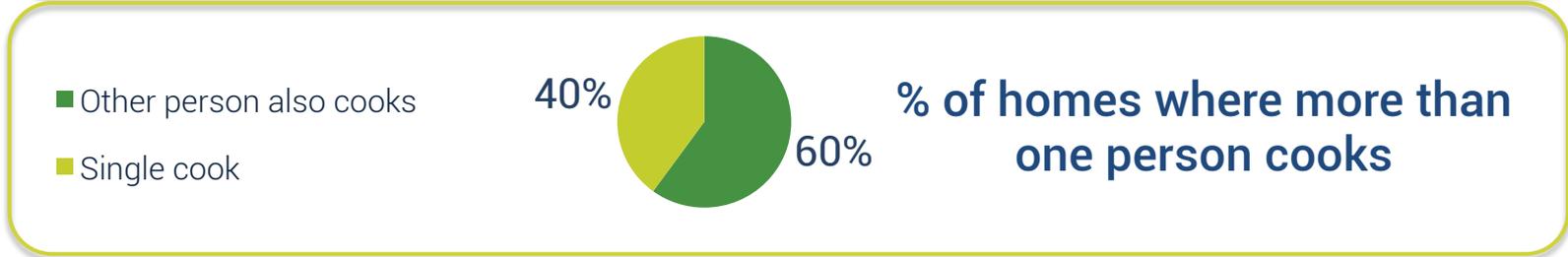
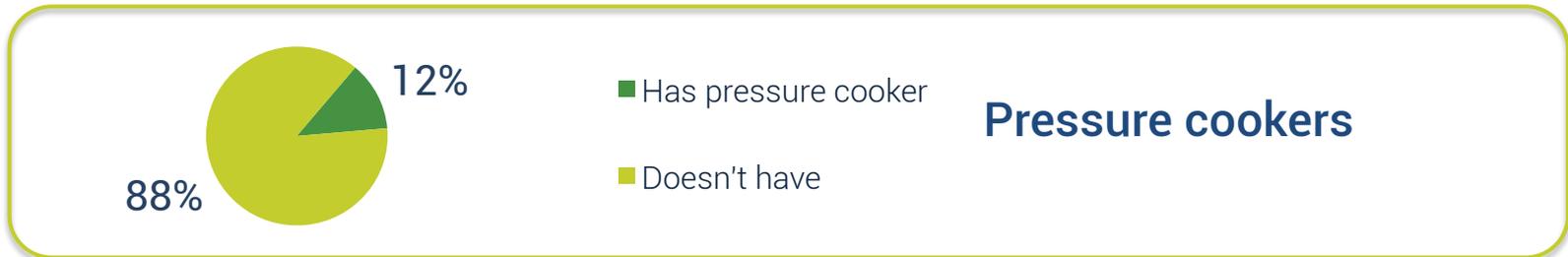


80%



# Young income-generating women

## *Cooking appliances and habits*

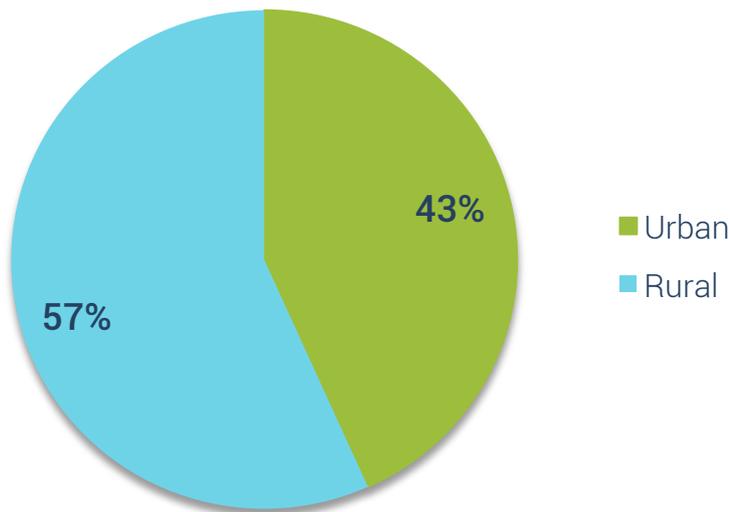


# Young income-generating women

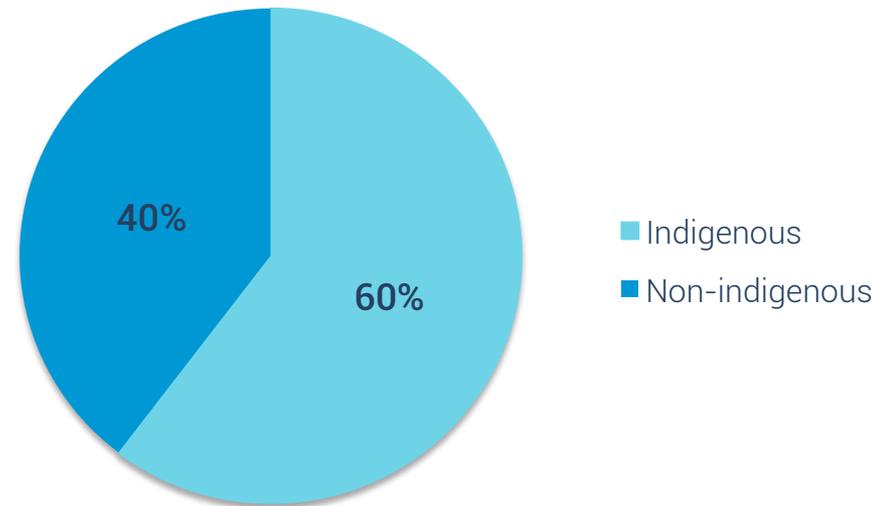
## Market size and distribution



- The total market size for this segment is **60,800 households** and an estimated 35,900 (59%) lack firewood stoves with a chimney.



This segment is split in urban and rural areas



The population is also split between indigenous and non-indigenous

# Young income-generating women

## *Market size and distribution*



Department	# of households	% without chimney
Huehuetenango	7,553	31%
Quiche	6,581	47%
Guatemala	5,054	100%
Chimaltenango	4,879	73%
Totonicapan	4,497	32%
Solola	4,020	48%
Quetzaltenango	3,977	14%
San Marcos	3,687	25%
Suchitepequez	3,253	88%
Alta Verapaz	2,907	88%
Peten	2,370	94%
Baja Verapaz	1,869	85%
Sacatepequez	1,857	83%
Retalhuleu	1,847	70%
Escuintla	1,825	100%
Jutiapa	1,670	63%
Santa Rosa	906	47%
Izabal	734	100%
Chiquimula	584	75%
El Progreso	344	70%
Jalapa	299	36%
Zacapa	99	100%



# Strategic considerations for young income-generating women

- This is a segment with a high opportunity to transition to LPG, as women are more educated, aspire higher living standards, and have greater decision-making power.
- The focus of this segment is on a “right start”: having a clean kitchen upon marriage. Male awareness is crucial to open a negotiation ground for women to demand and agree on clean cooking before marriage. Clean cooking may be a combination of LPG and niche wood products (e.g. improved griddles and “nixtamaleras”).
- For women who are already married, incremental transitions to clean cooking may be more likely to succeed because households are still building basic assets.



## STRATEGIC FRAMEWORK: MARKET RESEARCH IN ACTION

## Key areas of intervention opportunity



### Rationale

### Barriers addressed

#### Clean fuels

Increasing predictability of expenditures

Budget-constrained cooks feel anxious over not knowing how much will be spent on LPG and electricity and hence do not use them. Volatile LPG prices mean cooks cannot forecast future expenditures.

- Management of financial risk through firewood
- Liquidity

Demonstrating usability of LPG

Cooks need to learn how to cook traditional meals on clean fuel stoves to optimize fuel expenditures, overcome perceptions of LPG explosion/toxicity risk, and taste.

- Product perceptions and attributions

Addressing liquidity constraints

Having the money to buy a full tank of LPG is something many cooks feel unable to do and less so on a consistent basis.

- Liquidity

#### Improved wood stoves

Decentralization of ICS production and distribution

1) Manufacturers face high distribution costs in the absence of large and concentrated sales. 2) ICS face competition from plancha stoves which are locally made when cash is available. Despite relatively high prices, plancha stoves have an organic massive penetration. 3) Locally-built stoves offer possibility to foster mutualistic relationships by employing valuable connections in the communities.

- High penetration of plancha stoves
- Price and present bias
- Gender decision-making imbalance
- Supply-related barriers

Consumer awareness

1) Few potential customers know where to purchase ICS. 2) People are confused about which stoves are energy-efficient. 3) Potential to drive sales though awareness of open fire impacts.

- Product perceptions and attributions
- Fact that few know of ICS

Donor coordination

Many communities have expectation that ICS should be free due to distribution of highly-subsidized ICS, hindering market prospects.

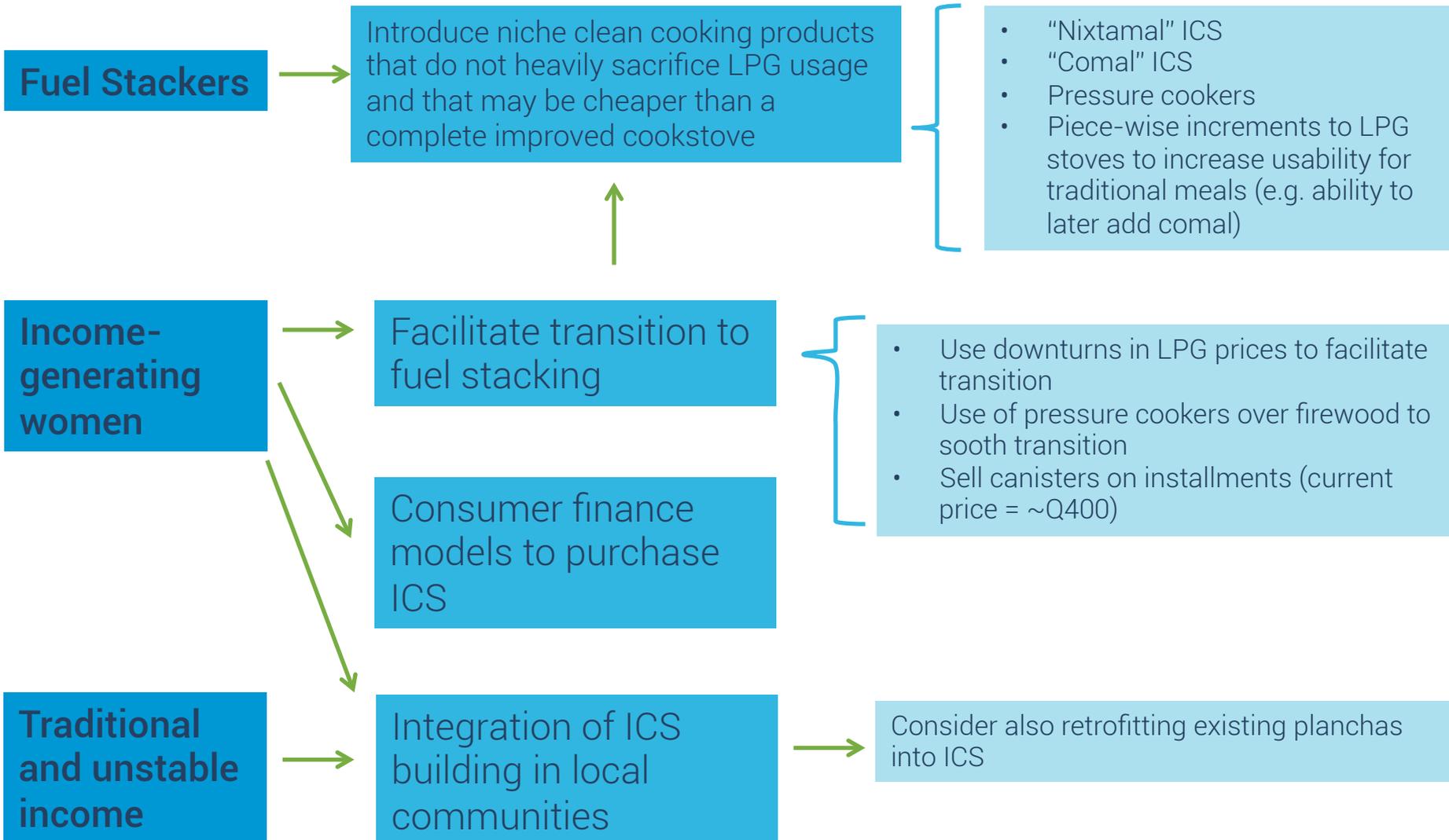
- Expectation of highly-subsidized ICS

# Examples of specific intervention opportunities



Clean fuels	Increasing predictability of expenditures	<ol style="list-style-type: none"> <li>1) Offer cooks instruments to measure how much LPG is in canisters;</li> <li>2) At the policy level, buffer or subsidize LPG prices to reduce volatility;</li> <li>3) Improve canister quality to reduce leaks &amp; ensure tanks are fully filled.</li> </ol>
	Demonstrating usability of LPG	<ol style="list-style-type: none"> <li>1) Improve quality and look of tanks to sooth danger fears;</li> <li>2) Establish replicable training modules on tortilla and bean cooking on LPG;</li> <li>3) Offer male partners comparisons of firewood vs. LPG cuisine.</li> </ol>
	Addressing liquidity constraints	<ol style="list-style-type: none"> <li>1) Offer possibility to partially refill canisters or smaller canisters;</li> <li>2) Facilitate transition to larger canisters that last for entire paycheck cycles (e.g. from 25 lbs to 35 lbs).</li> </ol>
Improved wood stoves	Decentralization of ICS distribution and marketing	<ol style="list-style-type: none"> <li>1) Shift revenue models away from products to payments for performance (e.g. payments for adopted stoves) to decentralize production and sales; mobilize donors in this direction.</li> <li>2) Offer community-based training to build ICS and couple with ICS awareness campaign.</li> <li>3) Offer incentive-based payments to construction workers for building ICS.</li> <li>4) Potential revenue models may include selling tools, molds, other instruments, and training to build ICS.</li> </ol>
	Consumer awareness	<ol style="list-style-type: none"> <li>1) Communications campaign to create awareness of clean cooking, present the products, and where to find them.</li> <li>2) Certification of ICS and certification awareness.</li> </ol>
	Donor coordination	Delimit areas where ICS can be donated and where they shouldn't.

## Other areas of intervention opportunity: transitional models



## Strategy summary: Fuel stackers



Strategy	More relevant for	Stakeholders involved
<b>Short-term strategies</b> (could be deployed with slight adjustments to current systems)		
Introduce niche clean cooking products that do not sacrifice LPG usage and that are cheaper than a complete improved cookstove (pressure cookers, improved comaleras and nixtamaleras)	All fuel stackers	Stove manufacturers (to create and commercialize products); GACC as facilitator
Lowering price of niche products by having males finish products to reduce manufacture and transportation costs.	Lower-income fuel stackers	Stove manufacturers
Test product sales performance (for applicable products) in retail stores with consumer financing	All fuel stackers	GACC as facilitator
<b>Mid-term strategies</b> (require significant adjustments to current systems, but can be tested and implemented with proper funding and capacities to see results in mid-term)		
Get cooks in control of expenditures (e.g. by showing how LPG can be measured in canisters)	All fuel stackers	GACC could facilitate testing and findings dissemination
Demonstrate to the wider population traditional cooking on LPG	All fuel stackers	GACC could facilitate testing and dissemination
Create products that can adapt to piece-wise increments in capabilities (e.g. ability to add griddle to LPG stoves later in time to cook tortillas).	All fuel stackers	LPG stove manufacturers
Offer partial refills and small LPG canisters	Lower-income fuel stackers; and exclusive firewood users	LPG retailers
Facilitate transition to larger tanks that last for entire paycheck cycles	Higher-income fuel stackers	LPG retailers; GACC as facilitator

## Strategy summary: Exclusive firewood users



Strategy	More relevant for	Stakeholders involved
<b>Short-term strategies</b>		
Offer community-based training to build ICS and couple with ICS awareness campaign	Traditional women, but applicable to all	Stove manufacturers, new market entrants, GACC as facilitator
Incorporate new revenue models among ICS manufacturers like selling specialized tools, molds, other instruments, and training to build ICS (instead of basic plancha).	Traditional women	Stove manufacturers
Work with MFIs on clean cooking consumer awareness (see Consumer Financing Section)	Income-generating women	MFIs, GACC as facilitator
Work with MFIs on non-compete terms and strategies with in-house financing (see Consumer Financing Section)	Income-generating women	MFIs, stove manufacturers, GACC as facilitator
Delimit areas where ICS can be donated and where they shouldn't; raise awareness among entities that currently offer in-kind donations.	All firewood users	Donors, GACC as facilitator, strategic partners (those wanting to sell products to BoP markets in Guatemala), donantes
<b>Mid-term strategies</b>		
Shift revenue models away from products and to payments for performance; mobilize donors in this direction	Traditional women, but applicable to all	GACC as facilitator, donors
Offer incentive-based payments to construction workers for building ICS	Traditional women, but applicable to all	Enterprises with CSR focus, bilateral, and multilateral organizations (e.g. World Bank, IDB); carbon credit managing entities; stove manufacturers, GACC as facilitator
Certification of stoves as "ICS" and certification awareness.	All firewood users	GACC, stove manufacturers

# Strategy summary: All segments



Strategy (summarized)	Stakeholders involved
<b>Short-term strategies</b>	
Work with Consumer Financing Partners (CFPs) to build awareness on clean cooking	MFIs, employers (private companies), depots, GACC as facilitator
Work with employers to offer clean cooking financing to employees	Employers (private companies), GACC as business development partner
Work with in-kind donors to raise working capital for ICS manufacturers to engage in in-house financing	Donors, stove manufacturers, GACC as facilitator
<b>Mid-term strategies</b>	
Communications campaign to raise awareness on problem and products	GACC as facilitator, donors, media, stove manufacturers (to coordinate distribution capacity), Government of Guatemala.
<b>Long-term strategies</b>	
Stabilize or buffer LPG price fluctuations	Government of Guatemala, LPG distributors and retailers, GACC as facilitator, multilateral institutions.
Ensure quality of LPG canisters	Government of Guatemala, LPG distributors and retailers, GACC as facilitator, financiers (private or public)



# Appendix A

## Description of cooking products in the market

## Product categories available in the market



The Guatemalan market is characterized by a variety of wood cooking products and high penetration of wood stoves with chimney; LPG stoves are available in a variety of models.

### Wood-burning devices

#### Open fires

- Pollo or polletón (open fire at waist height)
- 3-stone fires



#### Smoke-reducing devices

##### Plancha stoves

- Stoves with griddles and chimneys. Locally built, come in different sizes, shapes and finishing.
- High penetration in many areas



##### Improved cookstoves

- Have improved combustion chambers and in most cases chimneys.
- Generally distributed by NGOs at highly subsidized prices.

#### LPG stoves



#### Other appliances

Pressure cookers

Microwaves



## Close up to current firewood systems: Open fires



62% of our surveyed population still cooks over open fires

### The "Poyo" or "Polletón" (in 36% of surveyed households)

- Most commonly used system among those cooking with open fires
- Structure to raise the fire to waist height
- Usually made from locally available materials: combination of clay and ashes which is constantly repaired, cinderblock (blocks start to "crumble" with heat).
- Presence of pollos or polletones is not affected by household demographics or socio-economic levels
- Unused metal barrels also serve as pollos



### Three-stone fires (in 26% of surveyed households)

- Three-stone fires are also used, but less often and are usually associated with older times "*grandparents would cook in three stone fires.*"
- The presence of 3-stone fires is positively correlated with lower income.



### Other products

- Plancha stoves without a chimney (present in 8% of survey sample)
- Charcoal braziers (present in 2% of the survey sample)

## Close up to firewood systems: Plancha stoves



**Description:** Large stoves with combustion chambers topped by a griddle placed at waist height. Most have a chimney and are build in-situ; portable models are widely available in hardware stores. Aesthetics are often improved with ceramic-tile covering. Sizes and design specifics vary but are adapted to widely-available griddles.

**Perceived advantages:** Cooks feel they can adapt these stoves to their needs. The large combustion chambers enables keeping the fire for extended periods and having warm food whenever (and especially for when males arrive from work); in situ stoves are built by construction workers (often a family member) with locally-available materials.

**Performance:** Versions of these stoves reduce air-pollutant emissions as compared to traditional 3-stone fires.<sup>1</sup> Cooks perceive low levels of smoke, as most vents through the chimney. However, studies<sup>2</sup> conducted over these stoves do not show a reduction in firewood consumption. We confirmed the pattern: households with plancha stoves have the same fuel usage as those who do not have one.

**Market penetration:** overall market penetration among firewood-using households in Guatemala is 38.5% (46.6% among our target population), according to our quantitative analysis, adoption is positively associated with income, age of the head of household, and household size.



The median price for these stoves is Q525, but can be as high as Q3,000.



Plancha stove with water heater attached (replaced LPG stove)

<sup>1</sup> McCracken, John P., and Kirk R. Smith. "Emissions and efficiency of improved woodburning cookstoves in Highland Guatemala." *Environment International* 24, no. 7 (1998): 739-747.

<sup>2</sup> Ibid; Granderson, Jessica, Jaspal S. Sandhu, Domitila Vasquez, Expedita Ramirez, and Kirk R. Smith. "Fuel use and design analysis of improved woodburning cookstoves in the Guatemalan Highlands." *biomass and bioenergy* 33, no. 2 (2009): 306-315.

# Close up to improved wood cookstoves (ICS)



3% of our sample reported using an ICS. Most dissemination programs have focused on rural areas and among the poor.

**Description:** Aspect is generally similar to the plancha stoves, but have combustion chambers that enable efficient burning of biomass and hence can save fuel. Most models have a chimney and metal griddles to bake tortillas on top.

**Perceived advantages:** cooks that use them properly report satisfaction with fuel savings and lessened smoke exposure.

**Performance:** Although lab-based thermal efficiency results of several models are available and show improvements with respect to open fires, publicly available reports on the actual performance of these stoves in the field are limited. One study shows a 39% fuel consumption reduction with respect to traditional open fires when the combustion chamber of a plancha stove was modified to increase its efficiency.<sup>1</sup>

**Market penetration:** around 8,000 ICS were reported as distributed in 2013 in Guatemala, mostly to poor populations in rural areas.<sup>2</sup> Our survey found that 3% of the respondents owned an improved cookstove. ICS have traditionally been disseminated through donation programs.



<sup>1</sup>Boy, Erick, Nigel Bruce, Kirk R. Smith, and Ruben Hernandez. "Fuel efficiency of an improved wood-burning stove in rural Guatemala: implications for health, environment and development." *Energy for Sustainable Development* 4, no. 2 (2000): 23-31.

<sup>2</sup> Global Alliance for Clean Cookstoves. "2013 Results Report." Washington, DC 2014.

# LPG stoves



LPG stoves are widely available for purchase in markets, depots and other stores. Close to 48% of Guatemalan households use LPG for some of their cooking, with approximately 27% using it exclusively, and 21% using it along with firewood.

- Prices range from as little as Q150 to more than Q3,500
- 89% of our sample of fuel stackers reported having 4 or more LPG burners and half had an LPG oven integrated into the stove.
- The majority of the sample (93%) bought LPG in 25 lbs canisters. 20 and 35 lbs canisters are also sold in the market and delivered directly to homes.

Note: In our survey sample we interviewed 100 households that cook with firewood AND LPG (See annex 1 for a note on the sample). 3% of exclusive firewood users reported having an LPG stove that they do not use.





# Appendix B

## Detailed descriptions of secondary and deprioritized segments

## Mature traditionalist women



### Who are the Mature traditionalist women?

Doña Isidra, Huehuetenango, Huehuetenango



#### Demographics

Doña Isidra, aged 39, lives in the outskirts of the town of Huehuetenango. She is a mother of 4: one daughter aged 23; another daughter aged 21, a son aged 13 and another son aged 8.

#### Housing and appliances

The family lives in a rented house which they share with her eldest daughter and her husband. The house has 2 rooms and is made of cinderblock. The floor is partially covered with concrete. The couple has basic cellphones, a TV, an LPG stove which they don't use, and a plancha stove.

#### Cooking and fuels

Isidra spends about Q 250/month buying firewood which she purchases once per month. She thinks she could save a little money by switching into LPG, but finds it hard to make the case when she does not work because her husband likes the warmth of firewood and thinks it is cheaper; she also has no time pressures to save time cooking and tending the fire.

## Mature traditionalist women



### Who are the mature traditionalist women?

Doña Isidra, Huehuetenango, Huehuetenango



#### Income

Her husband, aged 45, is virtually the sole income earner in the household, with the exception of his son-in-law who only contributes to his own family. He works in a printing house earning Q300/week. Doña Isidra occasionally works cleaning a house where she earns Q15 in 2-3 hours of work.

Doña Isidra rarely makes purchases of durable goods. Her husband, however, recently bought a stereo and changed his cell phone a year ago.

#### Aspirations and concerns

Her main aspiration is that her children, especially the two youngest, study and be professionals, but she is concerned about the employment situation in the area for them.

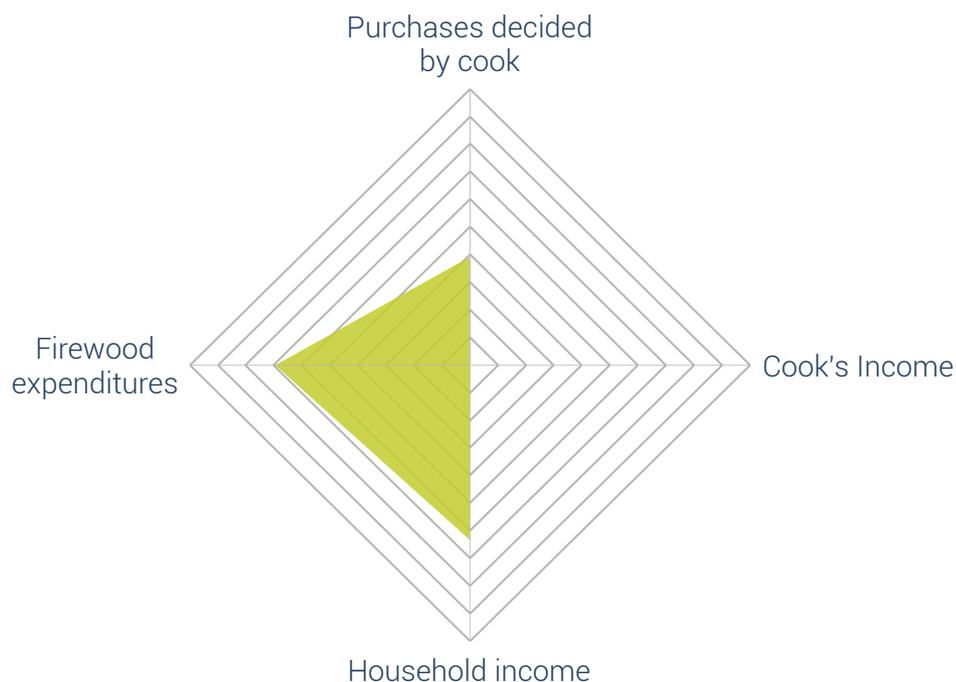
# Mature traditionalist women

## *Segment overview*



<p><b>Fuel Expenditures</b></p>	<ul style="list-style-type: none"> <li>• Firewood purchases occur less frequently than the mature income-generating (mean= every 74 days; median = every 30 days), possibly because lower time demands allow them to manage larger quantities of wood.</li> <li>• As a consequence of the low purchasing frequency and the rural location, households spend less on fuel than all other segments (mean= Q186/month on firewood; median = Q141/month).</li> <li>• Around 55% of the cooks in this segment purchase and collect wood.</li> </ul>
<p><b>Cooking habits and appliances</b></p>	<ul style="list-style-type: none"> <li>• 82% own a biomass stove with chimney .</li> <li>• A relatively large proportion own pressure cookers and microwave ovens (16% and 11% respectively).</li> <li>• A large proportion also buys tortillas which is reflected in lower firewood expenditures.</li> </ul>
<p><b>Housing</b></p>	<ul style="list-style-type: none"> <li>• 61% live in cinderblock houses and the rest in a combination of adobe, wood, and metal sheets.</li> <li>• Most have electricity, 55% have TVs, but only 20% have running water.</li> </ul>
<p><b>Income Levels</b></p>	<ul style="list-style-type: none"> <li>• Income levels are similar to other exclusive firewood users, but lower than fuel-stackers.</li> </ul>
<p><b>Women's empowerment</b></p>	<ul style="list-style-type: none"> <li>• Women in this segment engage occasionally in paid work</li> <li>• This segment makes fewer decisions regarding durable goods purchases than the income-generating.</li> </ul>
<p><b>Demographics</b></p>	<ul style="list-style-type: none"> <li>• This segment is comprised of women 32 years old and above.</li> <li>• Only 13% completed education beyond primary school (the lowest of all segments).</li> <li>• Household sizes are the largest of all segments (close to 6 people/household).</li> </ul>
<p><b>Market size</b></p>	<ul style="list-style-type: none"> <li>• The size of this segment is 144,000 households, predominantly in rural areas and is more or less evenly split between indigenous and non-indigenous.</li> <li>• The highest concentration of this segment is in the Western Highlands.</li> </ul>

## Mature traditionalist women *Comparative analysis*



### How this segment compares to others

- Because cooks do not work and incomes are low, the purchasing decision power of women is lower than the segments previously presented.
- Firewood expenditures are moderately low reflecting tortilla purchases, rural location, and low budgets closely monitored by males.
- Household per capita incomes are relatively low but comparable to other exclusive firewood segments.

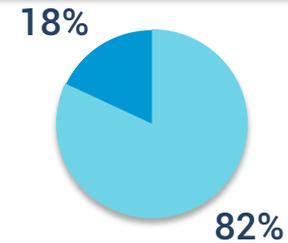
# Mature traditionalist women

## *Cooking appliances and habits*

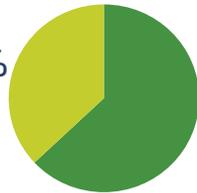


### Firewood stove with chimney penetration

- Has chimney stove
- Doesn't have



37%



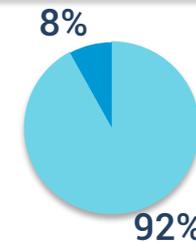
63%

- Has a dedicated room for a kitchen
- Kitchen shares space

### Cooking place

### % of people who buy tortillas

- Buys tortillas
- Doesn't buy

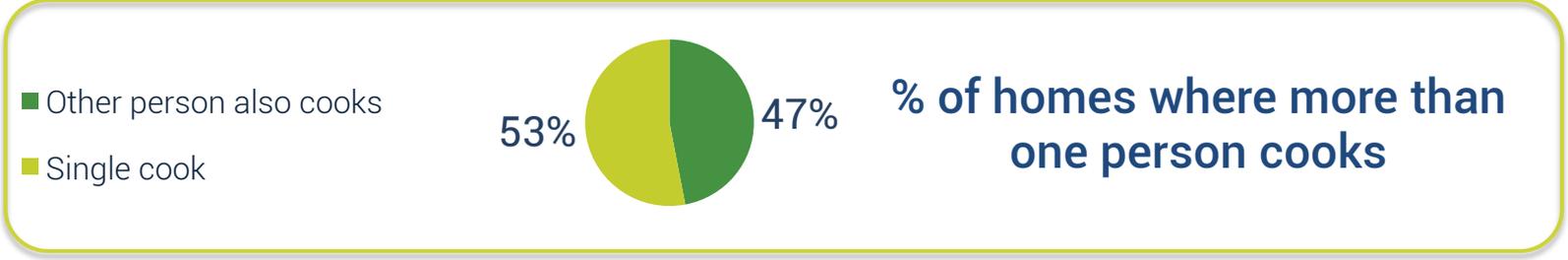
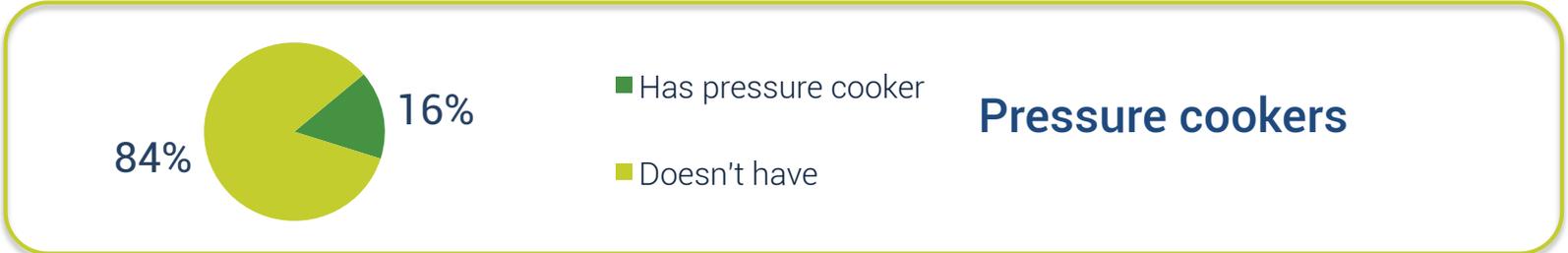


92%



# Mature traditionalist women

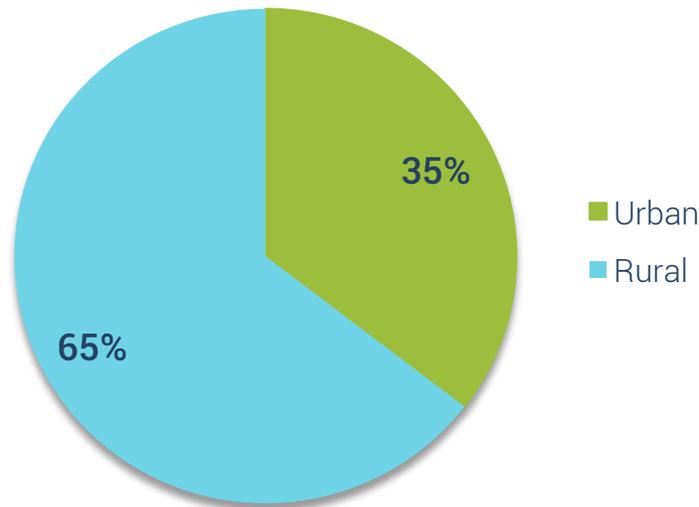
## *Cooking appliances and habits*



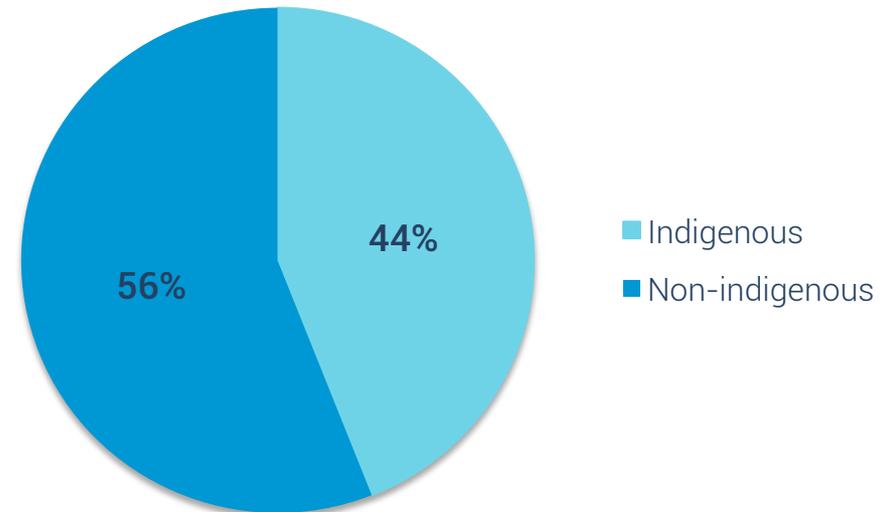
## Mature traditionalist women

### *Market size and distribution*

- The total market size for this segment is **176,600 households** and an estimated 31,800 (18%) lack firewood stoves with a chimney.



This segment is predominantly rural



The population is split between indigenous and non-indigenous

# Mature traditionalist women

## *Market size and distribution*



Department	# of households	% without chimney
San Marcos	32,861	11%
Huehuetenango	32,038	10%
Quetzaltenango	17,907	12%
Quiche	15,880	13%
Totonicapan	12,581	10%
Solola	10,422	9%
Chimaltenango	7,733	17%
Guatemala	5,744	62%
Escuintla	5,706	40%
Jutiapa	5,278	17%
Retalhuleu	4,920	40%
Santa Rosa	4,858	22%
Peten	3,679	50%
Suchitepequez	3,270	37%
Baja Verapaz	2,862	27%
Jalapa	2,217	36%
Alta Verapaz	2,205	58%
Sacatepequez	1,892	34%
Zacapa	1,613	37%
Izabal	1,382	64%
El Progreso	1,333	19%
Chiquimula	190	8%



## Strategic considerations for Mature traditionalist women

- Because women do not work for income and have large families, this segment is better targeted with wood appliances that are still considered cheaper than LPG.
- This segment has a massive penetration of plancha stoves. An opportunity to transition to ICS opens when these stoves reach the end of their useful lives or are old enough to consider refurbishing. Plancha stove combustion chambers could also be modified to improve efficiency.
- Male engagement will be crucial to facilitate the transition, as the large majority of women do not work for income. The high plancha stove penetration indicates that capacities to build stoves are strong and ICS have a better chance of succeeding if these capacities can be integrated.

## Young traditionalist women



### Who are the young traditionalist women?

Doña Laura, Quetzaltenango, Quetzaltenango

#### Demographics

Doña Laura is 22 and lives in the outskirts of Quetzaltenango (second largest city in Guatemala). Despite her age, she already has 3 children (aged 7, 5, and 3) and is expecting another.

#### Housing and appliances

She lives in the same compound as her in-laws and two brothers in law with their respective families.

Laura makes almost no durable goods purchases. Laura's husband recently bought a TV on installments and has a well-equipped smartphone. In contrast, she owns a basic cell phone which she bought for Q100 in installments.

#### Cooking and fuels

Her husband learned to build plancha stoves and gave one to her wife so that she could exclusively cook for him and not have to fight with her mother over food and firewood expenditures. Firewood is bought weekly usually at Q60 and early in the mornings from a truck. Doña Laura uses trash to light the fire and occasionally collects cartons from the street and wood from construction sites.



## Young traditionalist women



### Who are the Young traditionalist women?

Doña Laura, Quetzaltenango, Quetzaltenango



#### Income

Her husband is the sole income source for the family. He works as a mason, earning in total around Q1600/month. They share their house with her mother in law and two married brothers-in-law. However, they have managed to each have a separate cookstove.

#### Aspirations and concerns

Her main aspirations are focused on her children's well-being and education, so they can reach higher than their parents did in a more competitive world.

She is also concerned about finances because her husband recently had an accident and could not work for two weeks.

## Young traditionalist women *Segment overview*



<b>Fuel Expenditures</b>	<ul style="list-style-type: none"> <li>• Firewood expenditures are very similar to the young income-generating women (mean= every 48 days; median= every 30 days)</li> <li>• Households spend Q 223/month on firewood (median= Q169/month)</li> <li>• 58% of households in this segment purchase <i>and</i> collect wood</li> </ul>
<b>Cooking habits and appliances</b>	<ul style="list-style-type: none"> <li>• 61% own a biomass stove with chimney.</li> <li>• Around 11% own a pressure cooker, but only 4% own a microwave oven</li> <li>• Many (80%) buy tortillas at least occasionally.</li> </ul>
<b>Housing</b>	<ul style="list-style-type: none"> <li>• Housing conditions are very similar to other exclusive firewood users (60% cinderblock and the rest a combination of adobe, metal sheets and wood).</li> <li>• Almost all have access to electricity, 80% have a TV, but only 22% have running water.</li> </ul>
<b>Income Levels</b>	<ul style="list-style-type: none"> <li>• Per capita income levels are similar to other exclusive firewood users, except for the young income-generating who earn more per capita.</li> </ul>
<b>Women's empowerment</b>	<ul style="list-style-type: none"> <li>• Women in this segment do not work. As such, their purchase decision making capacity is mostly limited to non-durable goods.</li> <li>• Women in this segment have more children on average than the young income-generating women .</li> </ul>
<b>Demographics</b>	<ul style="list-style-type: none"> <li>• This segment is younger than 32 years of age and older than 16 (mean age= 23 years)</li> <li>• Women in this segment enjoy relatively high levels of education, coming after the young income-generating women and fuel stackers. 29% complete education beyond primary school.</li> <li>• Despite the young age, household sizes are already large (5.6 people/household)</li> </ul>
<b>Market size</b>	<ul style="list-style-type: none"> <li>• The size of this segment is 190,000 households, split between urban and rural areas, but predominantly rural.</li> <li>• The segment is spread throughout the country.</li> </ul>

# Young traditionalist women

## *Comparative analysis*



### How this segment compares to others

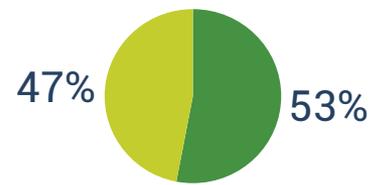
- Decision-making capacity is more limited than their income-generating counterparts.
- Firewood expenditures continue to be relatively high, despite lower-frequency purchases reflecting high firewood use.



# Young traditionalist women

## *Cooking appliances and habits*

### Firewood stove with chimney penetration



■ Has a dedicated room for a kitchen  
■ Kitchen shares space

### Cooking place

### % of people who buy tortillas

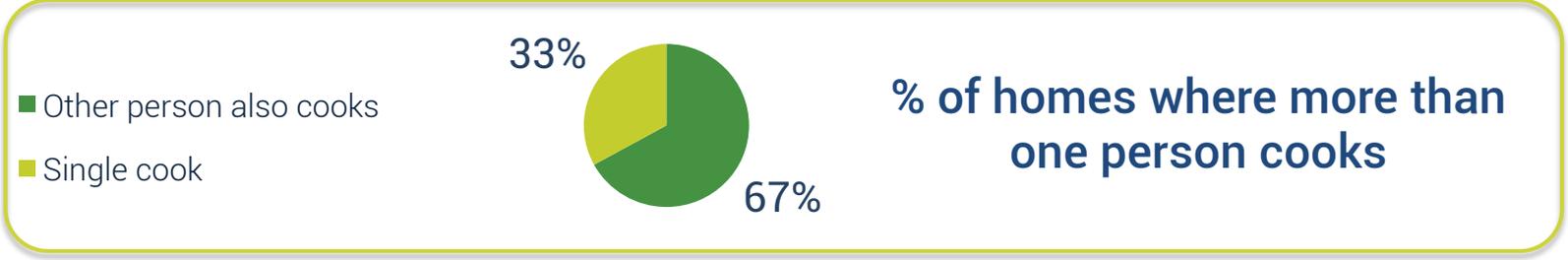
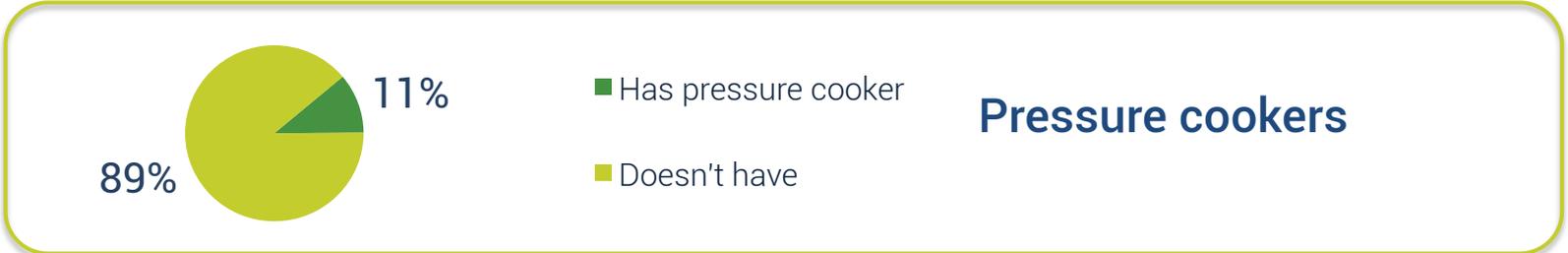


■ Buys tortillas  
■ Doesn't buy



# Young traditionalist women

## *Cooking appliances and habits*

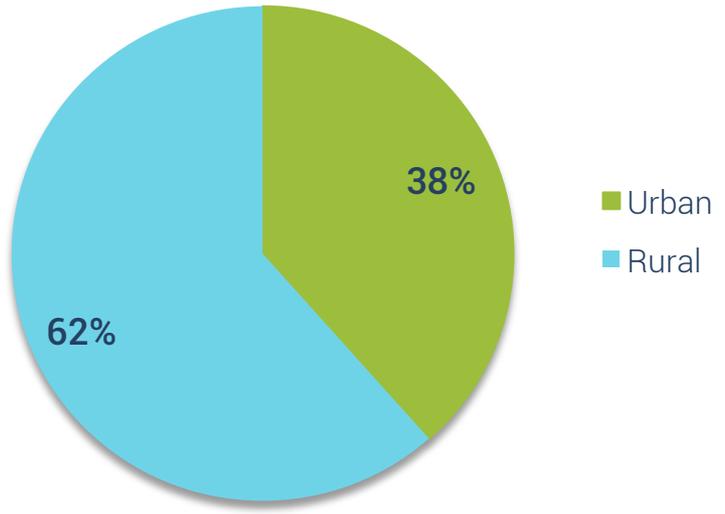




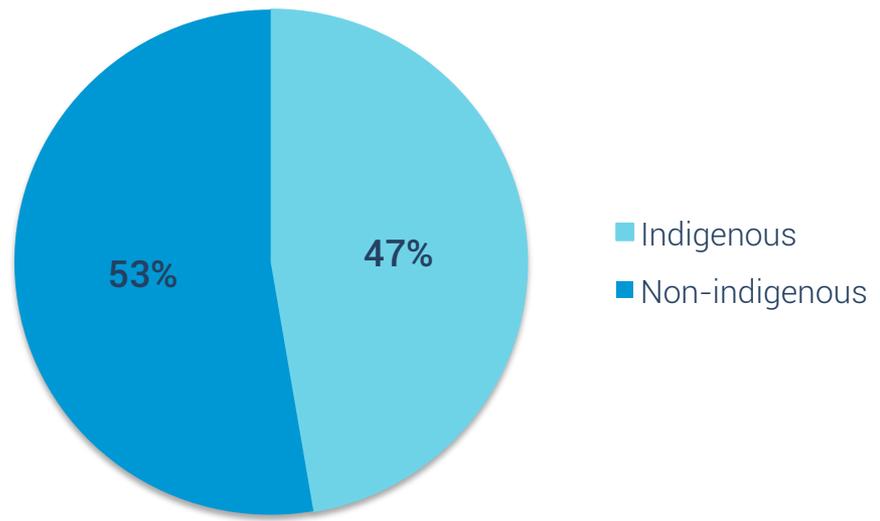
# Young traditionalist women

## *Market size and distribution*

- The total market size for this segment is **190,600 households** and an estimated 74,300 (39%) lack a firewood stove with a chimney.



This segment is predominantly rural



The population is more or less evenly split between indigenous and non-indigenous

# Young traditionalist women

## *Market size and distribution*



Department	# of households	% without chimney
Huehuetenango	31,555	14%
San Marcos	22,119	25%
Quetzaltenango	18,216	24%
Quiche	14,411	20%
Solola	11,210	24%
Alta Verapaz	10,841	88%
Escuintla	10,753	61%
Chimaltenango	10,267	51%
Guatemala	9,792	59%
Totonicapan	9,179	17%
Suchitepequez	6,324	85%
Peten	6,246	49%
Santa Rosa	6,093	59%
Retalhuleu	5,615	61%
Jutiapa	3,560	46%
Jalapa	3,402	44%
Baja Verapaz	3,176	63%
Sacatepequez	2,752	61%
Chiquimula	1,918	46%
Izabal	1,163	87%
El Progreso	1,022	49%
Zacapa	1005	67%



# Strategic considerations for young traditionalist women

- The introduction of clean cooking necessitates male engagement. Despite the relatively young ages, many young traditionalist women already own a plancha stove, often built by their husbands.
- Transition to clean fuels will be harder than among the income-generating as women in this segment do not work and penetration of plancha stoves is high.
- The integration of local workforce to promote and build ICS may result in increased penetration, as plancha stoves are already being built in the communities.
- Niche products may resonate among this segment provided they are cheap enough and fuel savings can be proven to males.
- Partial transitions to LPG can be negotiated with males if proven to be cheaper, especially in urban non-indigenous areas.

# Low and unstable income households

## Who are the unstable income households?

Doña Crescencia, Alotenango, Sacatepequez



### Demographics

Doña Crescencia is 33 and lives in the town of Alotenango, between the coastal plains and the highlands.

### Housing and appliances

She and her family live in a makeshift house made of a combination of wood, metal sheets and adobe. She is a mother of 4 and a widow.

Doña Crescencia rarely buys any durable goods. She owns a basic cell phone which is generally without credit. She feels a full time job would help her raise her quality of life, but she is occupied making a living for the next day and attending household chores.

### Cooking and fuels

Doña Crescencia sometimes gets food from her sister and neighbors when she cannot afford to buy. She cooks over a three-stone fire and a makeshift pollo.

She spends about Q300/month on fuel which she purchases almost on a daily basis.

# Low and unstable income households



## Who are the unstable income households?

Doña Crescencia, Alotenango, Sacatepequez



### Income

She makes a living by selling textiles and occasional work cleaning houses and harvesting crops in season. Her children oftentimes help with the tamales sales.

### Aspirations and concerns

Her main concerns include securing the next day's meal and the consequences of falling ill and having to leave her children alone. She aspires to get a more stable job and that her kids grow up so she does not have to take care of them.



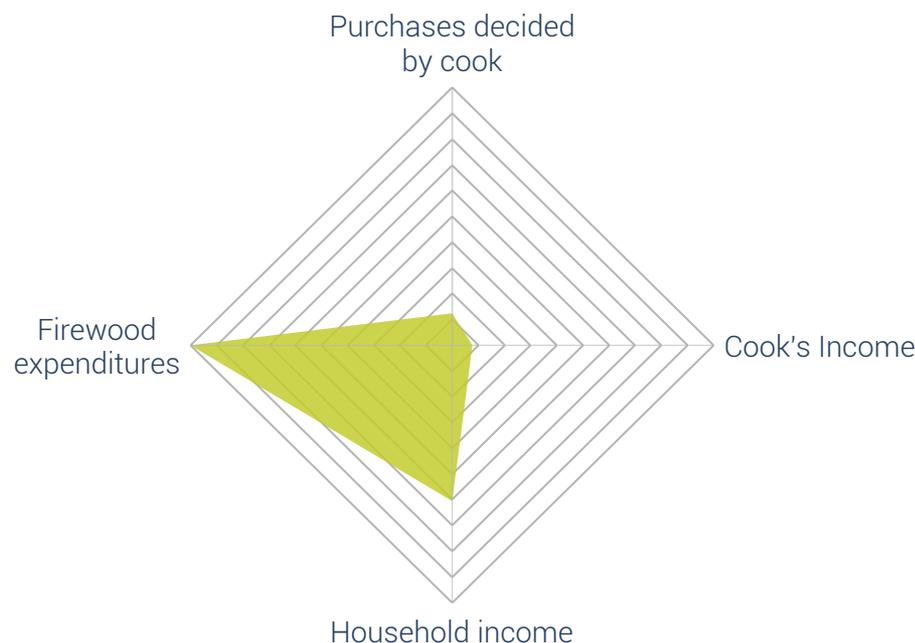
# Low and unstable income households

## Segment overview

<p><b>Fuel Expenditures</b></p>	<ul style="list-style-type: none"> <li>• This segment spends the most on firewood. On average, this segment spends Q 268 /month on firewood (median= Q 200/month)</li> <li>• Median firewood purchase frequency is every 30 days and the mean is every 52 days, similar to other exclusive firewood-using segments.</li> <li>• Firewood collection is the highest across all segments. Two thirds of households purchase <i>and</i> collect wood.</li> </ul>
<p><b>Cooking habits and appliances</b></p>	<ul style="list-style-type: none"> <li>• The fraction of people owning a chimney is the lowest of all segments: just 15%.</li> <li>• Microwave and pressure cooker penetration is below 5%.</li> <li>• Compared to other segments, fewer households buy tortillas.</li> </ul>
<p><b>Housing</b></p>	<ul style="list-style-type: none"> <li>• Housing conditions are very similar to other exclusive firewood users (60% cinderblock and the rest a combination of adobe, metal sheets and wood).</li> <li>• Almost all have access to electricity, 70% have a TV, but only 16% have running water.</li> </ul>
<p><b>Income Levels</b></p>	<ul style="list-style-type: none"> <li>• Per capita income levels are similar to other exclusive firewood users, but the lowest of all segments. Incomes are more unpredictable than other segments.</li> </ul>
<p><b>Women's empowerment</b></p>	<ul style="list-style-type: none"> <li>• Around 9% of women in this segment work. Purchase decision making capacity is therefore low and further constrained by relatively low incomes</li> </ul>
<p><b>Demographics</b></p>	<ul style="list-style-type: none"> <li>• Women in this segment are older than 16 years of age.</li> <li>• Educational attainment is one of the lowest. Only 15% of women in this segment earn degrees beyond primary school.</li> <li>• Households are large as compared to other segments (average size = 5.8 people/household)</li> </ul>
<p><b>Market size</b></p>	<ul style="list-style-type: none"> <li>• The size of this segment is 217,000 households, predominantly found in rural areas.</li> <li>• The segment is spread throughout the country.</li> </ul>

## Low and unstable income households

### *Comparative analysis*



### **How this segment compares to others**

- Firewood expenditures are the highest, reflecting over-reliance on wood, the lack of alternative cooking methods (e.g. pressure cookers and microwaves) and demands of large families.
- Cooks earn income sporadically to complement household financial shortages.

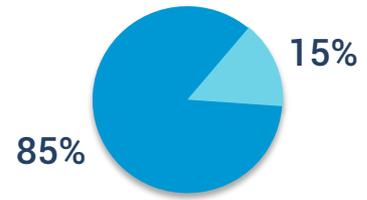


# Low and unstable income

## *Cooking appliances and habits*

### Firewood stove with chimney penetration

- Has chimney stove
- Doesn't have



13%

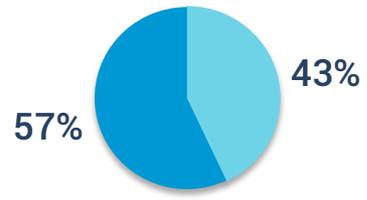


- Has a dedicated room for a kitchen
- Kitchen shares space

### Cooking place

### % of people who buy tortillas

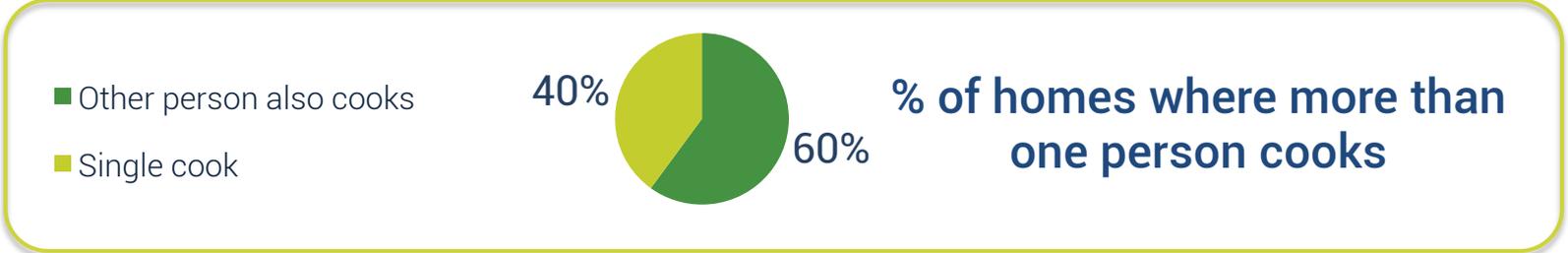
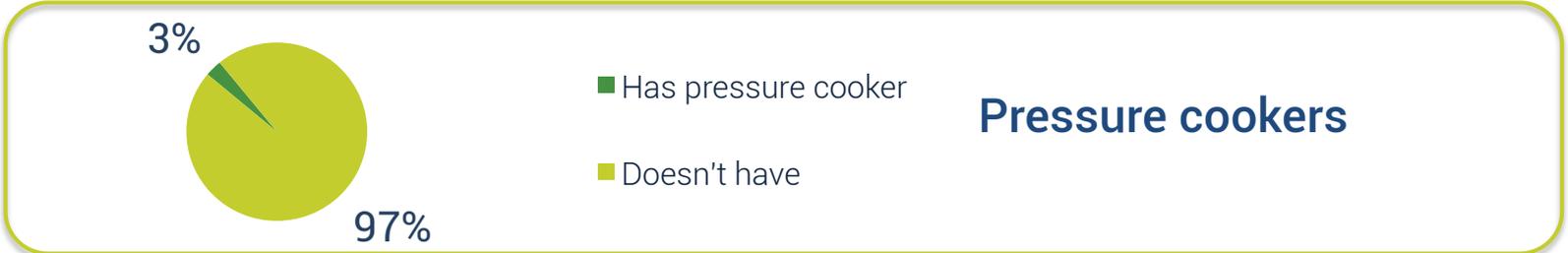
- Buys tortillas
- Doesn't buy





# Low and unstable income

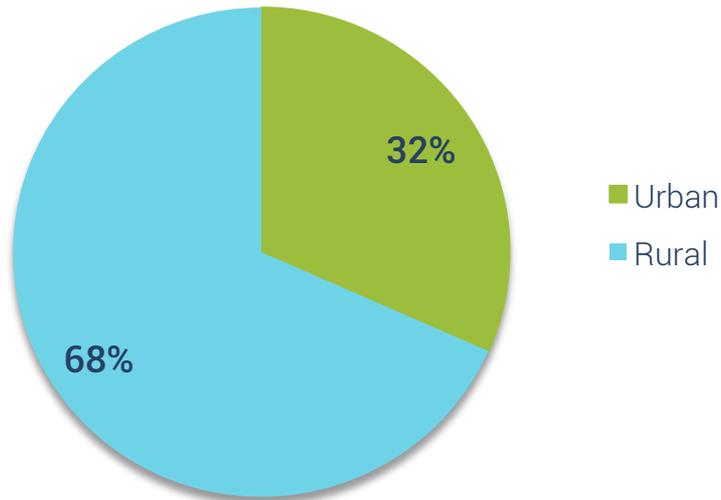
## *Cooking appliances and habits*



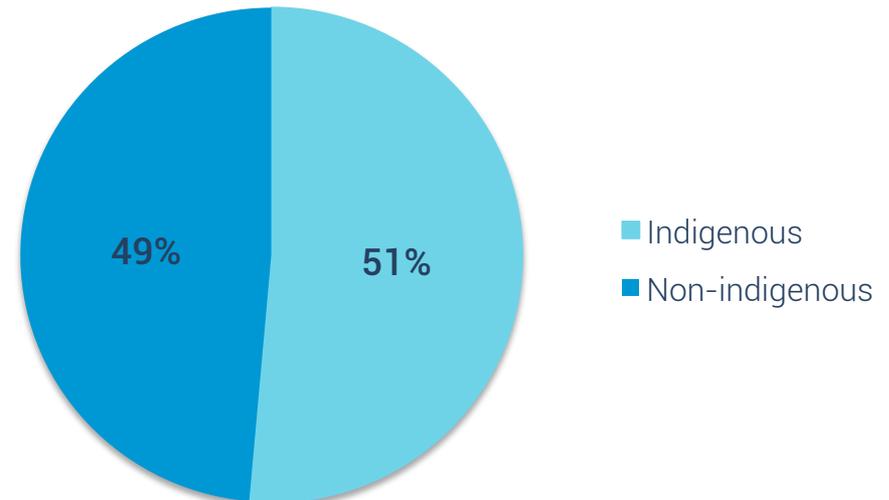
# Low and unstable income households

## *Market size and distribution*

- The total market size for this segment is **216,800 households** and an estimated 184,300 (15%) lack a firewood stove with a chimney.



This segment is predominantly rural



The population is evenly split between indigenous and non-indigenous

# Low and unstable income households

## *Market size and distribution*



Department	# of households	% without chimney
Quiche	26,754	84%
Alta Verapaz	23,004	98%
San Marcos	19,702	75%
Suchitepequez	18,876	97%
Guatemala	14,777	96%
Escuintla	14,129	95%
Chimaltenango	12,482	87%
Quetzaltenango	10,454	63%
Retalhuleu	9,482	92%
Huehuetenango	8,892	21%
Baja Verapaz	7,694	94%
Jutiapa	7,462	89%
Santa Rosa	7,087	89%
Peten	6,505	91%
Jalapa	6,085	94%
Totonicapan	5,657	45%
Sacatepequez	5,196	93%
Solola	4,603	45%
Chiquimula	2,988	90%
Izabal	1,980	100%
El Progreso	1,585	85%
Zacapa	1381	89%



## Strategic considerations for low and unstable income households

- This segment will be hard to transition to LPG due to income uncertainty.
- The best alternatives for this segment are cheaper products that partially get rid of smoke (e.g. nixtamaleras and comaleras in solo).
- The building of efficient plancha stoves can still yield results, but paying them upfront or in installments will be hard to achieve due to income unpredictability. Males need to be engaged in the construction of the stove and do so at the pace their income budget management strategies allow them to.

# Annex 1. Cooking fuel acquisition modes by area and income levels



<i>Numbers in thousands of households</i>	Extreme poverty	Poverty (non-extreme)	No poverty	Totals*
<b>Totals in rural areas</b>	<b>171</b>	<b>639</b>	<b>750</b>	<b>1,561</b>
Buy LPG	0	7	66	73
Buy LPG and firewood	2	24	140	166
Buy LPG and collect firewood	1	12	54	68
Buy firewood	60	252	273	585
Collect firewood	108	344	217	669
<b>Totals in urban areas</b>	<b>169</b>	<b>767</b>	<b>822</b>	<b>1,758</b>
Buy LPG	19	247	563	829
Buy LPG and firewood	18	206	166	390
Buy LPG and collect firewood	5	30	28	64
Buy firewood	78	202	56	336
Collect firewood	48	81	10	140
<b>Totals</b>	<b>341</b>	<b>1,406</b>	<b>1,572</b>	<b>3,319</b>

Source: ENCOVI 2011

\* Numbers may not add up exactly due to rounding

This analysis expands on the "Guatemala Market Assessment Sector Mapping" made by Fundación Solar, Energía sin Fronteras, and Madrid's Polytechnic University for the Global Alliance for Clean Cookstoves and released on July 2013. **Note:** this analysis uses ENCOVI 2011 data that was not available for the Sector Mapping study and population growth adjustments were made (2.5% annual); therefore, numbers may differ across studies.

# Annex 2. Quantitative survey sampling



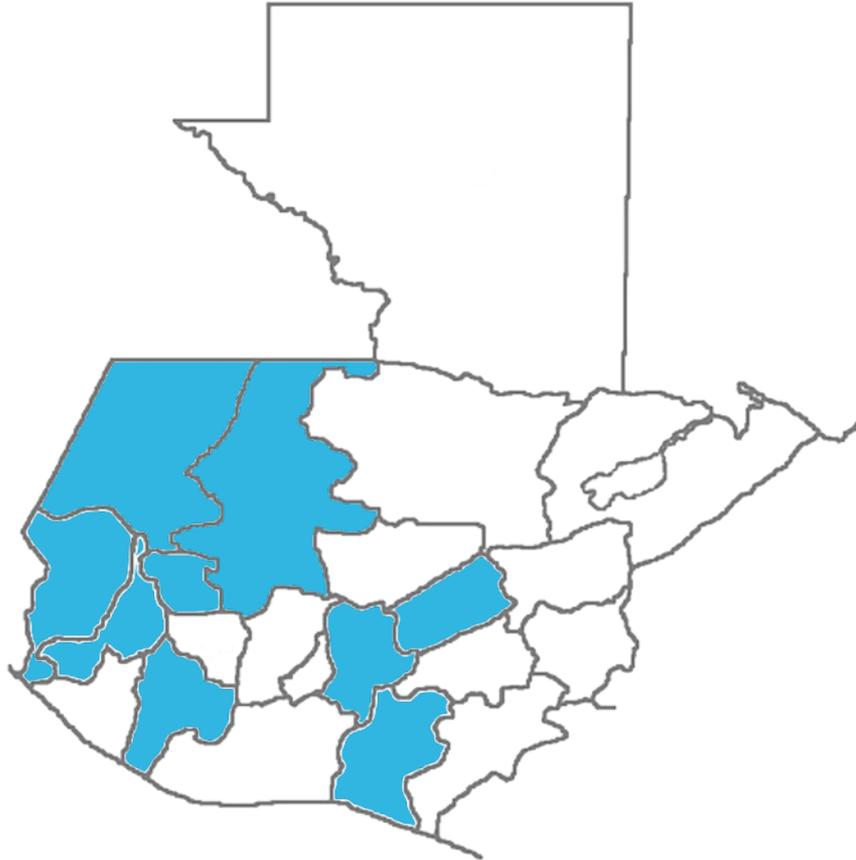
<b>Target population</b>	<p>Our target population was households who purchase and use firewood for cooking. We interviewed women aged 18-45 years of age who are main household cooks. The target population was also households where either the head of household or the main cook are literate. The target population was divided into 4 groups:<sup>1</sup></p> <ul style="list-style-type: none"><li>• Urban indigenous using firewood exclusively for cooking</li><li>• Rural non-indigenous using firewood exclusively for cooking</li><li>• Urban non-indigenous using firewood exclusively for cooking</li><li>• Urban non-indigenous using firewood and LPG for cooking</li></ul>
<b>Sample size and reliability levels</b>	<p>400 surveys (100 per group), seeking to obtain 90% confidence and 10% precision in firewood expenditure parameters.</p> <p>The surveys were applied in 20 municipalities (5 municipalities per group; 20 surveys per municipality)</p>
<b>Sampling frame</b>	<p>One sampling frame was created for each target population group. The sampling frames were Guatemalan municipalities. The population of each group in each municipality was used to sample with probability proportional to size. Sampling frame data was obtained from ENCOVI 2011.</p>
<b>Sampling method</b>	<p>Multi-stage sampling with the first level being municipalities and the second households within municipalities (5 municipalities per group). Municipalities were randomly selected using probability proportional to size. A random walk method was used to sample households within municipalities.</p> <p>The sample is representative of the 4 groups throughout Guatemala.</p>

<sup>1</sup> Groups were created based on an initial assessment of population groups most likely to adopt clean cooking technologies. Upon analysis of the data we collected, we re-grouped the target population as outlined in the report.

# Annex 2. Quantitative survey sampling



## Location of randomly selected municipalities



The sampled population is representative of the 4 population groups throughout Guatemala.

Note: whenever possible, data from ENCOVI 2011 was used to compare key statistics and expand metrics to groups falling outside the initial 4 sampled groups.

Contact information:

Javier Lascurain

[javier@fasttrackcarbon.com](mailto:javier@fasttrackcarbon.com)

Julie Ipe

[jipe@cleancookstoves.com](mailto:jipe@cleancookstoves.com)

**THANK YOU**

[www.fasttrackcarbon.com](http://www.fasttrackcarbon.com)