

**“Tapping the Potential of *Proalcool* for the Household Energy Sector”
Shell Foundation Project # 21316**

**Narratives of House Visits in the Three Communities of
Salinas, Dom Orione, and Ponte Nova in the state of
Minas Gerais, Brazil
12-20 June 2006**

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Landscape of Minas Gerais, Brazil along the road between the northern town of Montes Claros and the central capital city of Belo Horizonte

Background. James Murren and Cheryl O’Brien of The Stokes Consulting Group/Project Gaia visited Minas Gerais, site of Project Gaia’s 100 CleanCook (CC) stove pilot study in Brazil. While there, under the direction of Project Gaia/Brazil Director Regina Couto, they visited the three project communities of Salinas, Dom Orione, and Ponte Nova. To determine user reaction to the CC stove, they visited with families in their homes and carried out casual conversations with family members. A few questions guided the conversation: “How would you compare the CC stove with your LPG stove,” “How long does your LPG canister last,” “How much does the LPG canister cost,” “Do you gather or buy wood,” “How long does it take you to gather wood,” “How much does wood cost,” etc. The stove users were willing to share their thoughts and suggestions about cooking with ethanol, about the CC stove itself, and about the use of LPG and wood to meet daily cooking needs. The team took notes to ensure that the final translation from Portuguese to English would be as accurate as possible.

Thirty-two narratives (from homes and one child care center) and campground interviews were collected from 90 locations that are using the CC stove in Minas Gerais, Brazil. The following is a detailed account of 14 home visits and campground feedback. Notes taken by James Murren, Cheryl O'Brien and Regina Couto (the team) have been combined to give a more thorough understanding of the use of the CC stove in the homes and people's feedback on cooking with alcohol, wood and LPG.

Salinas. A small city in the northeast of Minas Gerais, Salinas is called the World Capital of Cachaça, a sugarcane-derived liquor of high alcohol content. Fifteen narratives were collected in Salinas, where 40 CC stoves are used in Salinas homes, a pre-school, and the Federal Agro-Technical School.



View of the neighborhood of Santo Antonia, Salinas, Minas Gerais

Monday, June 12, 2006

1. Gilza Pinheiro Magalhães

Household: Rua Darci Freire, 43 – Bairro Santo Antônio

Family size: 4



“If I can buy alcohol little by little in small amounts, it would be better for me... Sometimes I can't afford to buy the LPG tank. It's too much money. If the alcohol price goes lower, I will cook with the CC stove only,” Gilza notes. Before the CC, her husband collected wood every Sunday. With the CC, he gathers wood once a month for about 4 hours to use for heating bath water. The CC stove replaced wood for cooking, and she stopped using LPG. Before the CC, 13 kg

of LPG at 35 Reais (R) lasted 48 days when used with the woodstove for cooking. She explains that the CC takes about an hour to cook a meal, whereas LPG took about 40 minutes, but she stresses that with LPG she used 4 burners rather than two.

2. Morília Pinheiro de Almeida Costa

Household: Rua Getúlio Vargas, 520 – Bairro Santo Antônio

Family size: 5



Morilia speaks about the CC stove while Regina takes notes. Morilia states, “I prefer cooking with the CC because it is safer than gas and just as fast. 4 of the 6 gas burners didn’t work, so the CC is the same for me [regarding burners].” She explains that her LPG stove was leaking, and she used 2 LPG tanks a month and then it caught on fire. She says the CC is faster than LPG. Morilia notes that they were mostly cooking with wood before the CC, but now her husband has stopped collecting wood. She adds that there is also a CC at the childcare center for milk, formula, and coffee. Morilia says we can speak to her daughter about the LPG fire.



Morilia’s 18 year old daughter Ana Claudia speaks about the gas stove that dangerously spread the fire.



Ana Claudia notes that the flame spread under the burner area, and she turned off the tank on floor to stop the fire.

Ana Claudia states: “Many times the LPG explodes. Gas escapes below the burners and flares up because of leaks below the burners. Now we only use the CC and we stopped using LPG. The CC is faster than LPG. The CC doesn’t smell at all.”

3. Maria Ducarmo Santos Pretinha

Household: Rua Darci Freire, 38

Family size: 3



Maria bakes bread and sells it from her home, burning wood only for bread baking. She says that her LPG tank lasted 30 days before she received the CC, but since then she has not used her LPG. Maria states, “I would prefer cooking with alcohol if it could be bought in small amounts. I don’t always have the money to buy the LPG tank...The CC cooks faster than LPG.” (Photo: Maria with Regina Couto, PG/Brazil Director)

4. Maria da Piedade Santos (wife), and Manoel (husband)

Household: Rua Darci Freire

Family size: 2



Manoel responds, “I am the cook of the house because my wife works all day. Before the CC, I bought wood because I am too old to gather it ... Now I cook with the CC only. Two burners are enough for us. I prefer cooking with alcohol because it’s faster than LPG.” He says that 5 L of ethanol/week is sufficient. Before the CC stove, a 13 kg LPG tank lasted one month for his household. (Photo on left shows a grill on the left wall; it’s the grill he places on the CC stove as shown in photo on the right.)

5. Jonas Pereira de Melo – President, Association of the Citizens of Bairro Santo Antonio, and wife, D. Josefina Maria de Jesus



“Project Gaia has united the neighborhood. The Association is stronger now. Others without the stoves are supported by those with stoves to get them stoves,” Jonas exclaims. He explains that there are 400 families in Barrio San Antonio, and 60 more families joined “because of Project Gaia and a water project” in the neighborhood. People from two other neighborhoods are moving into Barrio San Antonio, because they see the neighborhood as being very organized. “People are requesting CC

stoves,” he says. He buys ethanol at 2.42 R/L at the pump, but he says a friend buys ethanol at 1.20 R/L in Sao Paolo. Since receiving the CC, his household does not use LPG. Josefina explains that today is “festival cooking,” so they are using the wood stove (below left) due to the large quantity needed for the festival. She is also brewing traditional herb tea with cachaça liquor on the CC (below right).



Tuesday, June 13, 2006 (Salinas continued)

6. Noême Teixeira da Penha

Household: Rua Mane Garrincha, 271

Family size: 3



“If the unit price of ethanol and LPG were the same, I would cook with the CC because it cooks faster than the LPG stove,” Noeme says. She explains that it takes only 45 minutes to cook beans on the CC. For rice it takes 15 minutes on the CC rather than 25 minutes on the LPG. She smiles and notes, “I cooked everything on the CC stove for the holiday festival...The 2 burner CC is sufficient, but 4 burners would be better.” She prefers alcohol to gas, but says sometimes the alcohol smells. 5 L of ethanol is enough for her family of 3. Noeme says that a 13 kg LPG tank lasts 45 days and costs 35 R. Her husband collects wood and sells some of it; he is constructing a wood stove for her to bake and sell bread and biscuits. Now they are using only the CC for cooking meals.

7. Rosalina Maria de Jesus

Household: Rua Mane Garrincha, 200 - Bairro Santo Antônio



“The CC stove is easy to use, practical, and cooks very fast. Wood stoves are very difficult to light. I prefer cooking with alcohol.” --Rosalina



11 year old Tainá cooks ramen noodles on the CC stove

Rosalina's household uses the CC for cooking daily meals. Rosalina uses the wood oven only to bake bread, and 5 sticks of wood cooks 2 batches of biscuits. Before the CC, she walked 6 km to collect wood and used the wood stove only. Her LPG stove is broken. She says 5 L ethanol/week is enough, and her husband cooks coffee with the CC.

Dom Orione, Betim, Minas Gerais. Dom Orione is a small farming village of 39 homes situated about 10 minutes from Betim. Twenty-eight families have CC stoves; we visited 10 of the 28 homes. Below are photos of the agricultural village of Dom Orione.



Friday, June 16, 2006

8. Rosa Gomez

Family size: 7 (6 adults and 1 baby)



Rosa holds her granddaughter Rafaela with her son Nilton (19-year-old PG surveyor). Rosa says she needs 7 L ethanol/week for her household. They use alcohol more than gas now, but she cooks breads in the gas oven. She prefers cooking some foods like beans on wood. Rosa says, "Alcohol cooks faster than LPG." She used more wood than LPG before the CC, when a 13 kg LPG tank lasted a month. Since the CC, the 13 kg LPG tank lasts 2 ½ months. The LPG dealers bring gas (2 R delivery fee to Dom Orione from Betim), and quickly on a motorbike, and sometimes the neighborhood orders together to share the delivery cost. Rosa adds, "At times, it's difficult to find the money to buy the LPG tank, so we use wood." Her son Nilton says, "I carry wood on my back and I have back pain. I've had 2 surgeries on my back. Before the CC, I collected wood 1 time/week, 2 hours each time."

9. Rosana

Family size: 7 (2 adults and 5 kids ages 6, 10, 13, 17, 18).



Rosana and son Vitor are shown in this photo. Although pots are on top of the gas stove, Rosana says she has never used LPG; her mother-in-law gave the gas stove to them as a gift. She uses the CC and wood stove, and she just started using 7 L ethanol/week since 5 L were insufficient. She would like 4 burners on the CC, and adds that it takes the same time cooking with wood and alcohol “once it’s cooking, but getting the woodstove hot takes a long time.”



Both 10 year old Leandro (here making a kite) and 6 year old Vitor (in previous photo) collected wood before the CC stove. Rosana explains how before the CC, she, her husband, and all five of their children collected wood 3 times/week (2-3 people at one time; 1 adult and 2 children) for 30 minutes each time. After receiving the CC, only Rosana collects wood 1 time per week for 30 minutes. She says that the children carried wood across their stomachs or chests (by pulling it close to their bodies) and on their shoulders. Rosana and her husband carried wood on their shoulders.

Tuesday, June 20, 2006

10. Elza Gomes Vieira

Household: Rua José Coimbra, lote 19

Family size: 3 (in her family and 3 neighbor families cook with CC)

“Before, I used a lot of firewood, and now with the CC I have more time to do other things. The CC is much faster than the LPG stove. My kids and some neighbors come to my house to use the CC,” Elza states. She cooks for 3 neighbors who don’t have a CC,



“because it’s faster for everyone, especially rice and coffee.” After the CC was introduced, she stopped using wood, which she previously bought for 25 R/load that lasted about a month. She does not like using wood because “it is a lot of work to light it and keep it going all day.” She says 5 L ethanol/week are sufficient.

11. Nelci Silva de Oliveira and husband, Joao

Household: Rua Cristina, 28

Family size: 11



With a family size of 11, Nelci says that 5 L ethanol/week are not sufficient. She adds that a large burner for large pots would be good, and 4 burners would be great. She cleans pots after using the CC with soap only, and she says ethanol does not smell. She uses the wood stove for beans, and she and her daughters cook rice, meats and vegetables on the CC. Nelci has completely stopped using LPG. Before the CC, a 13 kg LPG tank lasted 30 days. If the unit price of ethanol and LPG were equal, Nelci says, “I

would use CC because it cooks faster than LPG,” explaining that the CC’s flame is stronger than LPG’s. CC is “the best stove.” Before the CC, Nelci and her husband Joao collected wood every day for about 2-3 hours each time. Since the CC, they collect wood once/week for about 2-3 hours.

Ponte Nova. Twenty stoves were placed in several communities in the vicinity of the main large town of Ponte Nova, southeast of Belo Horizonte. Seven homes were visited and narratives were collected in Urucania—Usina de Jatiboca.

Tuesday, June 20, 2006

12. Hélio Rufino da Silva

Household: Rua da Esperança, 02 – Setor Ana Florência

Family size: 6



“I go to work at 5:30 and need to make food quickly. When my children [Ramiro, 11, and Felipe, 10] get home from school, around 12:30, they heat the food on the CC,” she states. Since 5 L of ethanol lasts about 6 days, she would like more ethanol. She has stopped using LPG, but she still uses wood sometimes to heat bath water. Before the CC, a 13 kg LPG tank lasted 3 months and they collected wood everyday, 4 hours each time, or her husband paid 25

\$R for a stack that lasted about a month. Since the CC, they stopped collecting wood. She prefers ethanol because it is faster than LPG. Even with beans, she says the CC is faster than wood and LPG when cooking in a pressure cooker pot.

Wednesday, June 21, 2006

13. Geraldo Marcelino de Freitas (D. Maria)

Household: Come e Deita, casa 25 – Usina de Jatiboca

Family size: 5



Maria stopped using LPG after the CC was introduced (about 40 days ago), but she still uses wood for heating bath water and cooking beans. She fills the CC canisters twice/week and she reports no problems of dirty/stained pots. If ethanol's price were equal to LPG, she says she would use the CC because it cooks faster than LPG. Before the CC, her husband collected wood every Sunday, and he has collected wood only once since using the CC. She adds that 4 burners would be nice on the CC.

14. Carlos Antônio da Silva

Household: Vila Nova, casa 3 – Usina de Jatiboca

Family size: 3



Carlos cooks some of the family meals in the morning, while his wife works. She then reheats meals throughout the day. Before the CC, a 13 kg LPG tank lasted 25 days and they collected wood twice/month for about an hour each time. Now they have stopped using LPG and wood. If the unit price of ethanol equaled LPG, he says he would prefer cooking with the CC, because it is faster than LPG and would use less fuel and be cheaper than cooking with LPG.

Serra do Cipo National Park. Five CC stoves are available for rent to campers and cabin renters at the YMCA Campground. We visited the park on Saturday, June 17, 2006 and spoke with two groups who had experience using the stove.

The first group was renting one of the cabins for the weekend. When we arrived, they said they had used the CC to cook breakfast and were very impressed with how quickly it heated water for coffee and tea. They mentioned that the match sticks were too short for lighting. We told them we were going to buy longer matches at a local store and that the campground would bring the matches to them. They were pleased, and went on to say that the stove is perfect for this kind of setting.



Serra do Cipo National Park

The second interview was with a husband and wife who had used the CC a few weeks earlier. They did not like that their pots were stained from using the CC. They noted that with LPG, pots do not stain. The husband said that methanol would be better to use in the CC because it would eliminate all soot. They loved the design of the stove, but felt that it is better suited for tent campers than for the permanent weekend trailer home set-up they had at the campground. They pointed out that a grill is needed for the top of the stove so that all pot sizes and shapes can fit on it, pointing out that the stove was likely made for Europe and with the developed world in mind. However, they agreed that the aim of the project is a good one, and with adaptation (more burners, grill to go over the burners) the stove would be a likely success in Brazil.

Conclusion. Thirty-two narratives (from homes and one child care center) and campground interviews were collected out of 90 settings (homes, institutions, campground) that are using the CC stove in Minas Gerais, Brazil. Feedback indicates user satisfaction with the CC is very high. Ease-of-use, improved cooking time over traditional and even modern LPG stoves, perceived economical gains, and cleanliness were cited as benefits of using the ethanol-powered CC stove. All households stated that if the unit price of ethanol and LPG were equal, they would cook with ethanol because the cooking time is faster and less fuel would be used. On average, homes cooked with 5 liters of ethanol per week, bringing a monthly total to an estimated 20-25 liters of ethanol.

Nearly all households suggested increasing the burner number from 2 burners to 4 burners. Brazilian cooking typically includes a pot of beans, a pot of rice, a pot of meat, and a pot of vegetables on a daily basis. Through their own ingenuity, many household cooks placed a small grill from the standard LPG stove in use in most homes over the CC burners. This adaptation allowed for all pot styles and sizes to fit on the CC stove.

Most insightful was the understanding we gained from interview after interview that many homes are finding it difficult to purchase the 13 kg LPG canister when it comes time for refilling. With a price ranging from 32-36 Reais per canister, and lasting an average of 25-30 days, it is becoming increasingly difficult for families to cook with LPG. In fact, nearly all homes do some cooking on their woodstove, and several families talked of cooking with wood until they were able to put together the money to buy another LPG canister. Having experienced such economic challenges related to cooking over the past few years, many families spoke of the desire to be able to purchase cooking fuel in small amounts on a daily basis. They posited that if alcohol were sold in small amounts, and were to be economical, they would cook with the CC stove because they were more likely to have a few Reais from day-to-day rather than having 35 Reais to buy fuel in bulk.

During the pilot study, we ran a simple price elasticity study. To assess each family's willingness to pay for ethanol, the field team began by providing ethanol for free and, after one month, began to charge for the ethanol. The exception to this was the pilot study in Urucania and Jatiboca in the Ponte Nova region. Here, a local sugar company provided ethanol at no charge to the study; therefore, free ethanol was continued for these households throughout the study.

In Salinas and Dom Orione, where ethanol was procured for the study from local gas stations by PG field staff and distributed to the households in 5 liter jerry cans, study participants began paying a portion of the ethanol cost at the beginning of week five. Pump price for ethanol in Salinas was R\$ 2.00 and pump price for ethanol in Dom Orione was R\$ 1.80. During weeks five and six, families in both locations were charged R\$ 0.50 per liter of ethanol. During weeks seven and eight, families paid R\$ 1.00 per liter, and in weeks nine and ten, families paid R\$ 1.50 per liter. Finally, during weeks eleven and twelve, households in Salinas and Dom Orione paid the full price of the ethanol at the pump; thus the people of Salinas paid slightly more for their ethanol than did the study participants in Dom Orione.

Survey data is not fully analyzed so specific numbers cannot be provided here. However, generally speaking, people began to show concern about the price of ethanol for cooking above R\$1.00 and began to drop out of the program at R\$1.50, saying that they would use the stove occasionally but not regularly at that price for fuel. Some users did persevere with the stove with ethanol at full price. As documented in the narrative interviews, many users said that they would use ethanol over LPG if it were priced below or equal to LPG. To approximate what this means, one may consider the energy value of ethanol compared to LPG. Ethanol contains 60% of LPG's energy by weight and 88.5% by volume. The CC stove generally shows a thermal efficiency gain of 5 to 7% over an LPG stove. This permits a correction of the above figures to 64% by weight and 95% by volume. Thus, the energy content of a 13 kg cylinder of LPG would be matched by 20 kg or 26 liters of ethanol. If the 13 kg canister sells at R\$32, ethanol would need to sell at R\$1.23 per liter to provide the same value; at R\$36 for the canister, this would be R\$1.38 per liter. These figures are approximate and only provide approximate use-equivalencies.

However, they demonstrate that the stove user's sense of what he or she was getting for his or her money was correctly bracketed by the R\$1.00 to R\$1.50 per liter ethanol price.

Ethanol is a ubiquitous, domestically-produced fuel in Brazil, with which Brazilians are well acquainted, but when it is sold at the pump for automotive fuel use, it's pricing is affected by the price of gasoline, which is an expensive fuel and which is highly sensitive to worldwide pricing pressures. Therefore, strong inflationary forces drive the pricing of ethanol as a vehicle fuel and affect the pricing of ethanol for any use in Brazil.

To make ethanol available cheaply for household fuel use, the ethanol will have to remain outside of the vehicle fuel market and be sheltered from the inflationary effects of the petroleum fuels markets, which dominate fuels pricing. One way in which this might be achieved is by linking household fuel use of ethanol to the burgeoning micro-distillery movement in Brazil. Micro distilleries would produce specifically for the household fuel market, and sell directly to the user in a local market. This might be characterized as a 'distributed energy' production and supply model.

Project Gaia/Brazil should expand the pilot study to develop a demonstration project centered on a community cooperative or a local business that owns and operates a small distillery (< 5000 liters output per day) that can provide ethanol directly to a dedicated local stove fuel market. Many distilleries produce beverage alcohol (*cachaça*) for sale, discarding residues that could be used to make additional ethanol for fuel, were there to be a use for it. These distilleries thus have, or have the potential for, extra capacity. Linking stoves in a local market to an operating distillery to test this distributed energy model could provide a valuable case study. Thus, it would be our recommendation to use and build upon the experience of this pilot study to run a demonstration project with a micro distillery that can provide ethanol to stoves in a local market. Commercial sustainability would be tested. If sustainable, this project could be replicated. The opportunity for wide spread replication is apparent. The enthusiastic response by our study participants to the performance of the stove indicates that the desirability of and likewise the need for the stove would help to drive the project.