

Tapping the potential of Brazil's Proalcool movement for the household energy sector



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The Brazilian alcohol programme, focussing exclusively on the industrial-scale production of ethanol, has been successfully operating for more than thirty years. This article discusses how the same can be accomplished for cooking and household energy - a Proalcool movement for the household. Instead of relying on large scale ethanol production and distribution, the household energy market can be provided with ethanol from micro distilleries - a distributed rather than centralized energy model.

The Dometic CleanCook stove has undergone successful pilot testing in Brazil for such a purpose. An active and enterprising microdistillery movement has perfected the microusina that produces not only fuel ethanol for cooking, lighting and power but also other products for sale or for use on the farm. This article will show that an on-farm micro distillery is a highly sustainable and environmentally friendly activity that can provide clean energy to the surrounding community.

Figure 1: Ms. 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. 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 a week for about 2-3 hours.

(Photo: Cheryl O'Brien)

Pilot study

The pilot phase of Project Gaia in Brazil began its field implementation in July of 2005 with the following immediate objectives: a) to install Clean Cook ethanol stoves in 100 households in the Minas Gerais state; b) to assess user acceptance of the stove and fuel in rural and urban households by measuring, among

other factors, perceived and actual stove/fuel safety, ease of use, convenience, appearance, cleanliness, and overall performance in fuel consumption economics. Long term objectives included: to understand the feasibility of rural, community-based cooperatives or associations in manufacturing and supplying their own ethanol to fuel the stoves through the use of microdistilleries; and to evaluate the stove's potential impact on local cutting of wood

for cooking fuel and in the reduction of indoor air pollution.

The pilot test of the ethanol-fuelled Clean Cook (CC) produced positive results. The stove was well accepted by the families in terms of safety, fuel consumption, ease of use, appearance and cleanliness. The fuel consumption of the stove was relatively low and, even with the small size of the fuel canister, refuelling was typically only conducted



every 2-3 days. The CC stove displaced a greater quantity of LPG stoves than wood stoves, the obvious reason for this being relative fuel costs.

Many of the families expressed concern about the environmental impact of collecting wood for cooking, and saw the stove as a possible solution to the challenge they face in seeking affordable cooking fuel. In Salinas, families now have to walk further to find wood and, when combined with rising LPG prices, this has caused growth in the market for purchased fuel wood.

Pilot study results

1. 74% of study households found the CC stove to be “safer” to operate than their LPG stoves
2. 95% of study participants in Salinas and Jatiboca, and 76% of homes in Dom Orione, said the CC stove was “as clean or cleaner-burning” than an LPG stove
3. 81% of families considered their kitchen environment to be “cleaner” as a result of cooking with the CC stove
4. 71% of families in Salinas, and 53% in Dom Orione, decided to continue using the CC stove by purchasing ethanol at full price after the study ended
5. Nearly every household observed that the CC stove cooked common food stuffs (eg. beans, rice) faster than their LPG stoves, saving approximately 15 minutes of cooking time on average for each of these food items
6. The CC stove reduced the use of wood and LPG stoves in part. Many families remarked that because the CC stove had only 2 burners, and that traditional meals in Minas Gerais require 4 burners to prepare, they had to use another stove to cook their meals. However, a majority stated that if a 4-burner CC stove was available, it would meet their cooking needs and they would switch to cooking with the CC stove.
7. Amongst the lowest income households, the ability to purchase ethanol in small quantities was very attractive.



Buying ethanol in small quantities

One key advantage of the Clean Cook stove, as noted by 60% of the families in Salinas, was the ability to buy ethanol in small amounts as and when they had money available. Given that the majority of families do not have a steady income, it is difficult for them to have the economic means to buy an expensive LPG cylinder.

For the families in the pilot study, the current reality of higher ethanol prices at the pump renders the use of the CC stove, if dependent on pump ethanol, as being more costly to run than LPG. Despite knowing this, many of the families of lower or variable income say they would prefer to cook with the CC stove, if supplemented with some cooking with wood for certain food stuffs. They also emphasized that many families cook with more than one stove and that for them the CC is a better option than LPG because it is clean, safe, fast cooking and because they can buy ethanol in small quantities.

It is possible that families living in Sao Paulo state, where Brazil’s major centre of sugarcane and ethanol production is located, could purchase ethanol from the pump to fuel the CleanCook stove. Currently in Sao Paulo state, ethanol sells at the pump for between 1.00-1.45 Reais (0.59-0.85 USD). Surveys indicate that most households would purchase ethanol for cooking up to a price of about 1.20 Reais. In areas where pump ethanol is not affordable, one possibility for ethanol production is the microdistillery.

Microdistilleries

In rural Brazil, microdistilleries (MD) have the potential to alleviate poverty, especially in agricultural families. The national legislature has recognized this and three laws are currently being debated in the legislature regarding the provision of market incentives for MD. In Minas Gerais there is a state law that provides incentives to microdistilleries, though it is not yet fully implemented.

The increasing global demand for both ethanol as an automotive fuel and for sugar has proven very beneficial to the

Figure 2: “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”, said Ms Gilza.

(Photo: Cheryl O’Brien)

Figure 3: Microdistillery of Angatuba - Sao Paulo. Installed by the Municipality to produce ethanol for official vehicles. Farmers in the surrounding area are partners and supply the sugar cane. It serves as a great public investment for the local economy. They also produce rapadurinhas for the municipal kindergartens. (Photo: Regina Couto)

large sugar companies, as internal market prices have increased with global demand. Microdistilleries could be used to supply the local markets and perhaps keep costs down in the household market in some key regions.

A microdistillery that produces 100 to 500 litres per day could be managed by one farming family. Aside from producing ethanol for their own use, they could also make other products such as rapadura (sugarcane juice/sweets), sugar, and cachaça (alcoholic drink). The production of alcohol on small rural properties has the potential to generate a cycle of development and raise the productivity of small-scale producers. With 2 hectares, the bagasse and vinhoto by-products can be used to feed 10 cows, which not only improves the quality of the land but also gives the farmer more produce. In northern Minas Gerais, small-scale farmers are very familiar with milk and cachaça production, meaning that they understand the distillation process and many have some of the equipment necessary for alcohol production.

Using MD residues at the farm level is a perfect fit for this technology. The environmental impact of sugar/ethanol waste products can be reduced by using the residual sugarcane bagasse to feed cattle and the ‘vinhoto’ can be used as fertilizer in the fields. For local governments, the improvement in the quality of life in rural areas through the promotion of microdistilleries could reduce the costs of many social programmes.

For more on the benefits of microdistilleries see the [@HEDON](#) link over the page.

Figure 4: Microdistillery at the Federal University of Viçosa. The university has carried out studies of improved technologies, and set up a unit for testing on campus. This model does not use a boiler and so offers a lower cost solution.

(Photo: Regina Couto)

Replicability and sustainability

Alcohol fuel programmes can be replicated in tropical countries where the weather is suited to the growing of sugarcane, and even the possibility of using other crops such as cassava, sweet potato, and sorghum saccharin. In least developed countries, where access to energy is often minimal at best, the creation of MD could provide a great benefit for marginalized people. The production and use of ethanol in an MD can have multiple effects: increased incomes in rural areas and a consequent reduction in the numbers of people leaving the countryside; improved quality of life due to reduced levels of domestic pollution; reduced environmental impact from fuelwood gathering; and provide a source of clean, safe household fuel.



Local stove production

From the outset of the project the manufacturer of the CleanCook stove, Dometic AB of Sweden, have shared the goal of local production with Project Gaia. Currently, the process is underway in Ethiopia and is in the initial stages in Brazil. Several metal manufacturers have been identified and Project Gaia are facilitating correspondence between the potential local producers and Dometic, with full transfer of the technology expected to occur by the end of 2009.

Outlook

Although microdistilleries are currently not permitted to sell their ethanol commercially in the open market, it is quite feasible to set them up as a cooperative or association between households and the MD operators. Nevertheless, MD is a technological option that goes beyond Brazilian borders. Considering the recent fluctuations in LPG prices worldwide, and assuming a reasonably high carbon tax on fossil fuel use, biofuels, and more notably ethanol, are an obvious future alternative to LPG among some of the 2.4 billion people who do not have access to clean cooking fuels.

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