

Project Gaia's Ethanol-fueled CleanCook Stove Pilot Study in the Town of Denan, Somali Regional State, Ethiopia

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The town of Denan, Somali Regional State, in the Ogaden Desert of Ethiopia

Project Background. Project Gaia (PG) Director Harry Stokes met Dick Young, independent filmmaker and founder of The Denan Project, a U.S. non-governmental organization (NGO), while en route back to the United States on an Ethiopian Airlines flight out of Addis Ababa. The two struck up a conversation and shared their work, the conversation resulting in the decision made by Stokes, with the encouragement of Young, to place 50 ethanol-fueled CleanCook stoves in Denan under the direction of the Ogaden Welfare and Development Association (OWDA), a regional NGO that would serve as on-the-ground facilitator of the 50-stove pilot study.

An initial trip in July 2005 by Project Gaia staff to assess the feasibility of running the stove study in the Internally Displaced Peoples (IDP) camp on the edge of Denan town

was made by Melat Esayas, Project Gaia—Ethiopia Director, and Fiona Lambe and Andrew Stokes of Project Gaia Research Studies. OWDA collaborated with PG on this effort. After visiting the IDP camp, a consensus was reached by both OWDA and PG. Citing lack of food in the camp, which possibly renders introducing a new cook stove as insensitive to more immediate needs, concern over migration of camp residents, and the logistical difficulty of managing the study in an unincorporated “village,” it was decided to carry out the study in the town and not in the camp.



Moonrise over the IDP camp, Denan, Somali Regional State, Ethiopia

OWDA selected a male and female surveyor for PG and the town administrators chose study households, representing the various clans. Surveyors and study households from the town were trained by PG on proper stove operation and maintenance, ethanol as a cooking fuel, and the three-month surveying structure. A subsequent meeting between Esayas, Lambe and Mukhtar Shek Omer of OWDA finalized the plans for the pilot study.

Unfortunately, there was a delay in ethanol and stove delivery, pushing the placement of stoves into the homes back to November 2005. Stoves and ethanol were distributed to the households on 25 November 2005. When the ethanol arrived in late November, it was decided by OWDA to store it in Denan’s medical clinic under the supervision of Dr. Sadik.

PG surveyors, Abdi Kadir and Sahara Hussein, are responsible for ethanol distribution. Given that one barrel cracked during the delivery, each household is provided 23 liters of ethanol per month. Each household brings their own 25 L gerry can to the clinic for filling. Dr. Sadik uses one stove at the clinic for sterilizing needles.

On 13 December 2005, Cheryl O’Brien and James Murren of Project Gaia Research Studies traveled with Dick Young and Mukhtar Omer to Denan. O’Brien and Murren

visited households that had been using the CleanCook stove for a little over two weeks at the time.

Denan. Situated 42 remote miles in the Ogaden Desert from the airstrip in Gode along a dirt road of sorts that requires a 4WD truck to get there, Denan is a hard scrabble town where the locals are friendly, camels abound, and the horizon goes on forever. The people are followers of Islam, culturally Somali, but politically Ethiopian. An armed resistance in the region named the Ogaden National Liberation Front (ONLF) has been waging a war on the Ethiopian government for more than a decade. They seek an autonomous state, perhaps believing that the vast natural gas reserves found in the Ethiopian Ogaden is potentially their way to sustain themselves as a unified people.

The area around Denan is an open, flat, mostly treeless terrain where the topsoil is little more than a couple of inches of blowing dirt and sand. Water is most scarce, and agricultural production is extremely low, at best, due to a recent onset of drought caused by the non-arrival of the October rains. Currently, living conditions in the region are severely dire for those living on the margins, with the possibility of famine-like scenarios being given attention by the Ethiopian and Kenyan governments.



Lone home on the edge of Denan town

PG's Visit to Denan. Against this backdrop, O'Brien and Murren accepted the invitation offered by Young to visit Denan on 13-16 December 2005. Young's The Denan Project has been supporting the medical clinic in town, flying in supplies and medicines every 2-3 months. Additionally, he is working with a U.S. military well-drilling detachment in Gode on the construction of a water distribution system that will bring water to Denan.

Upon safe arrival in Gode, we quickly sorted and counted 64 cases of medical supplies being delivered to the Denan medical clinic by The Denan Project. With all 64 boxes accounted for, we loaded two trucks, stopped by the U.S. military detachment, had a quick lunch of goat and pasta, and eventually set out for Denan around 2 in the afternoon.



Medical supplies being loaded onto the trucks, Gode airport, Ethiopia

Before leaving town on the road heading north out of Gode, all vehicles are stopped by an Ethiopian military checkpoint. We made the routine stop, expecting that our papers were in order and that we would soon be on our way. An hour and a half later we were granted permission to pass.

Two hours later, our bodies covered in dust as dusk was descending upon Denan, we arrived to town. Greetings were offered and the evening's schedule laid out: meet with the town administrators, meet with the elders, eat, and go to bed.

A recap of the evening: Both the administrators and the elders were thankful for the stove project, though all sitting before us under a full moon on mats spread out on the ground expressed that more stoves are needed. We explained that we are conducting a study first, and that we would need to ensure an ethanol supply before we could scale up the number of stoves in Denan. They were very understanding, and appreciated our visit and interest in their small town. They noted the lack of fuelwood and that their women had to walk very far to find wood.

The following morning we woke with the sunrise and had a breakfast of goat liver and kidneys, *injera*, and tea. Soon we were off to visit the study households before the sun became too hot for walking around town.

Visiting the Homes. Accompanied by PG Surveyors Abdi and Sahara, O'Brien and Murren randomly visited study households. Abdi and Sahara translated for PG staff and the study households. We were able to meet and talk with 14 households, the findings of which were very positive. Of note, every household said that they have completely stopped collecting firewood. They are able to cook their entire meals, including *injera*, on the CC stove. The following households are presented in the order of our household visits on 14 December 2005.

Household (HH) 1: Foos Sheekh Abdi (Abdi Nasir = husband)

HH size: 9

Kitchen is in a separate hut from the main house.

Surveyor: Sahara Hussein (female; 20 years old)



Foos stated, “One liter of ethanol per day is sufficient. I cook on the CleanCook stove for 1 ½ hour in the morning, 1 hour and 15 minutes for lunch, and 45 minutes in the evening. I cook injera on the CleanCook stove. Before I used the three stone wood stove. My daughter and I collected wood before, and we also loaded wood onto a donkey before the CleanCook stove. My daughter missed school before the CleanCook to collect wood. She is 16 years old and in the 4th grade.”

HH 2: Ruqiya Axmed (not present) (Abdi Shiik = husband; present; he came along with us after this interview); Nooc (sister-in-law and cook)

HH size: 8

Kitchen is in a separate hut from the main house.

Surveyor: Sahara Hussein



Nooc stated, “We use the CleanCook stove every day. I use 1 L/day of ethanol. I need more ethanol. I stopped using the three stone wood stove when we received the CleanCook. I collected wood on my own every 2 weeks, for 12 hours each time before the CleanCook stove. I always scraped my skin from the wood and I had back pain from lifting the wood onto the donkey. I cook injera, cow milk, tea, rice, pasta on the CleanCook. It took about 35 minutes to cook tea on the three stone stove, but it only takes 25 minutes on the CleanCook.” When asked where Ruqiya is, Abdi Shiik stated, “She is collecting water. It takes her one hour to collect water.”



A three-stone, open-fire wood stove. The kitchen is constructed apart from the house. Still, it is covered with plastic, old clothes, blankets, etc., making it an enclosed cooking environment. Note the small size of the twigs in the fire area. Finding sizable wood in Denan is rare. Women spoke of having to walk up to 12 hours round trip to find good woodlots. However, after receiving the CC stove, they spoke of not gathering wood at all anymore.

HH 3: Cibaado Cali (Wahaab Maxed = husband)
 HH size: 8
 Kitchen is in a separate hut from the main house
 Surveyor: Abdi Kadir (male; 25 or 27 years old)



Cibaado stated, "I cook every day with the CleanCook stove and I use 1 L/day of ethanol." After we noted how clean the CC stove appeared, Cibaado proudly said, "I clean it after each use." She added, "Before I purchased wood for the three stone wood stove, but now I've stopped using wood. I paid 100 Birr/month for wood before the CleanCook. I like that I can move the CleanCook stove from the dinner room to the kitchen or outside. I like that it is safe for the children. Before I had smoke in my eyes and I had to guard the children from the wood stove. I cook everything on this [CC] stove now, but we are almost out of ethanol." As we began to leave, neighbor women came and told us that they also want a CC stove.

HH 4: Nimco Muxumed (G. Xusem = husband)

HH size: 8

Kitchen is in a separate hut from the main house

Surveyor: Sahara Hussein



As was evidenced by her stove, Nimco stated, “I clean my CleanCook stove a lot.” She said with a smile, “Before the CleanCook, I collected wood on my own once a week, 12 hours a day. I put the wood on a donkey. I scraped my skin collecting wood. I also cut my leg when I axed a piece of wood and it split back. I hated the smoke of the three stone woodstove. I had coughing and eye irritation before, but now I no

longer cook with the three stone stove. I only use the CleanCook, and I have no health problems with it. I cook all day, using about 1 liter/day of ethanol. I think the ethanol supply is sufficient. I have no problems with the CleanCook, but others ask me how they can get the CleanCook.”



Scar from the splintered wood that gashed her leg as a result of the wood chopping accident she spoke of above.

HH 5: Ayaan Saxane (Rashiid = husband)

Photo: Ayaan did not want her photo taken, but said we could photo her stove.

HH size: 5-7 (7 maximum when she cooks for additional people on a weekly basis)

Kitchen is in a separate hut from the main house

Note: her stove does not have a fixed pot holder; her pot holder is not bolted down

Surveyor: Abdi Kadir



While cooking *injera* on the CC stove, Ayaan stated, “Before I received the CleanCook stove, I purchased wood for 80 to 90 Birr/month to fuel a three stone stove. I had coughing, eye irritation, and a runny nose with the wood stove. Now I do not use wood, and I do not have those health problems with the CleanCook stove. I use about 0.75 to 1 ½ liters/day of ethanol depending on the number of people I’m cooking for. I am almost out of ethanol. I would like to have one of the CleanCook stoves with a fixed pot holder, because when I cook injera the pot holder slides.”

Cooking *injera* on the CC stove

HH 6: Nasro Maxamed (Abdi Axmed = husband; he has a total of 9 children between two wives—6 children with Nasro and 3 with his second wife, Haliimo Andmahamed)
NO PHOTO

HH size: minimum of 8 people she cooks for

Kitchen is in a separate room from the main house

Surveyor: Abdi Kadir



A typical kitchen in Denan

Nasro stated, “I use the CleanCook stove all day. I cook everything on it, using about 1 L/day of ethanol. I think I have enough ethanol for my family. I used the three stone wood stove before the CleanCook. Sometimes I also used the charcoal stove. I purchased both wood and charcoal before the CleanCook stove. It costs 1 Birr for 5 sticks of wood. Each month it cost me 70 to 90 Birr for wood, but now I only use the CleanCook.” This family has two wives, so we asked if they share the CleanCook stove. Nasro explained,

“Because of the limited ethanol supply, the second wife does not use the CleanCook now. The second wife cooks for at least 5 other people every day. The first time she used my CleanCook stove, she made a mistake and then I showed her the correct way to use it. Now she [the second wife] uses the three stone wood stove. I like the CleanCook stove.”

We asked to speak with the second wife named Haliimo, who was seated in a partitioned off area beside us as we sat outside with Nasro. Haliimo moved the partition back farther to speak with us. Haliimo said, “I collect wood three times each week. It takes me six hours when I go alone (3 x/week), but 12 hours with a donkey because I go farther with a donkey (2 x/week). There are many problems when collecting wood. There is no water. I fear the hyenas and lions. It is hard work cutting trees. There are accidents when the axe or the wood hits you. Five or three women try to go together for safety.”

HH 7: Maryama Sheekh Maxamed (Abdi Waahid = husband)

HH size: 8 (2 adults and 6 children)

Kitchen is in a separate hut from the main house

Surveyor: Sahara Hussein



Surveyor Abdi Kadir translates Maryama’s statements to Cheryl O’Brien of Project Gaia.

Maryama stated, “I use the CleanCook stove all day. I use 1 liter of ethanol each day, and I think that is sufficient. I gathered wood for my three stone stove before receiving the CleanCook stove, but now I do not gather wood. I went once a week by myself with the donkey to collect wood.

I also went once a week with my daughter and the donkey. It took about 12 hours each time for a total of two times each week. My daughter missed school once a week to gather wood. She is 15 years old and is in the 4th grade.”

HH 8: Khadra Macalin (daughter/cook) (Mom = Saynabo) (Dad = Macalin Xused)

In photo: wat and camel meat on the CC stove

HH size: 13-15 people, she cooks for them every day

Kitchen is in a separate hut from the main house

Surveyor: Abdi Kadir



Cooking camel meat on the CleanCook stove. The camel is very important to Somali well-being. Not only do they eat camel, but camels produce very nutrient milk for drinking. Also, camels serve as transportation in the desert.



Khadra stated, “I cook all meals on the CleanCook stove, and I use 1 liter of ethanol per day. It is not enough ethanol; it [motioning to her gerry can] is almost empty. I used the three stone wood stove before, but since the CleanCook I’ve stopped using wood. I purchased wood before at 120 Birr/month. Now that I do not buy wood, I purchase more food for the children. There was a lot of smoke with the wood stove and I had eye irritation and coughing.

We also had smoke in our clothes.” While cooking wat and camel meat on the CC stove, Khadra says, “Camel meat costs 20 Birr/kilo. It takes 45 minutes to cook camel meat on the CleanCook. It takes about 25 minutes to cook tea on the CleanCook.” We asked if she had any suggestions for improvements, and she said, “I want a larger CleanCook stove, and the townspeople want more stoves.”

HH 9: Khadra Axmed (17 yr old daughter/cook) (Mom = Sareyaxanan)

Photo: with Surveyor

HH size: 11

Kitchen is in a separate hut from the main house

Surveyor: Abdi Kadir



Khadra stated, “I use the CleanCook stove all day and cook everything on it. I use 1 L/day of ethanol and that is enough for me. Before I purchased wood at 90 to 120 Birr/month for the three stone wood stove, but now I do not purchase any wood. I would like a bigger CleanCook stove in the future.”

HH 10: Shukri (Abdi’s wife); (Massal Maxamed = Mother of Abdi; primary cook; not present); (Surveyor Abdi Kadir’s house); (Baby daughter = Sacda)

HH size: 9

Kitchen is in a separate hut from the main house

Surveyor: Abdi Kadir



Shukri (in white) stated, “We cook all foods and meals on the CleanCook stove. We use one liter of ethanol per day and that is sufficient. We used the three stone wood stove before the CleanCook stove, and we purchased wood at 70 to 90 Birr/month. Now that we don’t purchase wood, the saved money helps because food prices have risen and we share the rest of the saved money

with our relatives. With the wood stove, I had a runny nose, eye irritation and coughing. There is very little smoke with the CleanCook stove.”

HH 11: Khadra Deeq (Hened = husband)

HH size: 4

Kitchen is in a separate hut from the main house

Surveyor: Sahara Hussein



Khadra stated, “I use the CleanCook stove all day for all foods. I use about 0.75 L/day of ethanol, and that is enough. Before I used the three stone wood stove. One time each month my husband’s [20 year old] daughter collected wood for 12 hours. She had leg pain and torn skin from collecting wood. Sometimes we purchased wood at 40 to 50 Birr/month.” (Note: The husband’s 20 year old daughter is not Khadra’s daughter. The mother of the 20 year old daughter is deceased.)



Abdi Shiik holds Khadra’s son’s Koran tablet and stands with Khadra’s son. In the evening, children’s voices can be heard emanating from the Koran school. In unison, they recite passages for an hour or so after prayers.

HH 12: Yamla (24 year old cook; daughter); Ardo Sheekh C/Laahi (wife; mother)
(Maxamed = husband)

HH size: 10

Kitchen is in a separate hut from the main house

Surveyor: Sahara Hussein



Yamla stated, “I cook all foods on the CleanCook stove all day. I use 1 L/day and that is enough ethanol. Before I used the three stone wood stove. My mother and I both collected wood with one donkey for 12 hours one time each week. My mother had torn skin, and I was tired and had leg pain from collecting wood. Now that I do not cook with wood, I have no eye irritation and no leg pain. My mother’s skin is healing now. When I gathered wood, I missed my Holy Koran studies.”

HH 13: Fardowssa Xuseen (not present) (Xuseen Dubad = husband); we met with a guest named Nimco (far left in photo) staying at the house

HH size: 12

Kitchen is in a separate hut from the main house

Surveyor: Abdi Kadir



Nimco stated, “Fardowssa cooks all foods and meals on the CleanCook stove. She uses about 1 to 1 ½ L/day, and that seems to be enough ethanol. She used a three stone wood stove before and it took them more than one person to gather wood three times/month, 12 hours each time. Now they don’t use wood.”

HH 14: Amran Xuseen (C/Raxmaan S. = husband) (This is also the house where Cheryl, James, Dick, and Mukhtar stayed while in Denan.)

HH size: 5-8 people she usually cooks for each day

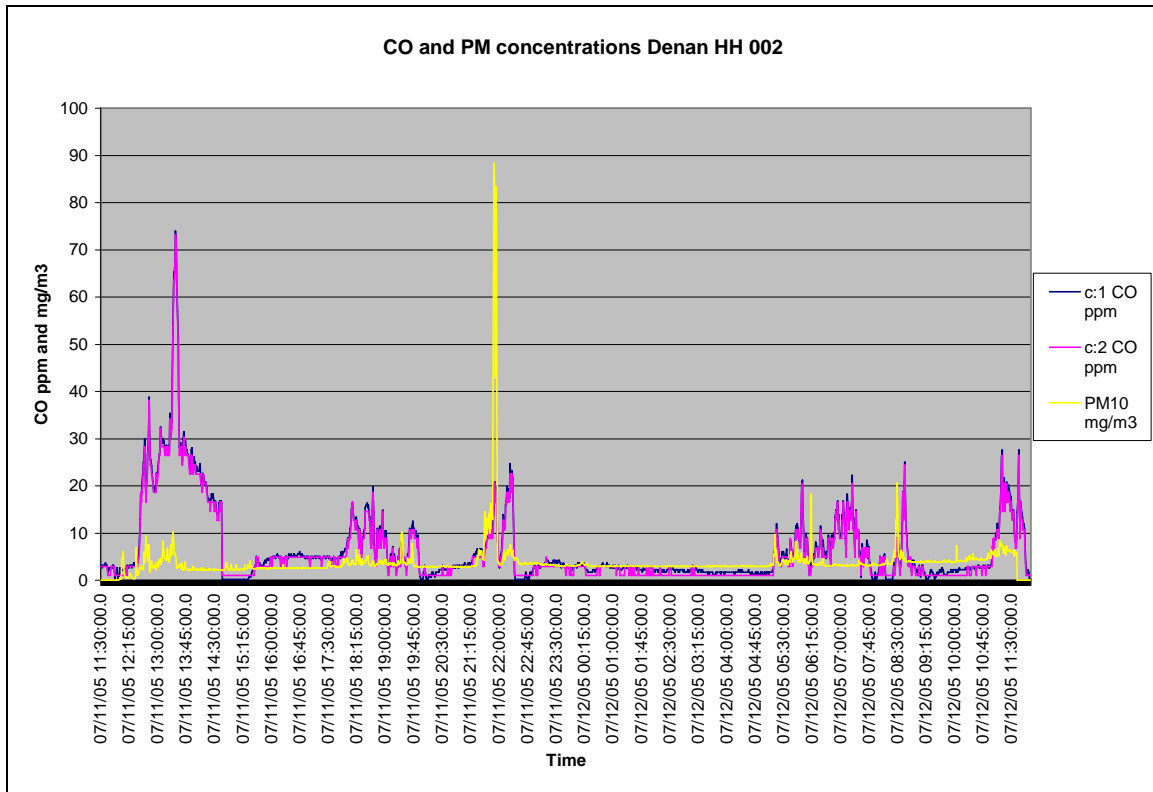
Kitchen is in a separate hut from the main house

Surveyor: Abdi Kadir



Noting that she has 4 extra guests eating three meals a day, Amran stated, “I use both the CleanCook stove and the charcoal stove when there are many people to feed like today. I usually use 1 L/day of ethanol and that is enough normally. Before the CleanCook stove, I purchased wood for about 90 Birr/month. There is a lot of smoke with the wood and charcoal stoves, my clothes are dirty and I have eye irritation. When I cook with only the CleanCook, I do not have these problems.”

Indoor Air Quality. Dr. Sadik, in a conversation with O’Brien, talked of the importance of the CC stove in addressing poor indoor air quality. He explained that exposure to high levels of pollutants while cooking does adversely affect the health of women and children especially. He said that respiratory illnesses would likely be reduced if the women were able to switch from cooking with wood to ethanol. PG tested the indoor air quality of a few homes during the July visit. Below is a typical reading of a common home in Denan, showing high levels of CO and particulate matter.



Price of Wood in Denan. At the request of PG and OWDA, Surveyor Abdi Kadir visited the local market in Denan and spoke with the wood sellers. Abdi found that the average price of wood for a cart load pulled by a donkey costs 70-90 Birr. He also found that the average household uses one cart load of wood per month.

During our visit to the IDP camp, we came across a home where wood was laid out in neat little bundles. When we asked what the cost was per bundle, we were told “1 Birr.”



“1 Birr per bundle,” the price of wood in Denan’s IDP camp

Challenges. PG Surveyor Abdi reported that Ruqiya Macalin Ismaeliil (a very poor HH participant) accidentally consumed 3 mouthfuls of ethanol. She needed to take medicine and so she asked a non-HH girl to get her a cup of water. The girl was not familiar with the house or the ethanol-fueled stove. Ruqiya’s gerry can of water looks the same as her gerry can of ethanol. The girl brought Ruqiya ethanol by mistake; Ruqiya drank it and quickly realized what had happened and began drinking a lot of water. She then vomited to flush her system. Surveyor Abdi Kadir told Ruqiya to go to the health clinic, but she refused. She said she was going to visit someone in Gode that day, so she would stop by the hospital there for a check-up. Surveyor Abdi Kadir said she has not returned from the trip to Gode, but he says she seemed fine to him when she left.

Mukhtar of OWDA informed us that they had asked the households in the study to provide their own gerry cans for the ethanol. As a result, the gerry cans used for ethanol often look like the ones used for water in the households. Most gerry cans we saw were dark yellow or blue. Mukhtar said the people also use green and black gerry cans in Denan. He said they have not seen white gerry cans in Denan, so he will see if OWDA can provide new white gerry cans for the ethanol to each study household. If OWDA cannot supply the gerry cans, Mukhtar will speak with the Gaia Association about purchasing gerry cans.

While in Denan, a battle between the ONLF and the Ethiopian Army broke out 25 km from Denan. The army lost 4 soldiers, while 11 ONLF combatants were killed. Safety is a concern while working in the region, though we were assured that as guests of OWDA, the ONLF would not harm us because of their respect for OWDA. However, perhaps a greater concern expressed by others would be the Ethiopian Army doing something and making it look like it was the ONLF. It is essential that PG Staff travel with OWDA at all times when in Denan.

Possible fuel gathering threat: Landmines.

Mowlid Faisal, a 14 year old goat and sheep herder, was injured by a landmine from the 1970s war between Somalia and Ethiopia. While herding, Mowlid picked up what he thought was a plastic flashlight. When he saw that it was not a flashlight, he dropped it on the ground and it split open. It looked like a metal toy was hidden inside. Mowlid picked up the metal “toy” and it immediately exploded. Dr. Sadik amputated some or part of his fingers. While Mukhtar Omer translated, Mowlid told O’Brien that he would like others to be aware of the threat of landmines in the Denan area. Certainly, landmines could threaten women and girls traveling far across land in search of fuelwood and water.



Mowlid Faisal, landmine victim

Water. The scarcity of water is the biggest challenge facing Denan. It is likely that the town’s wells will be dry by the end of January 2006, leaving them with a 12 km walk to the nearest water source, which was expected to dry up by the end of February, leaving Denan dependent on water being trucked in by the UN. Young’s negotiations with the U.S. military well-drilling detachment in Gode regarding the construction of a water distribution system took first priority when meeting with the administrators and elders.



Dried-up water hole in Denan. The women and girls walk farther and farther to fetch water and fuelwood.



Empty water tank becomes a canvas for children. Even the medical clinic’s water tank was completely dry upon our visit.

Small watering-hole where a 2 year old girl and a 5-year old girl collect water. Fetching water and collecting fuelwood are traditional unpaid jobs for women and girls in the Denan area. Cattle also drink from and excrete in the same water source.



Conclusions. While packing, several men came to the house and asked to see us. They spoke with us, with PG Surveyor Abdi Kadir serving as translator. They told us that they do not want their wives and daughters collecting wood anymore. They told us about the health problems with the wood and charcoal stoves. Then they gave James and Cheryl an "application" for CleanCook stoves on a simple thin piece of paper. It reads:

Date: 12/12/05

Application for stove

We are member of people who live in Denan
 So we are requesting from your project of stove
 to give us or help the stove, B/C we have seen
 the people who have taken already, B/C they
 got satisfied from the wood-fire. and so many
 things, So, we are so many people who live in
 Denan especially in section (2) so we are requesting
 from you to consider our application, and even
 we are ready to pay the price of stove
 please and please we are begging to put this
 application under your consideration
 And Here ~~are~~ there are

this application
 prepared by
 mr nur muhamed
 farah

1. Dahab sh. Hasan
2. Bisharo Ahmed Hadi
3. Dalays muhed Farah
4. Abshiro sh. muse
5. Nuur muhamed Farah
6. Abshiro Abdi ma. alii
7. Fatumo ma. alii yausuf
8. Khalid Nur muhed
9. Maryama Abdi Ali
10. Fatumo Ibrahim
11. Rahma Abdi burale
12. Sahra mohamed sofe
13. muse adan dhafane
14. Rutiya burale Haji
15. halimo Aba yaro

While we told them that we could not guarantee that they would receive stoves, we told them that we would try to seek more funding for the project in Denan. They seemed disappointed, but said, “Thank you for coming to Denan.” They each shook our hands and wished us a safe trip to Addis. Then they departed in a group as they had arrived.

The immediacy of a new cooking technology in Denan is apparent. For miles, the desert is void of trees, making each day a struggle for food preparation. A mechanism for introducing more stoves to the town needs to be researched. OWDA has stated they would continue to support the CC stove initiative in Denan. Mukhtar said that OWDA may be able to pay for ethanol supply and transport if OWDA can get a contract from FINCHAA. Mukhtar discussed the possibility of seeking a contract with Metahara Sugar because it is geographically closer to Denan. Metahara does have plans to begin ethanol production. PG should collaborate and support OWDA to follow up on Mukhtar’s query. If OWDA could provide ethanol to Denan, PG could seek donor monies for the purchasing of additional stoves for Denan.

The future of PG’s efforts in Denan depends on the ability of OWDA to supply ethanol to the town. PG is currently not in a position to continue providing ethanol free-of-cost to OWDA beyond the three month pilot study. More stoves could be placed only if ethanol supply is secured and if monies are found to purchase the stoves. It is unlikely that the people of Denan could purchase a CC stove at its current cost, despite the sentiments expressed in the “Application for Stove” above. Given those sentiments, it is essential that PG and OWDA make every effort to bring a cleaner cooking technology that requires no fuelwood gathering to the people of Denan. The extreme living environment of the region demands that PG continue to work with OWDA and The Denan Project to improve the lives of Somali people in and around Denan.

For more information on Project Gaia, visit www.projectgaia.com.

For more information on The Denan Project, visit www.thedenanproject.com.