

# Testing of the CleanCook Alcohol Stove in Refugee Camps in the Horn of Africa



Prepared by Harry Stokes for  
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"The global refugee problem is massive and growing..." \* Over 25 million refugees and more than double that who are displaced in their own country because of drought, famine, war or tsunami.

East and Central Africa have more than a third of these refugees.

Often they live in camps as large as cities. The environmental impact of these emergency settlements is enormous. A major impact comes from the harvesting of biomass in the surrounding community for cooking.

\* Boiling Point No. 37, June 1996

Ethiopia has 65 million people, second only to Nigeria among African countries. Despite a settled culture, skilled manpower and some excellent farmland, the country is chronically short of food. In the drought year of 2003, an estimated 11 million people needed international food assistance. In "favorable" crop years 4 to 5 million Ethiopians need food aid. Malnutrition and starvation are constant threats to Ethiopia's poor majority. Eighty percent of Ethiopians are farmers who produce too little food on too little land.

Tuesday, October 5, 2004/ The Sun

## IN BRIEF

### **Ethiopia dependent on foreign food aid**

ADDIS ABABA, Ethiopia — At least 4 million Ethiopians would die each year without food aid, a British aid group said Monday, marking 20 years since a devastating famine killed more than half a million people in the impoverished country.

Now, foreign aid should focus on lifting this nation of 70 million out of poverty, rather than just keeping people alive with food handouts, the Save the Children aid group said.

"Millions of people in the historically famine-prone northeastern highlands are worse off and more vulnerable than ever," said Mike Aaronson, head of the group.

Ethiopia is virtually completely deforested.

What remains is less than 3% of its historical forests. The urban centers (and these must now include the quasi-permanent emergency camps) are consuming what remains of Ethiopia's woody biomass—acacia for charcoal, eucalyptus for direct burning, and whatever else can be found.

Biomass is hard to find and gather now, and expensive to buy. Soon there will be even less.

In the remote western Sudan province of Darfur, several million people have recently been displaced and many more are being displaced.

Although eclipsed by the humanitarian crisis in the Darfur, in southern Sudan an estimated 4 million people have been displaced by a 21-year civil war between North and South that has killed at least 2 million.

In the Somali Region of Ethiopia, several million people are currently displaced as a result of severe, on-going drought.

**Violence against women in Darfur:** The crisis in the remote western Sudan province, Darfur, threatens several million people with death and displacement. The Janjiweed militia prey upon women and girls as they leave camps to gather firewood. Trees are scarce and overpopulation in camp areas is causing rapid deforestation. Fuel gatherers must travel farther out each trip. They know it is only a matter of time until they will be seized and raped or killed. (Refugees International, 11/5/04)



**Morning breaks in the Hessa Hissa IDP camp near Zalingei.  
Women prepare to depart the camp to find firewood. (Photo:  
Cassandra Nelson, Mercy Corps)**



Camps consume enormous amounts of biomass.  
These are Sudanese at the Hessa Hissa Camp.

Cassandra Nelson, Mercy Corps





Camp families consume a great deal of biomass daily—an estimated 1.7 to 3 kg per person, sometimes more than they traditionally consumed in their previous way of life.

Based on 1995 demographics, 6.8 million kg of firewood were consumed in East African camps on a daily basis. (Gitonga, ITDG, Boiling Point No.37)

In Ethiopia, a new sugar factory distillery is capable of producing some 12 million liters of ethanol per year, with the sugar industry generally able to produce triple that amount.

The ethanol has not found an export market nor has it been accepted for automotive fuel blending.

Six million liters are sitting in storage with no market, preventing the distillery from continuing to produce. This ethanol would cook **at least 18 million meals** for refugees who have diminishing access to biomass fuels.

We are placing stoves with 500 families in the city of Addis Ababa as we design a fuel distribution infrastructure for the city. We are placing several hundreds of stoves in two UNHCR camps and one camp in Ethiopia's Ogaden region. We are also placing stoves in some 14 orphanages of children of HIV/AIDS run by the Mother Teresa Mission of Charities. Some of these facilities are in locations where biomass resources are very scarce.



The ethanol can be delivered by truck to storage depots at or near the camps, or can be transported in steel or plastic barrels on conventional trucks. At the camps, the ethanol is appropriately containerized for daily rationing.





This is the camp in the Somali region of Ethiopia, the Dhenan IDP camp, where stoves are being tested by a local NGO, the Ogaden Welfare and Development Association. As one can see, this is a very difficult environment for stoves.



# Storage Tent at UNHCR Sheraro Camp for Stoves and Ethanol





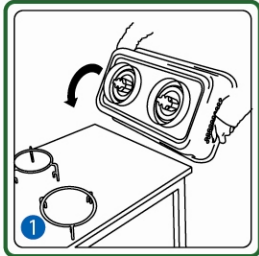


Mud Brick Houses at Sheraro Camp  
Stoves Will Be Placed with These Houses First

# Double-sided plasticized user manual reviewing the "dos" and the "don'ts" of the CleanCook Stove

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 የደኅና / ደሣቲክ ክስ፣ ንኩክ ምድጃ  
 Safety instructions for Iacona / Dometic Clean Cook Stove





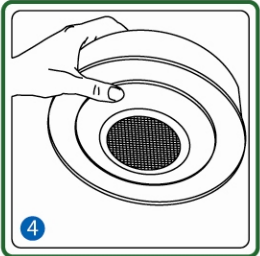
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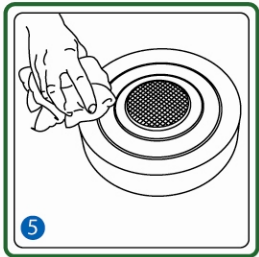
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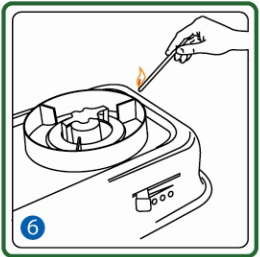
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5. የተንጠባበቀ ነጻድ ካለ ታንኩቹን በሚገባ ይጥረጥሩ፡፡ በትክክል ምድጃው ላይ መገጠሙን ያረጋገጡ፡፡ ምድጃውም ሆነ ታንኩቹ ምንጊዜም ከከይት ነክ ንጥረ ነገሮች ነፃ መሆን ስለባቸው



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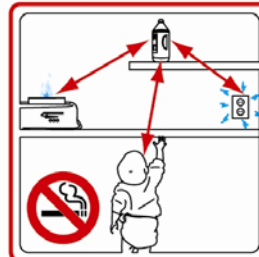
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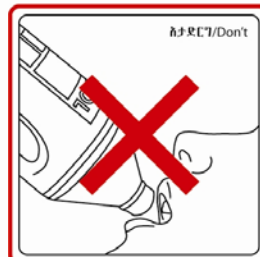
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የማይሰማ

**ማስጠንቀቂያ**

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**የጥንቃቄ መመሪያዎች**  
 የደኅና / ደሣቲክ ክስ፣ ንኩክ ምድጃ  
 Safety instructions for Iacona / Dometic Clean Cook Stove






All liquid fuels should be denatured for safe use!

The ethanol is denatured with a strong bittering agent and colored with a dye. Alcohols can be denatured more effectively than kerosene because they are not fatty and do not coat the tongue or taste buds. The bitter taste of the alcohol is immediately detectible and repugnant.

**CLEAN** ኤ.ታ.ኖ.ስ  
**ETHANOL** **COOK**

**የ ማይ ጠጣ / DO NOT DRINK!**

**ይዘት:** 1.2 ሊትር ዲናቸር አልኮል **Content:** 1.2L Denatured Alcohol.

**ማሳሰቢያ:** እንዲያውም - ግዴታ ይጠይቃል - ግዴታዎን ወስኖ ከገባ ህይወት ለመግባት በደንብ ይታወቅ - ስሜት በማይደርስበት ቦታ ይቀመጥ - የኢትዮጵያ መንግሥት ከፍተኛ በደንብ ይገዛል - እሳት ካለበት አካባቢ ይቀርብ - እሳትን በውሃ ማጥፋት ይቻላል - ለምሳሌ / ተኩ ከሊንክ ምድቅ ብቻ

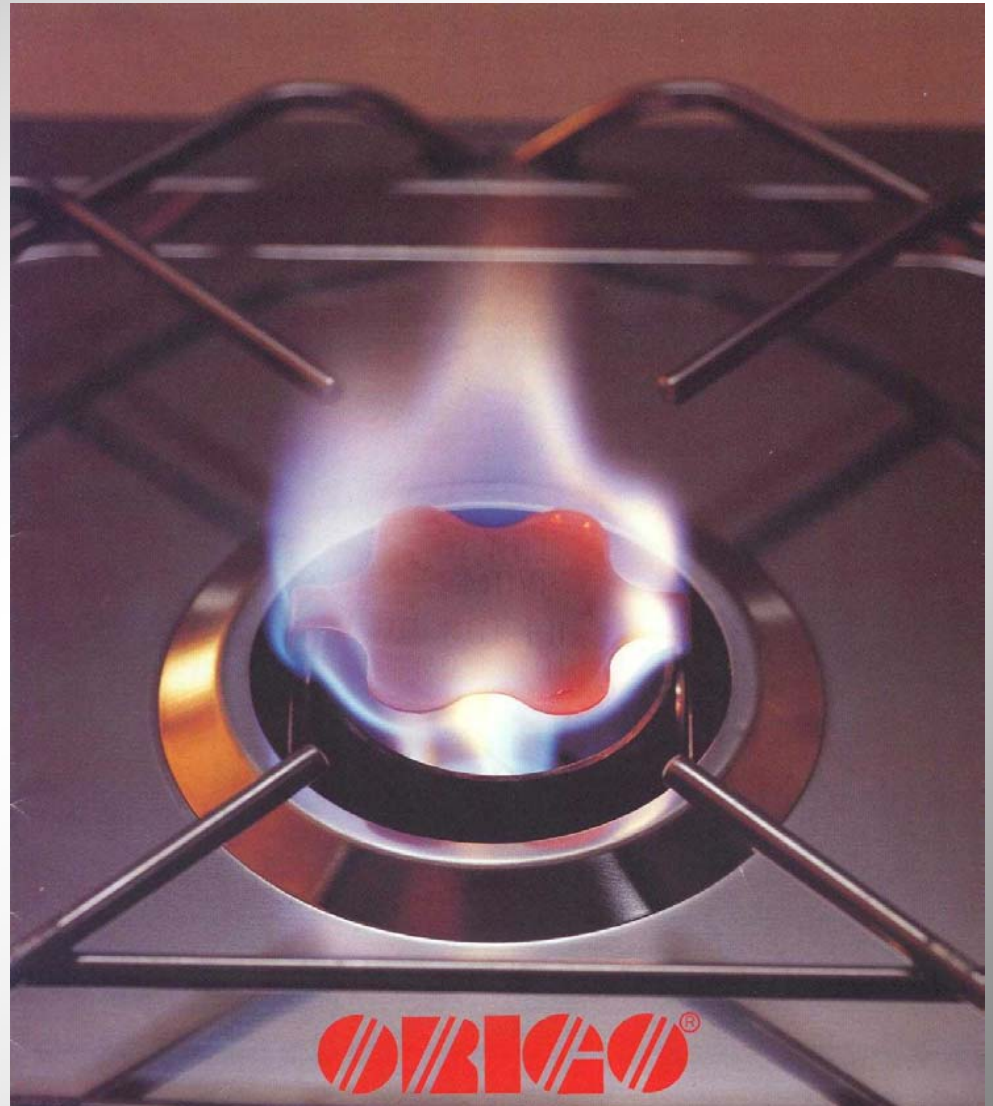
**Warning:** Do not drink. Do not get in eyes. In case of contact immediately flush eyes with plenty of water. Keep away from children. Keep container closed away from heat, sparks and flames. Fire can be extinguished with water. To be used with the lacona / Dometic Clean Cook Stove only.



**ETHANOL PRODUCED BY FINCHAA SUGAR FACTORY**

Alcohol's typical blue flame. This blue flame has apparently helped in Ethiopia with the switch from charcoal to ethanol.

This burner has a heat output of 1.5 to 2 kW, similar to the burner of an LP gas stove.



# Which stoves will the CleanCook replace?

Below are “change motivators” that could encourage a switch

Q=Quality, C=Convenience, S=Safety, A=Availability, E=Economy

Market Sector	Electric	LPG	Kero	Charcoal	Wood	Dung	Leaves & Twigs
Upper Income	A	A		A			
Middle Income	AE		QSAE	CAE	QCAE	QCA	QC
Lower Income			QSAE	CAE	QCAE	QCA	QC

Ethanol and methanol are very clean when they burn — as compared to the smoke, particulate matter and complex mix of organic compounds produced by the burning of biomass fuels and kerosene.

Analyte	Unit	Test 1	Test 2	Test 3	Test 4
Time to burn 500mL fuel	minutes	129	127	130	125
Water left from 2500mL	mL	509	899	412	738
Carbon monoxide, CO	ppm	19	17	20	20
Carbon dioxide, CO <sub>2</sub>	ppm	2050	2100	2450	2400
Nitrous fumes, NO <sub>x</sub>	ppm	<1	<1	<1	<1
Formaldehyde, HCHO	ppm/hrs	<1	<1	<1	<1
Ethanol, C <sub>2</sub> H <sub>6</sub> O	mg/m <sup>3</sup>	2.97	<0.01	3.77	<0.01
Methanol, CH <sub>4</sub> O	mg/m <sup>3</sup>	<0.01	6.54	<0.01	11.15



One day, we will harvest the last tree if we do not find a way to make the switch to improved fuels.

