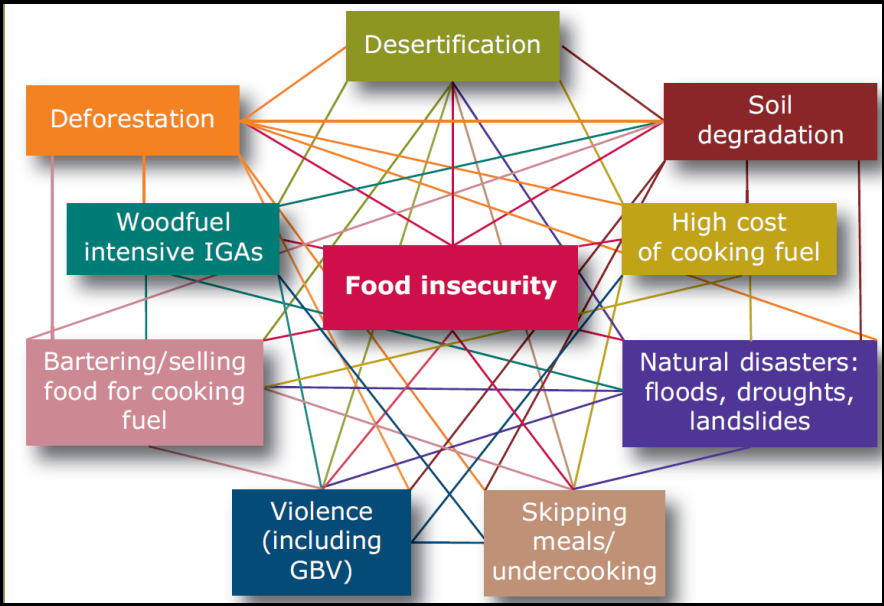

StoveTec Super Pots

A review of East Africa pilot testing results

Food Security and Nutrition Unit
UNHCR Regional Support Hub

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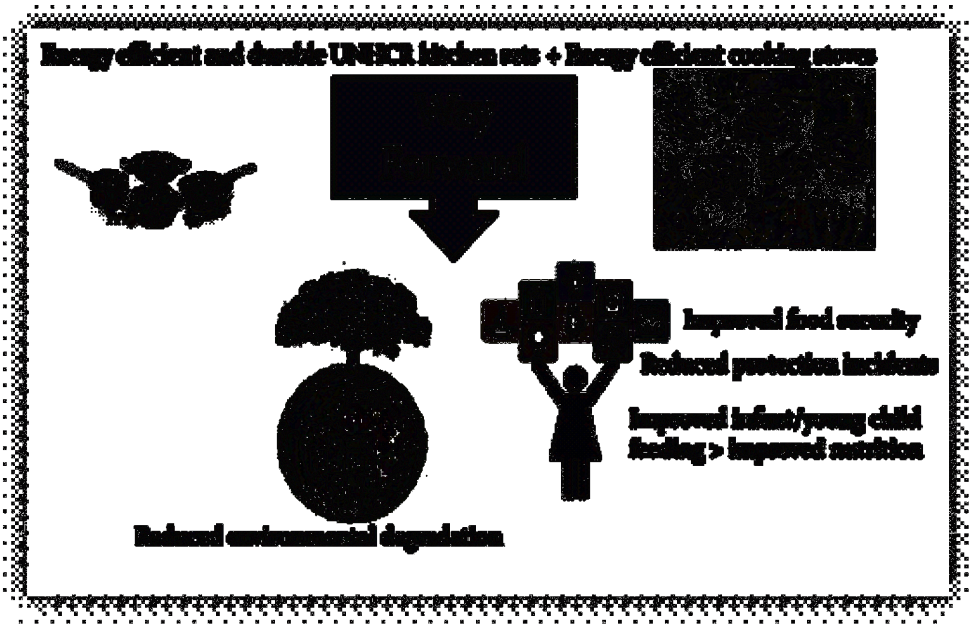
INTRODUCTION

Figure 1: CO Report Dadaab



Background

Lack of safe access to fuel or to fuel-efficient stoves in humanitarian contexts has far-reaching consequences. The collection, supply, and use of firewood influences food assistance outcomes, long-term food security, beneficiaries' safety, dignity, health and livelihoods, women's vulnerability to gender-based violence, and the environment (UNHCR, 2014). The myriad reasons and breadth of risks reveal the multi-dimensional protection issues inherent to the issue of safe access to firewood and alternative energy (WRC, 2006; UNHCR, 2009; WFP; 2012).

The ultimate goal of the 2014-2018 UNHCR Global SAFE strategy is to increase refugee self-reliance by properly addressing various socio-economic, gendered and environmental impacts of unsuitable and unsustainable energy and fuel options. Exploring innovative interventions and appropriate technologies that may work to strengthen and compliment food assistance programming is a fundamental component to this strategy and its guiding principles, and is essential to the organization's overall goal of reducing risks that have direct bearing on protection, food security and nutrition.

Purpose

As part of the SAFE strategy, focus has been on the potential suitability of fuel saving stoves. Findings from site testing indicate that though beneficiaries appreciate the fuel saving stoves, nearly all stoves were difficult to refuel and none of the stoves had any effect on cooking time (USAID, 2010). UNHCR is

continuing to mobilize resources to look into additional possibilities and ways to meet the objectives of SAFE, one of which is by testing a cooking pot that is claiming to have inherent energy saving properties.

Based on pilot testing results from seven field sites in five countries, this report assesses and evaluates the suitability of the StoveTec Super Pot against the 2014-2018 SAFE guiding principles, and whether it meets the criteria required for acceptable performance: proven fuel efficiency, significant cooking time saved, water usage, and high general acceptance from the beneficiaries.

METHODS

2. The Stovetec Super Pot

The StoveTec super pot is a stainless steel 7 liter volume cooking tool that can utilize any fuel source. It has a greater skirt surface area, which increases heat transfer and supposedly reduces emissions and fuel use up to 30%. This skirt also protrudes below the base by 3cm and thus increases safety as the pot cannot slide off stove while pot is being stirred.

2.1 Objectives of pilot testing

Broad objectives of the pilot testing were as follows:

- To explore possibilities to improve energy efficient cooking in refugee settings
- To consult refugees about their preferences and needs with particular focus on refugee women

The specific objectives of the pilot testing were:

- To compare cooking time between super pot and regular aluminum pot
- To assess degrees of fuel efficiency as compared to regular pot
- To compare results when testing different variables: super pot windshield, fuel source, food type
- To received feedback from refugees about suitability, efficiency and usability of super pot

2.3 Test Locations

Pilot testing took place in seven refugee camps in four countries in East Africa: Kenya (Kakuma, Dadaab); South Sudan (Yida, Maban); East Sudan (Kilo 26); Ethiopia (Dollo Ado; Bambasi).

2.4 Limitations

Methods used to conduct pilot tests were not consistent across sites.

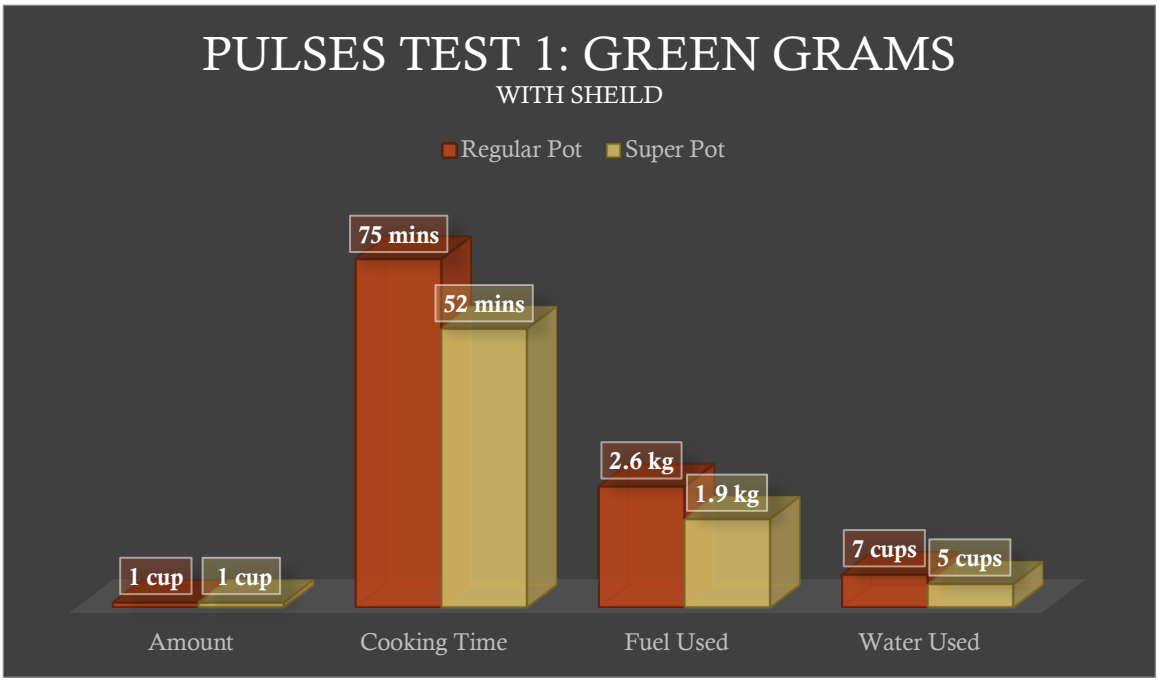
RESULTS

3.1 KENYA

3.1.1 KAKUMA

The test site was located in Kakuma I at the Turkana Café. Twenty participants from the Ethiopian community attended. Two tests were conducted: the first with 1 cup of green grams and the second with 1 kg of beans. Both tests were trialed by using open fire – using three stones for each test as opposed to jikos.

Figure 3.1.1.1 PULSES: Green Grams

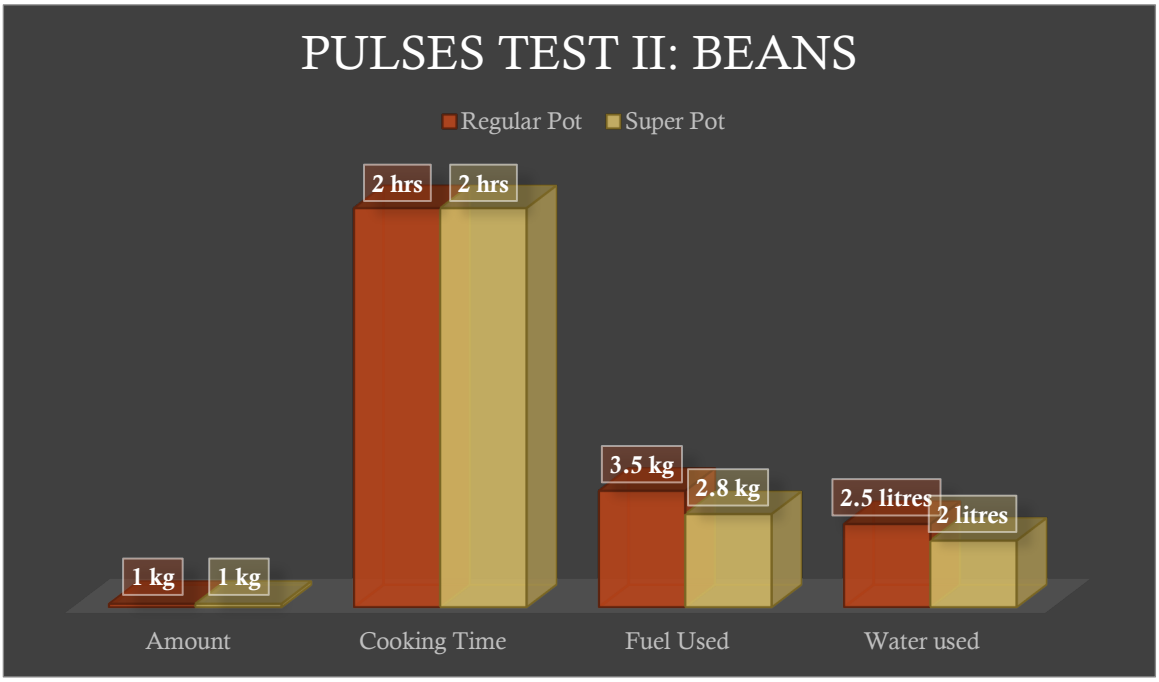


Some discrepancy was noted when boiling water with and without the Super Pot windshield. Without the windshield, water reached boiling point in 15 minutes; with the shield boiling point took 9 minutes. Overall cooking time for the super pot when using shield was 52 minutes, which is 23 minutes faster than the 75 minutes cooking time of regular pot. Windshield is a device unique to Super Pot and increases efficiency yet the test participants observed that it was difficult to use as it needs to be "screwed in place and the bolts used may get lost" (Kakuma Report, 2014, p.2). With the shields, however, the super pot

performed better on all indicators – specifically water and fuel consumption. **Fuel savings amounted to 36.8% for green grams**.

For the beans (figure 3.1.1.2 below), no windshield variable was conducted. The results illustrate that Super Pot is efficient and **saved participants 25% fuel consumption**.

Figure 3.1.1.2: PULSES: 1 kg of Beans



Tests conducted in Kakuma overall yielded very positive results. The participants confirmed that cooking time is faster – with or without shield - fuel is saved, and water is conserved even if only by a scant amount. Participants agreed that Super Pot is a much better option than the regular cooking pots not only because of the efficiency but they are apparently also easier to clean, saving more energy and water.

> *"Women and girls spend a great deal of time securing cooking fuel. This limits their ability to engage in safer, more productive activities, including earning an income or attending school"*
>
> *SAFE Guidelines, WFP, 2012, p. 28*

3.1.2 DADAAB

Two different tests were conducted in Dadaab. The first test site was Ifo 2, and consisted of a focus group and testing with a mother-to-mother support group, consisting of 15 mothers including the section leader. This group used 3 pieces of firewood per jiko to test cooking time and efficiency when cooking green grams. 3 cups of water was used in both pots. The team did not measure fuel consumption post-testing to see if there was any difference between the pots. The regular pot had water left over after cooking, indicating that the regular pot would require less water to cook the same amount of food.

> *"Less usage of firewood would mean less incidences of rape while women are out there collecting firewood"*
>
> Test Participant, Mother-to-Mother Group, Ifo2, Dadaab

Figure 3.1.2.1 Green Grams Ifo 2

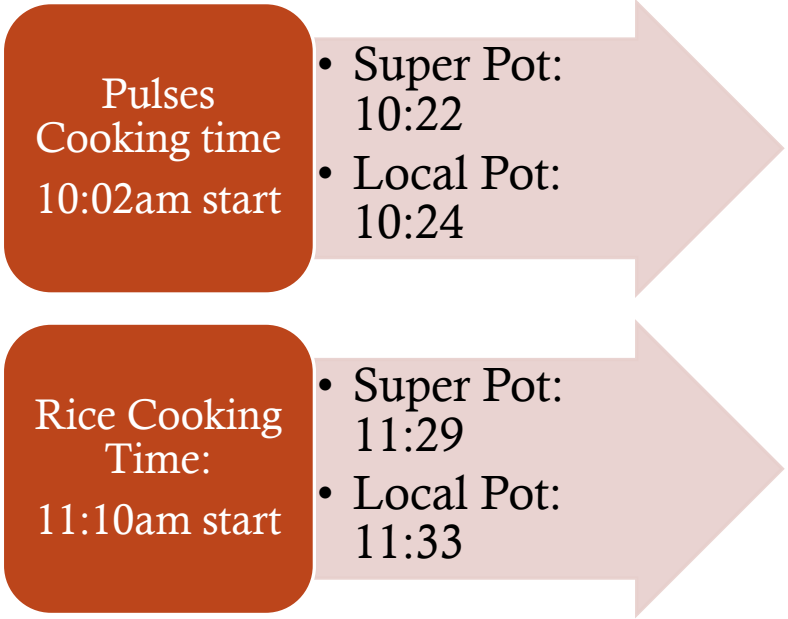
Some limitations of this study were that no post-test measurement of the wood was done to compare fuel consumption and only one foodstuff was used. The pans were also kept closed and the timing of boiling is not accurate. Finally, testing was only done with jikos, and some participants reported that some families still do not have jikos and used traditional 3 stones. No information was gathered regarding the format and volume of pot, whether the women actually liked the pot.

The team did manage to collect feedback from the mothers and team. These include:

- ✓ Smoke expelled from the sides of the pan and does not enter the pot thus no change in the smell and taste of food
- ✓ Super pot cooks food faster and thus less firewood used
- ✓ Less usage of firewood and faster cooking would mean less protection incidents, more time for infant/child care
- ✓ With the super pot there was less heat loss and firewood consumption by wind as most of the surface was covered with the pan unlike the traditional pot

Better energy (or cooking?) can be obtained if the surface of the cooking stove was flat thus all heat could be channeled through the secondary layer of the super pot. Two tests were conducted in Hagadera by a mother-to-mother support group at the health post. The mode of cooking was charcoal for both tests, one cooking rice and the other pulses.

Figure 3.1.2.2: Rice and Pulses, Hagadera Health Post



Testing with the pulses began at 10:02 a.m., and the super pot finished cooking in twenty minutes. However, the super pot required more water to cook the pulses, the pulses subsequently got burned in the process due to unexpected high evaporation. Fuel was not measured at the end of this test, and no indication of how much water was used.

The rice test yielded similar results. No measurement was made for water or for fuel. Rice cooker faster in the super pot by 4 minutes.

Participants also noted that the super pot generated too much heat. "For the stovetec, there appears to a need to have low heat especially for rice. The food tends to cook much faster and the water got finished before the rice was ready. Initially, one litre of water was added to 0.5 kg of rice in both pots but ¼ litres of water had to be added to the rice in the stovetec[sic]" (Hagadera test, 2014, p. 1). This would imply that additional information and sensitization would be needed to instruct on changing cooking techniques to adapt to the increased energy supply.

Every day, millions of women and children risk being raped, beaten or killed as they search for and collect the firewood they need to cook their food. In poorly ventilated dwellings, smoke from solid fuels exposes occupants to heightened risks of respiratory diseases. Women and children are especially susceptible because they spend the most time near the cooking area. Use of wood and charcoal for cooking also contributes to environmental degradation. This, in turn, may limit livelihood options and food assistance outcomes.

- WFP, 2012, SAFE Guidelines, p. 7

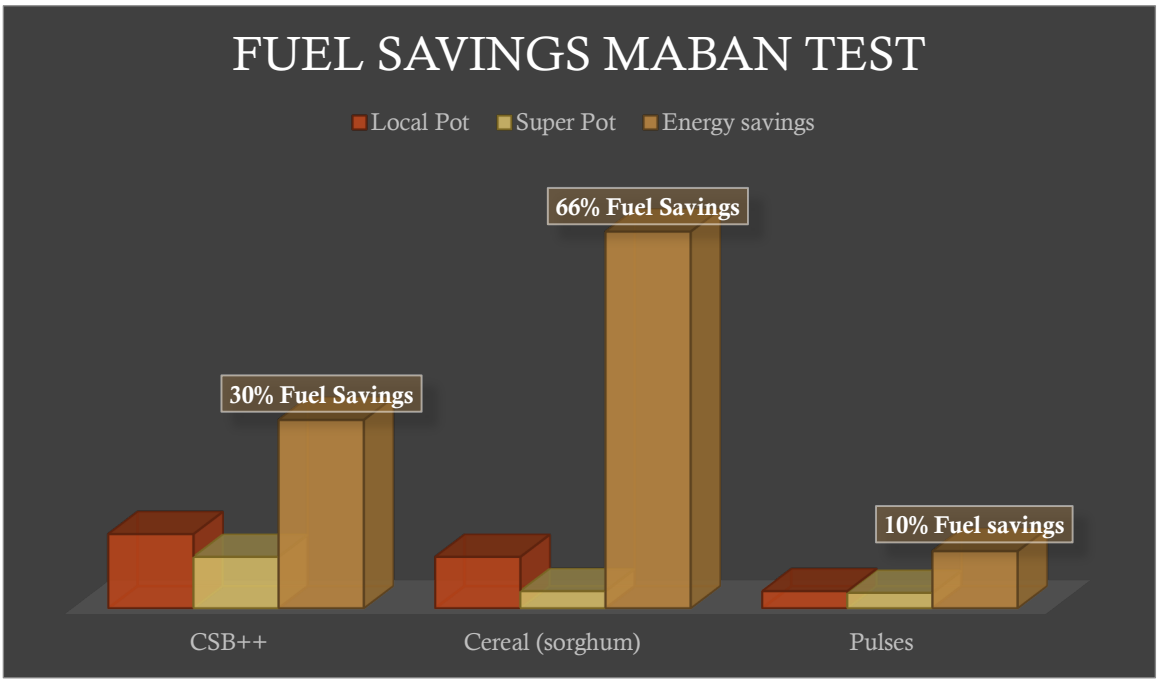
3.2 SOUTH SUDAN

3.2.1 Batil Camp – Bunj Office Maban County – Upper Nile Province

Testing of the super pot was conducted in late November 2013 with a mother-to-mother support group. The team and participants assessed and compared the differences in cooking speed/time, quantity of firewood/charcoal used by type of food – CSB++ (750ml), grinded Sorghum (1gm) and pulse (1gm), differences with and without use of windshield on super pot, and the preferences and experiences of the mothers in the group. **The windshield was not used/assessed.*

Significant differences in cooking time were noted: for CSB++ Stovetec super pot cooked 8 minutes faster than the local pot; for cereal, there was a difference of 4 minutes. With pulses, super pot cooked faster by 5 minutes. Overall, Stovetec is time efficient. The fuel savings are particularly impressive.

FIGURE 3.2.1.1: *Fuel savings documents November 28, 2013 Maban, South Sudan*



For the CSB++ 4kg of charcoal/wood was used to begin the test, and the Stovetec used 0.9kg to cook the porridge compared to 1.3 kg used by local pot. Saving 0.4 kg of wood corresponds to a **fuel savings of 30%.**

Team used 3.3kg of wood to begin the test with cereal. 0.3kg of wood was used by Stovetec to cook the sorghum while the local pot used 0.9. Saving more than 0.6kg of wood corresponds to approximately **66% more fuel savings from super pot.** The pulses needed 4kg to being, with Stove Tec using only 2.7, local using 3kg**. Fuel saved is only 10%,** but added up over time, it is a significant amount of energy.

"The women show a great interest on using StoveTec as compared with the local aluminum pot. From the current experiences, they have noticed the time saving qualities of the pot"

-Team leader, Maban Testing, 2014

"They know, with Stove Tec, they could consume less firewood. They have found this very important in a contest where they are confronted with difficulties (conflict with host communities) to get firewood."

-Team leader, Maban Testing, 2014

3.2.2 Yida Camp

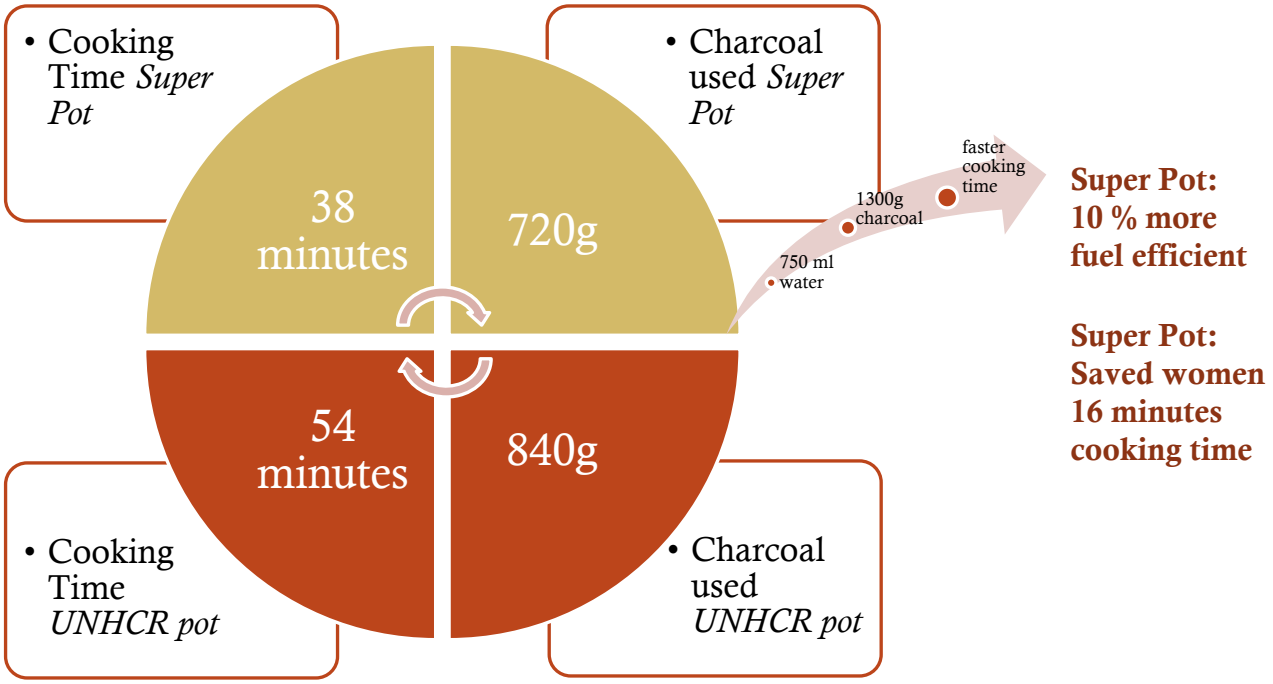
Testing was conducted on February 7th, 2014 in the form of a cooking demonstration with mothers who participate in the PLW BSFP. Participants used 400g of yellow split peas and 250g of sorghum flour for testing.

"In most refugee settings, women and girls are responsible for getting cooking energy; using less energy translates to decreased frequency of looking for firewood which therefore minimize their exposure to protection risks such as rape or other associated protection risks."

-Yida test participant, PLW program, Yida camp, February 2014

In both tests 750ml water was used for each pot. Participants used the super pot windshield for both tests, and 1300g of charcoal was placed under pots and used throughout both tests. Time saved with sorghum flour was an added 4 minutes with the super pot. The yellow split peas tests yielded better results.

Figure 3.2.2.1: Yellow Split Peas Test



Together, both tests saved women 20 minutes in overall cooking time. According to the participants, this **time saved "can be used for other productive household economic activities or be dedicated to childcare which will effectively improve the nutrition and health status of the children and the entire household members" (Yida report, 2014, p. 3).**

3.3 SUDAN

3.3.1: East Sudan – Kilo 26 Camp

Testing was conducted at hospital kitchen inside Kilo 26 hospital complex by four people including two cooks and the HAI nutrition coordinator. 500g of lentils were cooked in 750ml of water in both pots on improved stoves. Report does not indicate whether windshield was used, nor did they measure for fuel consumption. The super pot cooked the lentils in 27 minutes, as opposed to aluminum pot, which took 34 minutes, for a difference of 7 minutes.

Cooking Start time	•Super Pot: 9:01 •Local Pot: 9:01
End TIme	•Super Pot: 9:28 •Local Pot: 9:34
Time Taken	•Super Pot: 27 minutes •Local Pot: 34 minutes

Limitations of study:

- 800g of wood as charcoal was used, but charcoal not measured/weighed at the end. **Fuel consumption unknown**
- Did not specify whether windshield was used
- Did not note whether any water was left over and/or needed to be added

3.3.2: Um Gargour Camp

One test was conducted at this site with two cooks from Um gargour hospital and the HI nutrition coordinator. Each pot was placed on top of three stone traditional fires and filled with 1/2kg of *fuulu* and 3 cups of water.

The experiment yielded negative results for the super pot. It cooked *fuulu* faster by only 1 minute. The following observations were made:

- Water dried up faster in the super pot; at one point more water was added
- Super pot burnt *fuulu* at the bottom and when cooked smelled smoke
- No conclusive evidence that super pot is fuel efficient
- *Fuulu* made not be the best test commodity as it is difficult to cook. However, it is the most highly consumed and cheapest commodity in the community so therefore may be the best test food for this area.

3.4 ETHIOPIA

3.4.1: Assossa/Bambasi Camp

Women from a self-help group for the promotion of livelihood and self-reliance activities gathered with UNHCR, AARA and LWF representatives. Participants ran four field tests with 2 different commodities and fuel sources:

- ✓ Lentils/Kerosene/Kerosene Stove
- ✓ CSB/Kerosene/Kerosene Stove
- ✓ Lentils/Firewood/Open Fire
- ✓ CSB/Firewood/Open fire

Community Voices

- Fuel consumption on kerosene stove was less for techo pot
- Fuel consumption was higher in traditional 3 stone
- Techo pot loses water faster than regular pot, evaporation is higher. This is not liked by community
- External part of Techo pot is difficult to clean; internal part is easily cleaned compared to local pot

S. Tadesse, Stove Tec pot testing Ethiopia, p. 5.

Table 3.4.1.1[1]

Use of Kerosene fuel and Kerosene stove		
Pre-test preparation for boiling water	• 1Lt water each • 1000ml (1Lt) kerosene) each • Test under shade (inside room) • Same size Kerosene stove • Trades kept equal size • Fire set at the same time • Kept on the stove same time • Cover opened same time for checking	

[1]Tables in the section are taken directly from CO report: S. Tadesse (2014). *Stove Tec super pot test in Ethiopia: Assossa/Bambasi camp of Sudanese Refugee in Benishangula-Gumuz Regional State of Ethiopia.*

Test results		
Boiling water	9 minutes	12minutes
	3 minutes difference	
Pre-test preparation for cooking lentils		
	• 0.5Kg lentils each • 2Lt water each • Fuel same amount • Cover opened same time for checking • Type of food prepared: Boiled plane lentils (nothing added, only water and lentils))	
Result cooking lentils	40 minutes	55 minutes
	15minutes difference	
Fuel consumption for boiling water and cooking lentils	150ml	240ml
	90ml difference	
Fuel consumption in %	15% fuel utilized	24% fuel utilized
	Fuel efficient by 9% from the regular stove	
Water remained after cooking	20% water remained	30% water remained
	Water evaporation high by 10 % during cooking	
Pre-test preparation for cooking CSB		
	• 0.5Kg CSB each • 1 Lt water each • Fuel 1000ml (1Lt) each • Cover opened same time for checking • Type of food prepared: Traditional tin porridge	

Results indicate that community perspectives are positive for the StoveTec super pot. The water boiled faster in the super pot by 3 minutes and the lentils were cooked 15 minutes earlier on kerosene stove, while also being 9% more fuel efficient than the regular pot. When testing CSB on kerosene stove, super pot was 4% more fuel efficient and save 7 minutes of cooking time.

When testing water, lentils and CSB on a three stone stove and firewood participants found a 2 minute difference when boiling water, a 2 minute difference also between pots when cooking lentils and virtually no difference in fuel consumption.

Data indicates that super pot is not as efficient when used on firewood and traditional 3 stone stove than when used on an improved stove with firewood or when used with kerosene stove.

Result cooking CSB	12 minutes	19 minutes
	7 minutes difference	
Fuel consumption	40ml	80ml
Fuel consumption in %	4 % fuel utilized	8% fuel utilized
	Fuel efficient by 4%	
Traditional three stone stove and fuel wood utilization		
Pre-test preparation and conducting test	• 2Kg fuel wood each (similar size woods are selected) • 2Lt water for boiling • 0.5 Kg lentils • 0.5kg CSB • Three stones equal size/height for the stove • Test undertaken inside shade (Kitchen) • No wind shield: followed traditional way of cooking • Cover opened same time • Cooking time included boiling of water • Time recorded for boiling water and cooking food • Remaining wood measured	
Result water boiling	7 minutes	9 minutes
	2 minutes difference	
Fuel not measured for boiling water		
Result cooking Lentils	37 minutes	39 minutes
Fuel consumption for boiling water and cooking lentils	1.25 kg	1.5kg
	0.25kg difference	
Fuel consumption in %	62.5%	75%
Water remained after cooking	Almost all water used: 5% remaining	About 15% remained
Result cooking CSB	10 minutes for boiling water and cooking	11 minute for boiling water and cooking
Fuel consumption	0.25Kg	0.25Kg
	No difference	

3.4.2 Buramino Camp, Hilaweyn camp, Kobe camp

Testing in these three sites was incomplete. Though results indicated some efficiency regarding cooking time, the participants did not measure fuel nor amount of water used for cooking. The test in Buramino Block 2 involved a Mother-to-Mother support group and cooking CSB over firewood. Test was disqualified as "it was difficult to tell time the cooking via the taste of the porridge" (p.1). The exact same times were recorded for both Stove Tec and Local Pots (start time: 10:48; boiling: 10:54; end of cooking: 11:14). Test is void for Buramino.

In Hilaweyn camp, tests were ran in Buramino Block 13 and Buramino Block 24 Line A with woman groups. In Block 13, the women tested cooking time for 500g of rice over an improved stove (with windshield). The Stove Tec pot cooked the rice faster by 8 minutes. In Block 24, women cooked 500g of lentils over firewood. Stove Tec pot out performed local pot only by 2 minutes. Neither water used nor fuel consumption were measured.

In Kobe camp, women and IMC IYCF staff cooked 500g of rice over kerosene stove. No significance test difference between the two pots was found.

CONCLUSION

Factors Determining Efficacy	Range of Performance	Comments
Cooking Time Savings	1-23 minutes	Most variability due to whether windshield was used and the chosen fuel source during testing. Windshield increases time saved, as does cooking on kerosene stove. Lowest time savings seen with use of firewood and traditional 3 stone stove, especially without use of windshield.
Fuel Usage	0-66%	Variations in fuel savings depend on fuel source. Usage of firewood resulted in 35%-66% savings of firewood/charcoal, especially when windshield was used. Less savings seen with kerosene, but at least 4%.
Water Usage	Minus 10% - Plus 29%	Rate of water evaporation higher when cooking without windshield, regardless of fuel type. Similar rate of water loss seen with kerosene stove and firewood without use of windshield while cooking pulses. 29% water savings occurred whilst cooking pulses over firewood with windshield.
General Acceptability	Better than current pot – 90% Worse than current pot – 0% Same as current pot – 10%	Acceptability in terms of meeting criteria for effectiveness and efficiency is high. General acceptability is high among the beneficiaries. ✓ Cooks rapidly ✓ Uses Less Fuel ✓ More Convenient ✓ Appropriate and reliable ✓ Empowering to women ✓ Meets energy needs The variability in general acceptability was due to technicalities, such as the use of windshield. Though it increases the efficiency and performance of the super pot, it is considered to be not user friendly.

Results indicate that the super pot is fuel efficient, effective in saving time, safe and well accepted by the community.

These performance results also indicate that procurement and distribution of the super pot will help achieve the following SAFE objectives:

- ✓ Increase livelihood options by decreasing the percentage of household income spent on cooking fuel
- ✓ Increase HH food security by decreasing the percentage of food sold or bartered for fuel; possibly decrease transaction sex
- ✓ Increase environmental sustainability by decreasing degradation and exploitation of natural resources, thereby reducing tensions between host governments, local communities and camp residents
- ✓ Increase protection by reducing risk taken during collection of firewood
- ✓ Increase school attendance of girls by decreasing time required for cooking and collecting firewood
- ✓ Reduce negative coping skills resulting from scarcity of fuel: i.e. boiling water insufficiently, undercooking meals, skipping meals. Increasing capacity to cope by cooking food and water properly and eating all meals decreases risks of foodborne illnesses and malnutrition.

PARTICIPANT OBSERVATIONS

Positive observations [verbatim]:

- ✓ Looks better than normal pot (Kilo 26, Sudan; Kakuma, Kenya)
- ✓ Plastic handles on the lid and pot well-liked (Kilo 26, E. Sudan); the inside of the pot is easier to clean (Bambasi, Ethiopia)
- ✓ Stove Tec pot showed evidence of saving time and fuel. Fuel saving is more marked than time. Super pot accepted and preferred by beneficiaries as compared with currently used pot (Maban, S. Sudan)

Neutral or negative observations [verbatim]:

- Super pot has a thin body therefore likely to be less durable (Kilo 26, Sudan); external part of pot difficult to clean (Bambasi, Ethiopia)
- It was not fitting properly on the fire improved stove, so could easily fall off if shaken (Kilo 26, Sudan); more efficient with windshield but to use the shield is not easy as it has to be screwed into place and the bolts used may get lost (Kakuma, Kenya)
- While using firewood, food can easily burn or allow smoke it in (Kilo 26, Sudan); firewood is fuel efficient only with improved stove (Bambasi, Ethiopia)
- In Ethiopia (Dollo Ado) the only combination that showed reduced cooking time with the super pot was cooking with rice using charcoal on an improved stove with windshield
- Super pot appears to need low heat, especially for rice. The food cooks much faster and water evaporates (Hagadera, Dadaab, Kenya)

Questions raised by participants:

- Does super pot come in other sizes? The one size is observed to be too big for HH size 1 and 2 (Kilo 26, Sudan)

Recommendations made by participants:

- ➢ Perform testing with windshields in other locations (Maban, S. Sudan)
- ➢ Take into account bias which might arise from the size differences between the two pots (Maban, S. Sudan)

Limitations

Size of super pot is different from the size of the UNHCR provided aluminum pot, which may influence and bias testing results. Participants noted the size may be too large for household size 1 or 2.

Beneficiaries do not consider the windshield to be user friendly.

Recommendations

1. Procurement and distribution of super pot in select humanitarian contexts within priority countries according to needs of the most vulnerable households.
2. Monitor and evaluate impact on food security, nutrition, livelihood and protection indicators in line with SAFE objectives; gather community perceptions.
3. Extensive training for beneficiaries on the most effective way to use super pot and to increase performance – i.e. low heat, use of windshield, use of skirt.
4. Extensive trails or supervision with girls and/or adolescents using the pot for the first time to make sure it is safe and can be managed.

REFERENCES

UNHCR, (2009). *Household energy in refugee and IDP camps: challenges and solutions for UNHCR*. Research Paper No. 12: New Issues in Refugee Research: UNHCR Policy and Evaluation Unit: Geneva.

UNHCR (2014).*Global Strategy for Safe Access to Fuel and Energy (SAFE): A UNHCR Strategy 2014-2018.* UNHCR Division of Programme Support and Management: Geneva

USAID (2010). Evaluation of Manufactured Wood-burning Stoves in Dadaab Refugee Camp, Kenya. USAID

WFP (2012). *WFP Handbook on Safe Access to Firewood and Alternate Energy*. WFP: Rome.

Women's Commission for Refugee Women and Children (2006). *Beyond Firewood: Fuel alternatives and protection strategies for displaced women and girls.* WRC: New York.