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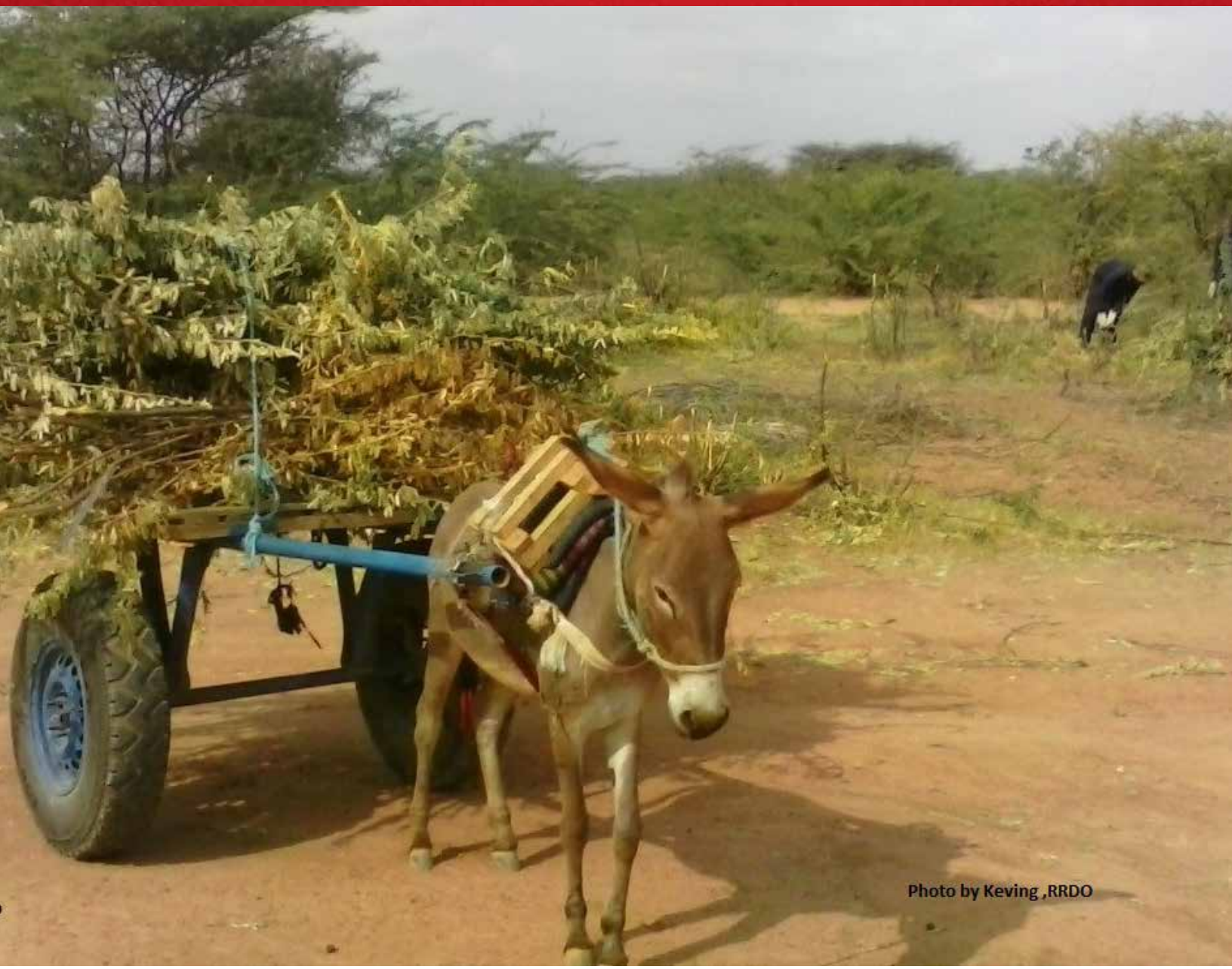

Prosopis: An alternative fuel resource for refugees and host communities in Dadaab, Kenya?

April 2016

WOMEN'S REFUGEE COMMISSION

Research. Rethink. Resolve.

The Women's Refugee Commission improves the lives and protects the rights of women, children, and youth displaced by conflict and crisis. We research their needs, identify solutions, and advocate for programs and policies to strengthen their resilience and drive change in humanitarian practice.

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Cover photo: Harvesting and collection of *Prosopis* by host communities. (c) Keving/RRDO

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Acronyms & Abbreviations

CCT	Controlled cooking test
CSDI	Community Sustainable Development Initiative
FaIDA	Fafi Integrated Development Association
FAO	United Nations Food and Agriculture Organization
GBV	Gender-based violence
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
ILF	International Lifeline Fund
Ksh	Kenyan shillings (currency)
KEFRI	Kenya Forest Research Institute
KFS	Kenya Forest Service
NGO	Nongovernmental organization
NEMA	Government of Kenya National Environment Management Authority
RRDO	Relief Reconstruction and Development Organization
UNHCR	United Nations High Commissioner for Refugees
WFP	United National World Food Programme
WRC	Women's Refugee Commission

Executive Summary

The vast majority of refugees in Dadaab, the world's largest refugee complex, rely on traditional biomass, primarily firewood, for their cooking fuel and household energy needs. Inadequate fuel supply has long been a major challenge for the 350,000 residents, forcing women to undertake an average of 5.5 collection trips per month, consuming about seven hours and covering almost 10 kilometers per trip.[1] This basic chore puts them at risk of gender-based violence (GBV), including rape and kidnapping, as they are forced to search for firewood in unsafe areas farther and farther away from the camp.

There is an urgent need for safe and sustainable fuel alternatives that would allow refugee and host communities to move away from their dependence on traditional firewood – both for the safety of refugee women and girls and to manage the environmental degradation that is transpiring as both refugees and the host communities vie for a scarce natural resource. *Prosopis,* a fast-growing invasive plant that is resistant to drought and poor soils, has been identified as a potential cooking fuel alternative. The largest pieces of *Prosopis* can be efficiently used as firewood or for making lump charcoal, and nearly all of the woody pieces of the plant can be used to manufacture briquettes.

The World Food Programme (WFP) and a local implementing partner are piloting *Prosopis* briquette production and distribution in Dadaab in a project conceived with the Women's Refugee Commission (WRC). In early 2016, the WRC undertook research, which found *Prosopis* has great potential to be an alternative fuel resource for *both* refugees and host communities, but there are numerous challenges that require careful consideration, further research, and technical expertise, as well as extensive consultation and collaboration among stakeholders.

Recommendations

1. All potential *Prosopis* fuel projects should include a mapping of the plant to ensure that it is abundant enough in strategically appropriate locations for sustainable use.
2. WFP and other organizations implementing fuel projects must ensure that end-users have appropriate cooking devices that are compatible with the new fuel.
3. All agencies and organizations seeking to develop and implement *Prosopis* fuel proj-

1 UNHCR, "Dadaab Population Statistics, August 2015" (2015). http://data.unhcr.org/horn-of-africa/region.php?id=3&country=110

ects for displaced communities in Kenya should consult and coordinate with Kenya Forest Research Institute (KEFRI), Government of Kenya National Environment Management Authority (NEMA), Relief Reconstruction and Development Organization (RRDO), World Food Programme (WFP), and the Food and Agriculture Organization (FAO).

4. The agencies and organizations involved in fuelwood-related projects must carefully navigate refugee and host community dynamics.
5. WFP and RRDO should commission an in-depth end-line evaluation of its *Prosopis* charcoal briquette pilot project in Dadaab to determine if scale-up is feasible and appropriate.
6. WFP and RRDO should assess the pros and cons of engaging the private sector in this *Prosopis* fuel initiative, recognizing the unique context of Dadaab and the challenges and implications of working with both refugee and host community populations.
7. WFP and UNHCR should formalize and lead a Safe Access to Fuel and Energy (SAFE) working group to coordinate activities and share information.

Shelter in Dadaab refugee camp, Kenya

Introduction

Inadequate fuel supply has long been a major challenge for refugees in Dadaab, Kenya. A lack of safe and sustainable access to cooking fuel and household energy resources is negatively impacting food security and utilization, putting women and girls at risk as they are forced to search for firewood in unsafe areas leading to increased incidents of gender-based violence (GBV), contributing to considerable environmental degradation, and increasing tensions with host communities over scarce natural resources. The dependence on traditional biomass has put immense pressure on the immediate and surrounding environs, particularly given the sheer number of refugees coupled with their protracted presence and the growing host community. The carrying capacity of the environment is vastly insufficient to support the population.

There is an urgent need for safe and sustainable fuel alternatives that allow refugee and host communities to shift away from their dependence on traditional firewood. Numerous United Nations (UN) agencies, nongovernmental organizations (NGOs), and government entities have called for solutions to the firewood dependency challenge in Dadaab, but sustainable alternatives have yet to be scaled up.

Prosopis has been identified as a potential cooking fuel alternative to the commonly used native tree species (such as *Acacia*) given its woody biomass characteristics and status as an invasive plant species. With support from the United Kingdom's Department for International Development (DFID) and the Government of Liechtenstein, the WFP and local implementing partner RRDO are piloting *Prosopis* briquette production and distribution in Dadaab.

The Women's Refugee Commission (WRC) is supporting this initiative through research including a comprehensive desk review, key informant interviews, and focus group discussions with community members to assess the existing evidence base and key stakeholder perspectives on *Prosopis* as a potential alternative to traditional firewood in Dadaab. The findings of this research and subsequent recommendations are detailed in this report.[2]

2 NB: The original project proposal planned for WRC to undertake the desk review and preliminary field research before WFP and RRDO began implementation to gather information that could inform the field-level activities. WRC was also meant to conduct the end-line evaluation once the pilot project finished. Due to donor constraints, however, WFP and RRDO had to begin activities sooner than expected, and due to funding constraints, WRC is unable to conduct the end-line evaluation.

WRC Research Question

Does the Dadaab context provide an appropriate environment for the implementation of a *Prosopis* project from the perspectives of community members, NGO workers, and government officials?

Research subquestions

What are the current cooking fuel needs and challenges of refugees and host community members living in Dadaab?

Can *Prosopis* be a viable (safe and sustainable) cooking fuel alternative to firewood based on the perspectives of key stakeholders including community members, NGO workers, and government officials?

Methodology

Desk review

Data collection for this project included a desk review and field visit for key informant interviews and focus groups discussions in Nairobi and Dadaab. The desk review, undertaken from November 2015 to January 2016, examined UN, NGO, and government documents and resources. The following search terms were used: *Prosopis, Prosopis* in Kenya, Dadaab fuel, Dadaab firewood, Dadaab cooking, Dadaab stoves, Dadaab energy, gender-based violence Dadaab, environment Dadaab, Kenya refugees energy, Kenya refugees firewood. Additional resources were identified through the reference and bibliography sections of the resources found through the search terms. In total, 27 documents and written resources were reviewed and consulted as part of the desk review.

Key informant interviews

From 18-27 January 2016, WRC undertook a field visit to Nairobi, Kenya to meet with stakeholders in the energy, environmental, protection, and food security sectors. Seventeen key informant interviews were conducted with 23 people from 13 organizations and agencies. Key informants were purposively selected based on their knowledge and experience working in Dadaab, with refugees in Kenya, and/or with *Prosopis.* Verbal informed consent was obtained. One interviewer and one note-taker were present for all key informant interviews and all transcripts were typed. A code-

book was developed and transcripts from those interviews were coded and analyzed using NVivo 10.

See Annex 1 (page 24) for list of the organizations and staff who participated in the key informant interviews.

Focus group discussions

WRC worked with RRDO to organize focus group discussions in Dadaab, which were held from February 1-4, 2016. Experienced male and female qualitative data collectors were recruited and trained by RRDO staff on the project objectives and WRC question guides. The questions guide was piloted with host male laborers on February 1, 2016. Thirteen focus groups comprising a total of 104 participants were held with male and female laborers of RRDO's *Prosopis* Project and women, men, adolescent boys and girls of host and refugee communities. Focus group discussions were held in the Somali language and each focus group had a facilitator and note-taker. Verbal informed consent was obtained from all focus group participants, and verbal consent for adolescents under 18 years of age was obtained through their school administration. The adolescents were interviewed in the school. Questions were asked about general experience with cooking fuel and alternatives, including use, access and challenges, as well perspectives on *Prosopis.* Transcripts from the focus groups discussions were typed and sent to WRC for coding and analysis using NVivo 10. Clarifications were responded to by RRDO staff and data collectors.

See Annex 2 (page 25) for details regarding the focus group subpopulations and number of participants.

Limitations

WRC staff were unexpectedly unable to travel from Nairobi to Dadaab and consequently could not undertake the focus group discussions themselves nor observe the *Prosopis* project site. Key informant interviews done with stakeholders based in Dadaab were done by phone or in person in Nairobi. Subsequently, the local organization RRDO, a partner of WFP, coordinated and managed the focus groups. RRDO was successful in providing transcripts for all of the requested subpopulations, but its role in this research may have elicited biased responses given that RRDO also manages the *Prosopis* Project, and distributes firewood to refugees and stoves to both refugees and host community members. Moreover, note-takers in each focus group discussion were RRDO staff, which may have elicited more positive responses than would have otherwise been found and/or recorded. Note takers also provided brief summarized responses and did not record verbatim responses.

Background

Brief overview of Dadaab

The Dadaab refugee camp complex was established in 1991 after the fall of the Somali central government to accommodate Somalis, mostly women and children, who fled from the ravages of war and fear of military conscription. At its establishment and in the early 1990s, the Dadaab camp complex was designed to accommodate 90,000 refugees. However, in 2008, intensive war in Somalia displaced more people, with the majority of them seeking refuge in the Dadaab camps. The Horn of Africa crisis in 2011-2012 resulted in a massive influx, with more than 160,000 refugees fleeing to Dadaab due to the twin effects of war and famine in Somalia.

The Dadaab refugee camps – Dagahaley, Hagadera, Ifo, Ifo II, and Kambioss – are located in the northeastern part of Kenya in Garissa County and spread in a radius of less than 20 kilometers. Collectively they host approximately 350,000 refugees and comprise the largest refugee camp complex in the world; it is also the fourth-largest population center in Kenya. The surrounding host community population is primarily composed of pastoralists. As of August 2015, UNHCR camp population statistics for Dadaab indicate that 80 percent of residents are women and children (17 years of age and under), and 95 percent are Somali nationals.[3]

Garissa County and Dadaab within it are classified by the Kenyan government as a semi-arid area due to chronic drought, low rainfall throughout the course of a year, and very limited vegetative cover.

Movement of refugees outside their camps is extremely limited due to the government of Kenya's encampment policy, which has significantly reduced any livelihood and trade opportunities. Consequently, the refugees are highly dependent upon humanitarian aid.

The growing population and longevity of displacement, coupled with donor fatigue, has meant that the availability of resources and services is shrinking and living conditions are deteriorating for those living there. Moreover, the Kenyan government has long grappled with fears that Dadaab is a breeding ground for insecurity throughout the country and has threatened to close the camp on numerous occasions, but is unlikely to actually do so in the foreseeable future. The vast majority of refugees living in Dadaab are likely to live out their lives there, despite the fact that a growing number are repatriating. For the most part, the host community focus group participants and refugee adolescents reported that they have been in Dadaab since birth, and the adult refugees reported that they have been in Dadaab since 1999.

3 UNHCR. See note 1.

Context

Numerous fuel-related projects have been implemented in Dadaab with varying degrees of success, but none have been entirely sustainable. The German Agency for International Development (GIZ) led the energy response in both Kakuma and Dadaab refugee camps for nearly 20 years with funding from UNHCR and the German government, with a budget of approximately USD 2 million per year. Its response programming consisted primarily of manufacturing and distributing improved cookstoves, raising and distributing tree seedlings, rehabilitating land within fenced greenbelts, constructing micro-catchments, and organizing the supply of firewood through contracted harvesters and supporters. GIZ's leadership in this area came to an end in December 2012 due to overarching changes in the German government's approach to transitional and emergency aid. In 2013, two local NGOs – Fafi Integrated Development Association (FaiDA) and RRDO – took over the energy-related activities formerly implemented by GIZ in Dadaab.

Fuel and food in Dadaab

The vast majority of refugees in Dadaab rely on traditional biomass for their cooking fuel and household energy needs. According to a 2014 UNHCR assessment, 98 percent of the households in the camps use firewood, while 3.7 percent use charcoal, and 3.6 percent use kerosene.[4,5] Interestingly, while most focus group respondents reported using firewood for their cooking fuel needs, nearly half of the groups reported using charcoal as well, and one refugee women's group reported using only charcoal.

Most refugee focus group participants reported that their staple foods include rice, injera, pasta, maize, and beans. Host communities reported that they eat beans, maize, rice, and pasta. Cooking takes 30-45 minutes for dishes like rice and pasta and 3-4 hours for maize or beans. Respondents varied in whether they cook two or three meals per days; however, all reported preferring to cook three. Depending on the type and availability of food, cooking can take up a large portion of the day for women and girls, who do the meal preparation for their families.

Firewood accessibility

Refugees living in Dadaab acquire firewood in three primary ways: through free distribution from aid organizations, by purchasing it from vendors at the market, and collecting it themselves. As part of UNHCR's 2014 Light Years Ahead baseline study,

4 UNHCR, 2014. *Light Years Ahead Project: Monitoring and Evaluation System and Baseline Survey Report*. Kenya Country Report.

5 The total fuel usage is more than 100% because some households use more than one source of fuel.

approximately 46 percent of surveyed households reported that they receive firewood from the UNHCR distribution, while about 49 percent said that they collect it themselves, and 57 percent said that they purchase it.

Of the refugee households surveyed by UNHCR in 2014, 95 percent reported that women undertake firewood collection;[6] however numerous key informants reported to WRC that the firewood collection activity has changed dramatically in recent years as tree cover has become especially sparse in and around Dadaab. With quality firewood now tens of kilometers away, men have turned firewood collection and selling into an organized livelihood activity.

Host communities do not receive firewood distributions from UNHCR and local partners. They either purchase firewood from the market or collect it themselves. In the focus group discussions, both men and women from the host community reported going every one to two weeks up to 15-30 km away, taking six to eight hours roundtrip to collect firewood in groups with five to 10 donkey carts.

One key informant working in Dadaab reported to WRC that both refugee and host community men collect firewood to sell at the market, despite the fact that firewood collection and selling is illegal for refugees. This key informant further elaborated that firewood collection is done about 20-30 km away by groups of donkey cart handlers who are primarily traders or vendors. A few individuals accompany the groups to collect for their own domestic usage. The process take about eight hours.

UNHCR works with local partners FAIDA and RRDO to procure and distribute firewood to vulnerable refugees. They employ host community groups or cooperatives through harvesting and transportation contracts. Key informants reported to WRC that the firewood sourcing for UNHCR and its partners is primarily done by men who harvest and collect the firewood 30-80 kilometers away from Dadaab. They use donkey carts, travel in groups, and often spend two to three days in the collection sites. After harvesting and collecting the firewood, they bring it to Dadaab with trucks, where it is weighed, bundled, and distributed by FAIDA and RRDO to vulnerable refugees. Key informants from these two organizations reported during interviews with WRC that they work with UNHCR to identify the beneficiaries with established vulnerability criteria. Key informants estimate that approximately 10 percent of the beneficiaries' fuel needs are met by the UNHCR firewood distribution.

UNHCR's 2014 Light Years Ahead report indicates that its distribution of firewood at that time accounted for less than 10 percent of household monthly consumption. About 46 percent of the households received an average of 38 kilograms of firewood in the six months prior to the assessment, and only 12 percent of households

6 Ibid.

received 13 kilograms of firewood per household on average during the month prior to the survey. More than half of the refugee households in Dadaab were purchasing firewood for their cooking fuel and energy needs.[7]

Both refugee and host community focus group participants reported that the cost of firewood at the market is a major challenge. All respondents who purchase firewood reported buying it from market vendors either in the camp or in the community. The amount paid for fuel ranged across both host and refugee respondents from 2,000-3,500 Kenyan shillings (approximately USD 20-35) per month, and the amount used ranged from 15-30 kg per week. There was a strong consensus that the high costs can be prohibitive, and yet many still find a way purchase it, because collecting has become so difficult.

Those refugee focus groups that reported collecting firewood said that they do so due to financial constraints. Among them, though, there was variation in terms of how far they travel to collect it. Two refugee women's groups reported an average of one collection trip per week for four to six hours, done in groups. A refugee men's group said they that travel four to five hours and 30 km away once per week in groups of three to four people.

UNHCR's 2014 survey results indicate that, at that time, women refugees in Dadaab were reportedly undertaking 5.63 collection trips per month with each trip spanning 9.66 kilometers and taking 7.03 hours.[8]

Overall, there was a consensus from key informants and focus group participants that the current fuel supply is vastly inadequate to meet household needs for communities living in Dadaab. Negative coping mechanisms include skipping meals, undercooking food, and sourcing wood from fencing in the camp.

Firewood and gender-based violence

Reports of gender-based violence (GBV) during firewood collection have long existed in Dadaab, and numerous efforts have been made to gather information on this issue and mitigate the risks. In the focus group discussions for this research initiative, refugee participants reported fearing insecurity and the risk of violence, theft, and kidnapping during firewood collection. More specifically, they mentioned the risks of rape for women and girls and physical assault for men and boys.

Host community men focus group participants reported no safety concerns when obtaining firewood. Host community women said that it is safe for locals to collect firewood most of the time, but also mentioned that people fear harassment by

7 Ibid.
8 Ibid.

Al-Shabaab[9] outside of town.

Everyone reported that they collected firewood in groups to feel safer. Host community participants, refugee women, and refugee adolescent girls also said that they go in the morning to feel safer.

Focus group participants reported that the police patrols make them feel safer; however, the police do not patrol very far from town or during later evening hours. One key informant working in Dadaab further elaborated that the radius of the police patrols is only within the refugee settlement area – within the town, market centers, and refugee camps. Focus group participants reported that when incidents occur, community members go to the police or hospitals in Dadaab town. Most, but not all, focus groups reported that people know where to go.

Only one group of focus group participants – refugee male laborers – reported hearing that women are forced to trade sex for firewood, but they also mentioned that the stories were never confirmed. One key informant working in Dadaab, however, told the WRC that women do trade sex for firewood from vendors, as well as in exchange for incentive work from agency staff.

While there was an overall feeling among key informants that incidents of GBV during firewood collection have declined in recent years, trends are difficult to establish. Because the environmental degradation has become so severe and men have become very engaged in the collecting and selling of firewood, most key informants believe that few refugee women are traveling great distances. Yet, refugee women and men alike report that women are the predominant collectors of firewood and that GBV risks are still of concern for them.

The International Rescue Committee Women's Protection and Empowerment Coordinator in Nairobi told WRC:

> *"What we know is that many cases are not reported. We had a team screening women on GBV at hospitals and they'd be asked upon arrival and quite a good percentage experienced violence but had not sought services. So they experience violence, but they're not sure if it's worth reporting. Like physical violence without needing medical attention, they won't report. Sexual violence, rape, if the injuries she can manage – if she's beaten and can manage – mostly they don't report."*

This key informant further described to the WRC that different subpopulations experi-

9 Al-Shabaab is an Islamic militant group from Somalia with a presence in Kenya.

ence different risks and that minority groups (such as Somali *bantus*), single women, and single mothers are more vulnerable to GBV and struggle the most to meet their household energy needs.

There was a consensus among key informants that firewood distribution helps to reduce the incidents of GBV against women and girls in Dadaab, and one key informant from RRDO who previously worked with GIZ in the 1990s asserted that there was a sharp decrease in reported cases of GBV thanks to a large firewood distribution project in 1998.

UNHCR's evaluation of that project, however, stresses that it is difficult to draw this conclusion from the available data, pointing to the fact that reported rapes rose significantly in late 1997/early 1998 due to a complex combination of environmental factors (El Niño-induced severe flooding) and economic factors (extreme cuts to Dadaab's programming budget). The number of reported cases then dipped later in 1998 to return to levels closer to those of 1994-1995 after the firewood distribution and other interventions.[10]

Recognizing the complex external variables, the evaluators sought to examine the differences in the frequency of firewood-related rape observable between periods when households were fully supplied with firewood and periods when they were not. Their analysis revealed a decrease of 45 percent in firewood collection rapes during periods of full firewood coverage. However, it is also important to note that there was an increase in rapes in other locations and contexts during these periods by between 78 percent and 113 percent.[11]

The evaluation goes on to highlight the importance of safe and sustainable livelihood activities and longer-term approaches, recognizing that firewood distribution is unsustainable and that household fuel needs are only one component of this complex issue.

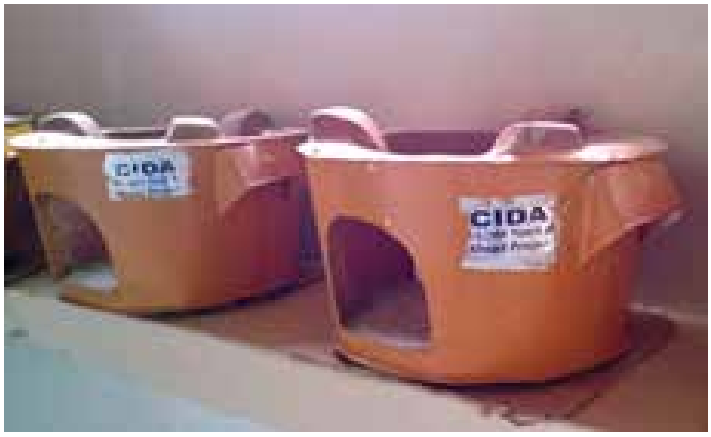
Improved stoves

In early 2014, UNHCR estimated that 58 percent of refugees in Dadaab use the Maendeleo fuel-saving stove, while 11 percent use the Rocket stove, and 37 percent use a three-stone fire. There was a consensus among key informants that the Maendeleo stove is the most popular model among communities and offers the best potential for long-term sustainability.

RRDO reported to WRC that most households have at least two cooking technolo-

10 UNHCR, *Evaluation of the Dadaab firewood project,* Kenya (2001).
11 Ibid.

gies, including the Maendeleo clay stove and three-stone fire. Most focus group participants reported using a three-stone fire. Many also reported using Maendeleo clay stoves, and a few reported using charcoal stoves in addition to the three-stone fire or Maendeleo stove. Both host and refugee participants said that they received their Maendeleo clay stoves from RRDO. Those with charcoal stoves reported that they purchased them from the market in Garissa town.



Maendeleo Stove, UNHCR 2014

Respondents said that Maendeleo and charcoal stoves require less fuel, which saves them time and money. They use the extra time for domestic chores and/or learning and the extra money for school fees, food, phone credit, or household savings.

In 2012, however, the International Lifeline Fund (ILF) undertook a series of controlled-cooking tests (CCTs)[12] in Dadaab for six different improved stoves and the traditional three-stone fire. The stoves models were the Jiko Poa, EZ stove, ILF stove, Envirofit, One Jiko, and Maendeleo, all of which are firewood stoves. The results of these CCTs showed that the Jiko Poa had the highest average wood savings as compared to the traditional three-stone fire. Conversely, and rather distressingly, the Maendeleo stove actually used more wood than the three-stone fire.[13]

Prosopis as a Fuel Resource

Prosopis juliflora, referred to as *Prosopis* throughout this report, is an evergreen tree native to South America, Central America, and the Caribbean. It is a fast-growing, nitrogen-fixing tree species that is resistant to drought and poor soils. It can survive and thrive in environments where other vegetation cannot.

12 A controlled-cooking test (CCT) is designed to assess the performance of the improved stove relative to the common or traditional stoves that the improved model is meant to replace. Stoves are compared as they perform a standard cooking task. See http://cleancookstoves.org/technology-and-fuels/testing/protocols.html for more information on CCTs and other performance tests.

13 V. Jahangiri and K. Sulpa, *Controlled Cooking Tests Conducted in Dadaab, UNHCR Compound, Kenya.* International Lifeline Fund (2012).

In its native areas, *Prosopis* has many redeeming qualities and can provide numerous products such as timber, firewood, and charcoal. These characteristics led to the plant's introduction into new locations starting nearly a century ago. In the late 1970s and 1980s, in particular, concerns about deforestation, desertification, and fuel wood shortages prompted a wave of projects introducing *Prosopis* and other tree species to new environments across the world.[14] In non-native areas, however, *Prosopis* can be extremely problematic and actually exacerbate the environmental challenges that it was intended to mitigate.

Today, there is extensive information about *Prosopis,* its introduction into non-native environments, and the subsequent difficulties of dealing with what has largely been deemed an invasive plant species in many of those locations.

Once established, *Prosopis* can crowd out native species and, due to its extensive root systems, can tap into groundwater reserves. Eradication is difficult, and grazing animals that ingest the pods spread the plant rapidly by disbursing the seeds through their droppings.

In Kenya, *Prosopis* has no natural enemies and as such has taken over wide swathes of land, eventually becoming classified by the Government of Kenya's National Environment Management Authority (NEMA) as an invasive weed. As described by the Garissa Country Government in its current Integrated Development Plan, *Prosopis* is "an unrelentingly aggressive thorny shrub that [has] formed a dense thicket covering much of the land and especially along the river."[15]

In 2008, FARM Africa reported numerous negative effects caused by the introduction of *Prosopis* in the Afar region of Ethiopia:

> *Prosopis is affecting the biodiversity and socio-economic environment of invaded areas in Afar region. It takes over pasture lands and irrigable areas; people and livestock suffer from mechanical injuries by sharp and poisonous Prosopis thorns; indigenous trees and pasture species are lost due to the invasion; access roads are blocked; challenge from predators increases; unrestricted livestock feeding on pods poses health problems; agropastoralists spend large amounts of money to clear*

14 E. Mwangi and B. Swallow, *Invasion of Prosopis and Local Livelihoods: Case study from the Lake Baringo area of Kenya,* ICRAF working paper no. 3. World Agroforestry Centre. Nairobi, Kenya (2005).

15 Kenya Garissa County Government. Integrated Development Plan 2030.

Prosopis from their farmlands; and malaria cases increased due to the favorable microclimate created due to the invasion.[16]

The myriad negative characteristics associated with *Prosopis* have caused many governments in affected countries, including Kenya, to actively encourage its management and ultimately its eradication if possible. Given the difficulty of eradication, many stakeholders are considering how best to make use of the plant.

> *In light of the fact that countries with substantial means – the USA, Australia and South Africa – have failed to rid themselves of Prosopis despite spending many millions of dollars in the effort, governments of poorer nations have accepted that it is exceedingly difficult to eradicate from lands in which it is not required, which realistically leads to the compromise of adaptation, with people in Prosopis-affected areas modifying their lives to cope with the plant and exploiting it as best they can for community well-being. This is not easy and local people may lack the technical abilities, financial resources and market access to manage the resource without external assistance. Control and management of Prosopis thus becomes a shared effort between stakeholders…*
>
> Chardust Ltd. Commercialisation of *Prosopis* juliflora products in Bura District, Coast Province, Kenya, May 2010.

For the most part, the largest pieces of *Prosopis* can be efficiently used as firewood or for making lump charcoal, and nearly all of the woody pieces of the plant can be collected and used to manufacture briquettes.

Prosopis fuel projects in Kenya

As described by the Kenya Forest Research Institute (KEFRI) and Kenya Forestry Service (KFS), charcoal production has been the most popular, widely accepted, and profitable activity for *Prosopis* utilization in Kenya. In their 2012 study, KEFRI and KFS assert that "the low initial capital outlay, use of traditional production methods, ready market and lifting of the ban on production and movement of *Prosopis* charcoal have helped to make the *Prosopis* charcoal production an attractive activity."[17] More-

16 G. Gebru Tegegn, *Experiences on Prosopis Management Case of Afar Region,* FARM Africa (2008).

17 S. Choge, N. Clement, M. Gitonga, and J. Okuye, Status *Report on Commercialization of Prosopis Tree Resources in Kenya,* KEFRI/KFS Technical Forest Management and Research Liaison Committee (2012).

over, the study shows that, from 2006 to 2012, *Prosopis* charcoal was generating significant income for communities, estimated to be at 90 million Kenyan shillings (Ksh) (approximately USD 900,000) in Baringo, 24 million Ksh (approximately USD 240,000) in Tana River, and 4 million Ksh (approximately USD 40,000) in Garissa counties on average each year.[18]

Despite these positive claims, however, other evaluations and technical expert testimonies provide mixed reviews and important lessons about the commercialization of *Prosopis* charcoal in Kenya.

Baringo County

Several key informants pointed to Baringo County in western Kenya as a location where *Prosopis* charcoal commercialization has been successful. In 2005, Community Sustainable Development Initiative (CSDI) reported in its baseline survey report on *Prosopis* management in Kenya that while KFS had given some groups harvesting and movement permits for *Prosopis* products in Baringo County, commercialization was still low compared to the existing market niche and potential.[19] In 2010, Chardust Ltd. reported that there was little uptake of charcoal making in the area because the predominantly pastoralist local population was not ready to change its way of life. While apparently some entrepreneurs had begun to produce and sell *Prosopis* charcoal and saw an improvement in their livelihoods, their activities had an insignificant impact on the *Prosopis* invasions.[20]

While both CSDI and Chardust Ltd. have reported various positive outcomes from *Prosopis* charcoal initiatives in Baringo, they have also highlighted numerous challenges and the need for improved practices before scale-up should occur. Given that both reports are now several years old, further research is required to determine the outcomes and impacts of the Baringo *Prosopis* charcoal efforts today.

Tana River County

Most key informants reported that the Tana River County possesses a large quantity of *Prosopis* that could be resourced for charcoal or briquette production, including for the refugee and host community populations in Dadaab. According to Chardust Ltd., this area has seen the least commercialization of *Prosopis* despite having the largest standing volume in Kenya.

18 Ibid.

19 A. Zeila, *Baseline survey on Prosopis management in Baringo, Garissa and Tana River*, Community Sustainable Development Initiative (CSDI), Nairobi (2005).

20 Chardust Ltd., *Commercialisation of Prosopis juliflora products in Bura District, Coast Province, Kenya* (May 2010).

In 2005-2006, the World Agroforestry Centre undertook a two-year project with the objective of stopping the spread of the *Prosopis* in the Tana River County by commercializing its products. CSDI's impression at the time was that local markets would take a while to respond to the presence of *Prosopis* products, and it found that there was little demand for *Prosopis* charcoal in Hola, the capital of Tana River District, because most residents were used to using firewood.[21]

In 2009, the Food and Agricultural Organization (FAO) Kenya country office employed Chardust Ltd. to explore the commercialization potential of *Prosopis* products from Bura in Tana River County. Chardust Ltd. researched technologies for harvesting the *Prosopis* wood and efficiently converting it to charcoal, as well as for the collecting and milling of the seed pods to produce feed supplements. The initiative ran for five months from January to May 2010.

The charcoal was successfully sourced, licensed, transported, and marketed in Nairobi through several channels at prices that were commercially viable, and as outlined in its 2010 report, Chardust Ltd. reports that the process appeared to be replicable.[22] At the same time, however, and despite the promising findings, Chardust Ltd. emphasizes a number of risks and challenges to be considered and overcome before large-scale commercialization should occur.

For example, in Bura, charcoal producers targeted mature and healthy trees, cut prime stems and left behind inferior scrub. This practice causes the *Prosopis* to spread with continually declining value. Moreover, the *Prosopis* in Bura was easily verifiable, whereas in most locations, it is often interspersed with indigenous trees and can be difficult to identify and access without compromising the indigenous trees.

In terms of good practices, it is important to note that KEFRI has invested heavily in training community interest groups to responsibly harvest *Prosopis* on a five-acre demonstration plot in Bura where they learned thinning and pruning techniques, as well as stump-killing methods.[23]

Garissa County

Garissa County borders Tana River County and is one of the areas most infested by *Prosopis.* In 2005, KFS reported that almost 90 percent of charcoal sold in Garissa was made from *Prosopis.*[24] However, field visits by Chardust Ltd. experts in 2010

21 A. Zeila. See note 18.
22 Chardust Ltd. See note 19.
23 A. Zeila. See note 18.
24 Ibid.

revealed that this figure may have been considerably over-estimated.[25]

CSDI asserts that while the local people still tend to gather firewood in most areas where *Prosopis* abounds in Garissa County, there is vibrant market for *Prosopis* charcoal in Garissa town. It advocates for better harvesting supervision to ensure selective cutting and burning of stumps at the source and, if possible, complete extraction, to minimize the effects of secondary coppicing.[26]

WFP/RRDO Prosopis charcoal briquette project in Dadaab

A WFP/RRDO pilot *Prosopis* charcoal briquette project is currently underway in Dadaab. After numerous assessments pointed to the urgent need to address the fuel challenge in Dadaab, this project was conceptualized by WFP and WRC in an effort to test the feasibility of *Prosopis* as an alternative source of cooking fuel for both refugee and host communities living there with the aim to:

- keep women and girls safer by reducing their need for firewood collection, particularly in unsafe areas inside and outside of the camps, through the provision of alternative household cooking fuel;
- ease environmental degradation by reducing dependency on traditional biomass for cooking fuel;
- mitigate the negative impact of *Prosopis* on agriculture and the growth of other vegetation by properly harvesting it to be used as fuel;
- improve livelihoods by promoting income-generating activities and strategies through the production of *Prosopis* fuel.

RRDO was brought on to the project by WFP as the local implementing partner in Dadaab to carry out the *Prosopis* charcoal briquette activities with members of the host and refugee communities.

RRDO originally planned to target 20,000 household beneficiaries, but as the project evolves – and given time and budget constraints – there are suggestions to scale it down to a more manageable number of 5,000. At the time of WRC's mission to Nairobi, RRDO had reportedly succeeded in providing extensive training to all of the laborers, procuring the necessary tools and machines, and producing and distributing a test batch of 1.75 tonnes of *Prosopis* charcoal briquettes to refugees. The charcoal briquettes were distributed to 35 households, each of which received 50kg. RRDO reported that recipients of the charcoal briquettes would receive a one-time distribution as part of the pilot project and that subsequent distributions would target 5,000 beneficiaries. RRDO reported that the refugee and host community workers were

25 Chardust Ltd. See note 19.
26 A. Zeila. See note 18.

Briquettes final production point. © Peter Otieno, WFP

being paid 6,800 Ksh (approximately USD 68) and 15,000 Ksh (approximately USD 150) respectively for their participation in this project.

While there appears to be great potential for this pilot project, there are two primary challenges that will likely prevent it from reaching its full potential unless additional funding and time are allocated. First, the project was originally intended to be a minimum of 18 months, but due to donor constraints, has been condensed to nine months, with an anticipated end date of 31 March 2016. Such a short timeline makes it very difficult to fully establish any kind of income-generating activity, particularly one that requires extensive technical training and input and relies on a rather complex supply chain.

Second, RRDO reported that it tested the *Prosopis* charcoal briquettes with the Kenyan Ceramic Jiko, the locally made charcoal stove, and had quite positive results. Due to funding constraints, however, it has not been able to procure and distribute this stove to the charcoal briquette beneficiaries, and most of these community members have been unable to purchase the appropriate stove themselves. Consequently, the beneficiaries are trying to use the new fuel in their firewood burning stoves and to no

surprise have reported that these stoves and fuel do not work well together.

In terms of scaling up the pilot, key informants felt optimistic if these hurdles could be overcome. One key informant relayed to WRC: "If we can get the pricing right and produce it efficiently, these are projects that could run well on their own. So, if we bring in other actors, and it's fairly priced for refugees, I believe it's sustainable." Another said "Dadaab is a tough environment and we have very few trees, most have been cut down. The only green thing in Dadaab is *Prosopis.* So, if the green thing is a menace, then we need to actually know how to solve that problem. For me this project is sustainable for production, not only in Dadaab but also in Kakuma and Hagadera."

Key Concerns and Considerations

The desk review of technical resources and historical information regarding *Prosopis* in Kenya indicate that utilization of the invasive plant for fuel is not only possible, but has been realized in parts of the country with some success. At the same time, however, there are many risks and challenges, including a complex political environment, which make it incredibly difficult to scale up and execute in a sustainable and responsible way.

The consensus among key informants interviewed by WRC, including technical experts who have studied and worked with *Prosopis* in Kenya, is very much in line with the desk research. They reported to WRC that while this invasive plant has a lot of potential to be an alternative fuel resource for both refugees and host communities, there are numerous challenges that require careful consideration, further research, and technical expertise, as well as extensive consultation and collaboration among stakeholders.

As articulated by FARM Africa:

> *"Mobilizing people to better deal with Prosopis requires full appreciation of constraints and opportunities imposed by socio-economic features of local societies, including attitudes and values with respect to community participation in resource management issues, problems that poverty imposes on people's priorities, conflicts in land use, land tenure, the role*

of rural insecurity in resource use, and constraints in the availability of labor."[27]

Abundance of *Prosopis*

Several fuel-related assessments have been undertaken in recent years that point to the abundance of *Prosopis* in and around the Dadaab camps. However, the majority of the key informants interviewed by WRC asserted that *Prosopis* is not abundant enough in and around Dadaab for scaling up a pilot project or for long-term sustainability. Moreover, leading technical expert and researcher Matthew Owen, who has undertaken multiple assessments in refugee settings in Kenya, asserts that while there is the visual impression of a lot of *Prosopis* in and around Dadaab, it is actually not as abundant as it may seem to a non-expert observer. Satellite images from the 2010 study funded by the Danish and Norwegian governments show that it is in fact not widely abundant.[28]

Access to *Prosopis*

In and around Dadaab, access to certain areas for wood harvesting is granted on the basis of clan affiliation and negotiations. Elders within the camp complex have established relationships with host community and indigenous elders outside of the camp. Recognizing this dynamic, GTZ (now GIZ) organized and facilitated environmental working groups in the mid-1990s to bring together refugee and host community representatives to negotiate access to firewood.

However, a 2010 study funded by the Danish and Norwegian governments revealed that such arrangements and negotiations were becoming progressively more difficult as tree cover and environmental resources decreased.[29] This same study also reported that the weakening of clan-based access controls was becoming evident at the time of the assessment, allowing for organized groups to engage in commercial charcoal production for export via Somalia, generating resentment among community members, and leading to more conflict over natural resources.[30]

In the context of Dadaab, it is important to thoroughly consider the profiles of the harvesters (e.g., refugees, host community members, men, women, skilled laborers, unskilled laborers) and the specific roles and responsibilities of those individuals, as well as remain

27 G. Gebru Tegegn, *Experiences on Prosopis Management Case of Afar Region.* FARM Africa (2008).
28 M. Enghoff et al., *In Search of Protection and Livelihoods: Socioeconomic and Environmental Impacts of Dadaab Refugee Camps and Host Communities* (2010).
29 Ibid.
30 Ibid.

sensitive to their individual needs, challenges, and risks. The organizations promoting *Prosopis* harvesting for fuelwood projects must consider the supply chain and logistical implications for gaining access to the plant, harvesting it, and then transporting it to the locations where it will be manufactured into charcoal/briquettes and subsequently distributed to end-users.

Prosopis juliflora grows around Dadaab refugee camp in Kenya, and may have potential as a fuel source for refugees in the camp.

Harvesting and management of *Prosopis*

Organizations promoting *Prosopis* projects must first determine if they want to eradicate or manage the *Prosopis* in a particular location based on environmental impact assessments and project objectives. *Prosopis* regenerates quickly, making it attractive as a potentially sustainable fuel resource. However, if not properly extracted or managed, it can regenerate more aggressively and exacerbate the challenges the project is seeking to mitigate. While effective harvesting and management techniques are well documented, they have proven to be very difficult to execute in practice.

When it comes to harvesting and managing *Prosopis,* there are a number of important considerations that organizations and communities promoting this activity must consider. *Prosopis* is often interspersed with indigenous trees. It is important that harvesters are able to accurately verify the *Prosopis* plant and avoid harvesting or harming the other tree species. In addition, harvesters may be tempted to target mature, healthy trees and their prime stems and trunks, and leave behind the stumps and scrub that continue to spread and decline in value, as has been the case in the Bura district of Kenya.[31]

31 Chardust Ltd. See note 19.

FARM Africa identifies the following best practices for harvesting Prosopis:

- Cut the tree at least 10 centimeters below the ground to control coppicing.
- Mark the boundaries of areas of operation.
- Protect indigenous species.
- Give priority to pasture and croplands.
- Restore cleared land.[32]

Implementing agencies and organizations should seek out best practices for eradicating or managing the plant to help meet their project objectives and based on what is feasible in that particular context.

Appropriate stoves for *Prosopis* charcoal briquettes

Numerous stove models have been distributed to refugees in Dadaab over the lifetime of the camp. Most of them are designed to burn firewood, which has long been the primary fuel source of refugees and host communities alike. Some of these stoves may also function with other fuel types, such as charcoal or briquettes, but with limited efficiency and durability.

In many cases, refugees living in camp settings periodically have access to charcoal and other biomass fuel types other than firewood that they will attempt to use in a stove that is designed for firewood only. This practice not only damages the stove and causes it to break down more quickly, but it also negates the positive effects (e.g., efficiency, cleanliness, safety) that the stove is intended to have.

When considering new fuel types, it is essential to assess the capabilities of the existing and/or potential cooking devices that could be used by the end-user, as well as to field test the stove models with the new fuel types, preferably using a controlled cooking test with community cooks themselves and the local staple foods.

The vast majority of stoves that have been distributed or procured by families in Dadaab are firewood-burning stoves that are not compatible with charcoal/briquettes – this poses a major challenge for usage and user uptake of the new *Prosopis* charcoal briquettes.

Training and sensitization

Whenever new technologies are introduced to a community, end-users must be taught how to use and maintain the cooking system (the stove, pot, and fuel in this case) properly. Upfront training is essential, but experience has shown that periodic

32 G. Gebru Tegegn. See note 26.

refresher trainings and monitoring is important to ensure that families continue to feel comfortable with using the technologies and maintain the knowledge and skills required to do so.

Training and sensitization is essential for laborers, end-users, and their families to understand good practices and the risks of accessing and/or promoting *Prosopis* as a fuel resource over both the short and long term. Communities should understand the advantages of using *Prosopis* charcoal/briquettes, but should be discouraged from planting or harvesting it on their own without technical support and training.

In addition, the end-users and the members of their households should be made aware of the potential and intended benefits of the technologies, so that they do not immediately dismiss, sell, or misuse the technologies and so that they can reap the full benefits over time. In some cases where only the cooks have been sensitized on the importance and benefits of new cooking technologies, other family members, such as husbands or heads of household, have pressured them into selling or trading the items.

In situations where communities suffer from hunger or a lack of basic necessities such as medicine and clothing, end-users may consider selling or trading their technologies for the immediate gain of another item. It is important that they understand the long-term benefits that the technology can have if used correctly and regularly.

Coordination and collaboration

To date, the alternative fuel projects in Dadaab have predominantly been small scale and short term, with limited interagency collaboration or coordination. Given the cross-sectoral nature of energy and the number of relevant stakeholders whose mandate, work, and interests relate to fuel in Dadaab, it is critical to convene information-sharing and coordination meetings. Better coordination and collaboration will help to mitigate risk, maximize resources, and avoid duplication.

Furthermore, within Kenya, there is extensive expertise on *Prosopis* and environmental management, as well as a long history of *Prosopis* pilots and initiatives. Better coordination is essential to effectively and responsibly move forward with new or existing *Prosopis* fuel programming.

Conclusion

While it is not possible to conclude that *Prosopis* charcoal briquettes can meet the immediate or long-term fuel needs of refugees and host communities in Dadaab, the evidence thus far suggests that *Prosopis* has the potential to be a viable cooking fuel alternative to traditional firewood. If not carefully analyzed and overcome, however, the risks and challenges have the potential to create large adverse outcomes such as, but not limited to, further environmental harm and increased tensions between refugees and host communities.

Given the extensive environmental degradation and incredible need for alternative fuel resources, key stakeholders in Kenya should gather to discuss the findings and outcome of this WFP pilot project as soon as possible. Several other agencies and organizations are looking to implement *Prosopis* fuel projects in other parts of the country, including in Kakuma refugee settlement, and the information from WFP and RRDO's experience could be invaluable.

If the WFP and RRDO pilot project is to be scaled up, it should be done gradually with multi-year funding, adequate resources, staff capacity, ongoing technical support from *Prosopis* experts, and buy-in from key stakeholders, including the local government and communities.

Annex 1: Key Informant Interviewees

Organization	Titles
Kenya Government Department of Refugee Affairs (DRA)	Patrick Musango, Principal Refugee Officer
FaIDA	Silas Otieno Asaka, Environmental Officer
The United Nations Food and Agriculture Organization (FAO)	Maina Kibata, Field Coordinator/FAO Kakuma Queen Katembu, Head of Unit – Gender and Human Rights Philip Kisoyan, Natural Resources Management Sector
Food for the Hungry (FH)	Markus Takkunen, Country Director Samson Seyoum, M&E Officer Claire Njuguna, Marketing Coordinator
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)	Dr. Gabriele Wurster-Vihuto, Programme Manager Reimund Hoffmann, Expert Consultant
International Rescue Committee (IRC)	Sophia Wanjiku, Women's Protection and Empowerment Coordinator
Kenya Forest Research Institute (KFRI)	Simon Choge, Principal Research Scientist
Kenya Forest Service (KFS)	Clement P. Ng'oriareng, Senior Assistant Director, Head Dryland Forestry
National Environment Management Authority (NEMA)	Maurice Otieno, Chief Environment Planning Officer Anne Omambia, Climate change Coordinator
Relief Reconstruction and Development Organization (RRDO)	Ahmed Abdi, Executive Director Kevin Okoth, Energy Officer Gerald Gitau, Energy Officer
United Nations Environmental Programme (UNEP)	Ivy Nyandiko
UNHCR	Venanzio Njuki, Associate Environment Officer
WFP	Louise Sowe, Head of Office Dadaab Peter Otieno, Programme Policy Officer/ Refugee Unit/WFP Kenya Office; Fatuma Mohamed, Program Associate/Dadaab

Annex 2: Focus Group Discussion Participants

	Sub-Population	Number of FGDs	Number of Participants
Laborers*	Refugee Women Laborers (both sites)	1	8
	Refugee Men Laborers (both sites)	1	8
	Host Women Laborers (all three sites)	1	6
	Host Men Laborers (all three sites)	2	8; 9
Non-Laborers	Refugee Women	1	8
	Refugee Men	1	8
	Refugee Adolescent Girls	1	8
	Refugee Adolescent Boys	1	10
	Host Women	1	8
	Host Men	1	8
	Host Adolescent Girls	1	8
	Host Adolescent Boys	1	7

** Laborers are currently participating in the WFP and RRDO Prosopis briquetting pilot project.*

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