

Potentials of Biomass Cooking Fuel Production in Displacement Settings

A study conducted by Energy Solutions for Displacement Settings (ESDS)

Background

Study name	Potentials of Biomass Cooking Fuel Production in Displacement Settings
Conducted by	Energy Solutions for Displacement Settings (ESDS)
Commissioned by	BMZ
Implementation	GIZ and INTEGRATION environment & energy GmbH
Study Region	Gambella Region, Ethiopia; Turkana County, Kenya; West Nile, Uganda
Duration	05/2021 – 12/2021

The Energy Solutions for Displacement Settings (ESDS) project, commissioned by the German government and implemented by German Development Cooperation (GIZ), seeks to improve energy access in refugee-hosting areas of Gambella Region, Ethiopia; Turkana County, Kenya; and West Nile, Uganda.

Refugees tend to use sources of energy for cooking that are already familiar to them and readily available in the areas where they are temporarily settled (UNHCR, 2002). For the predominantly South Sudanese refugees in the three locations being researched, this generally means woodfuels (firewood and charcoal).

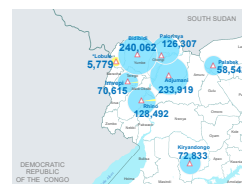
Imbalance between woodfuel requirements and sustainable biomass supply in these areas can result in increasing collection distances, greater commoditisation of fuel and rising energy prices, and may also contribute to environmental degradation.

A study on *Potentials of Biomass Cooking Fuel Production in Displacement Settings* was commissioned by ESDS to investigate options for

sustainably sourced, biomass-based cooking fuels in three ESDS locations, as well as the potential for commercially sustainable models for the supply of biomass-based cooking fuels.

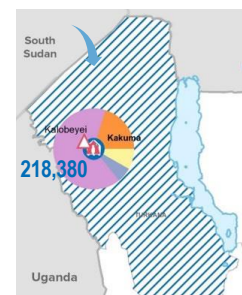
This factsheet summarises the key findings of the study. For reasons of cost, convenience, and familiarity, biomass cooking fuels are likely to play a dominant role in the ESDS locations in the future despite modern cooking solutions appearing more and more in the market.

Country Context



West Nile, Uganda

805,174 refugees in 23 settlements across 6 districts



Gambella Region, Ethiopia

351,677 refugees in 8 camps



Turkana County, Kenya

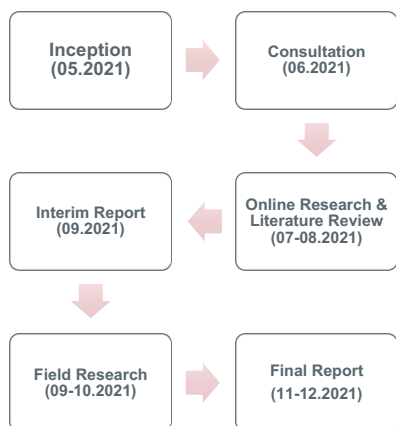
218,048 refugees in 2 camps



Objectives and approach

The simplified Objectives of the study were to:

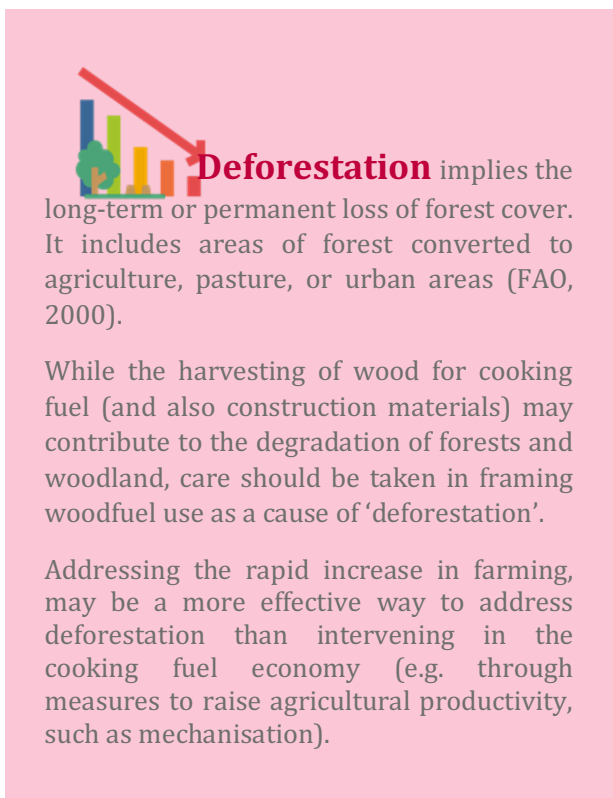
- a) Identify the most viable options for increasing access to safe, reliable, and sustainable biomass cooking fuel for refugees and host communities in the ESDS project locations
- b) Develop business models and implementation options for the selected solutions



Fuel shortlisting

Through a multi-criteria shortlisting process, charcoal and firewood were identified as the most viable biomass-based fuels for cooking in the three locations. Fuel briquettes manufactured from carbonised biomass (char) showed the most promise as a biomass-based alternative to firewood and charcoal, out of 21 fuels considered.





Charcoal briquette is only produced in advanced industrial economies for barbecue markets and is not used as a household cooking fuel due to high cost of production, which makes it uncompetitive with other available energy sources (such as charcoal and electricity). This not only means that there are no operations in East Africa from which to draw technical and economic data for business modelling, but also that there would be no prospect of a successful launch in a refugee operation. The focus of the remainder of the research was therefore on **char briquettes**.

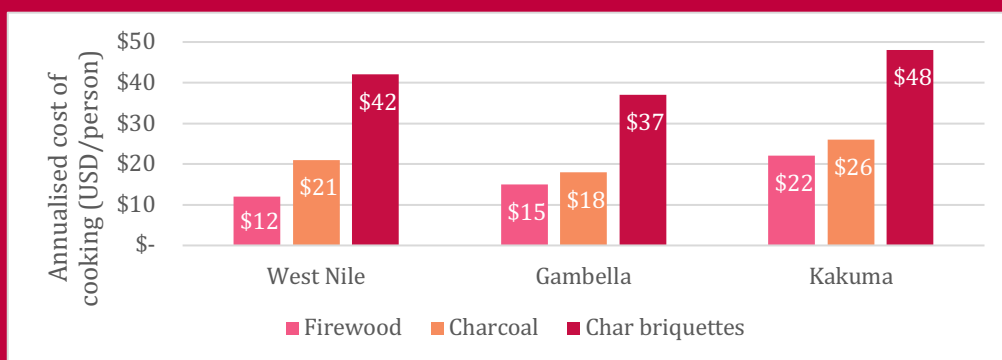


Deforestation implies the long-term or permanent loss of forest cover. It includes areas of forest converted to agriculture, pasture, or urban areas (FAO, 2000).

While the harvesting of wood for cooking fuel (and also construction materials) may contribute to the degradation of forests and woodland, care should be taken in framing woodfuel use as a cause of 'deforestation'.

Addressing the rapid increase in farming, may be a more effective way to address deforestation than intervening in the cooking fuel economy (e.g. through measures to raise agricultural productivity, such as mechanisation).

1	Charcoal , which is an energy-dense, adaptable, and popular fuel that is readily available in local markets.	
2	Firewood , Africa's most widely used fuel due to its availability, access, cost, familiarity, and suitability for a variety of diets and cooking traditions.	
3	Briquettes , the most promising alternative biomass-based cooking fuels in the three ESDS settings - a charcoal briquette made by densifying raw biomass and carbonising the resulting 'log' - a char briquette made by densifying carbonised biomass plus a binder	 

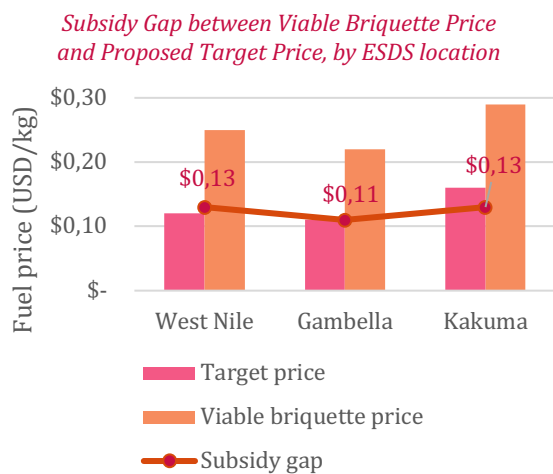


Annual per person cooking fuel cost comparison, by ESDS project location

Char briquetting business model

To determine the cost of production for a commercial briquetting operation, a customisable business model was developed to simulate the mass production of char briquettes for refugee operations.

The model reveals that the selling price for char briquettes in the refugee locations would need to be almost double the prevailing price of charcoal, the next cheapest alternative, for the business to be viable. As illustrated below, a subsidy of between \$0.11- \$0.13 per kg of fuel is required to get char briquettes into the refugee market at a price deemed competitive with wood charcoal. This is in addition to the 50% start-up grant support built into the model.



For modelling purposes, one facility is assumed to have production capacity of 150 t/mth and the potential market is taken as 10% of the total refugee population. The quantity of briquettes required is 159 kg per person per year. Based on these assumptions, the total financing requirements for a char briquetting supply programme across the three countries are around **\$3.15m** in the first year to meet the needs of **10%** of refugees across the three locations, and upwards of **\$3m** per annum thereafter.

Financing options

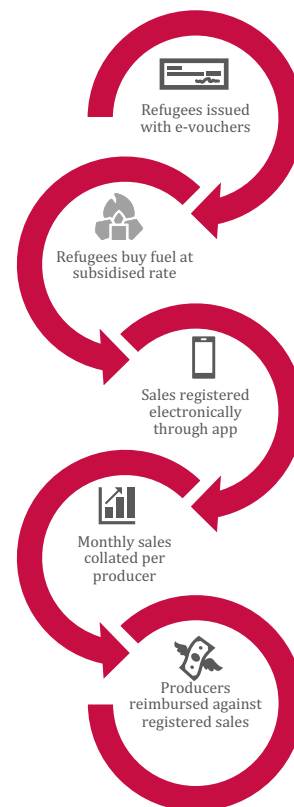
Under the type of market-based system that ESDS seeks to endorse, two types of potential subsidy are investigated. One is supply-side finance, which targets the producers of the fuel. The other is demand-side finance (also known as end-user finance), which targets the intended customers.

Therefore, a combination of investment (grant) subsidy and direct payment subsidy is deemed the simplest and most workable of the financing options available for char briquettes.

Manufacturers would receive partial grant finance for CAPEX at start-up (50% has been assumed).

Refugees would be issued with e-vouchers earmarked for briquette purchase at a reduced rate, up to the agreed annual quantity to be subsidised, by humanitarian agencies.

Intermediation through specialised financial service providers would be possible, but challenging. Larger formal financial institutions cannot easily be found in displacement settings, while smaller and more informal structures often lack the capacity to operate at medium scale and to meet the financing needs of large groups (ESDS, 2021). It would be preferable for the donor and briquette companies to jointly manage the financing arrangements and proposed e-voucher system.




Fuel subsidy system using electronic vouchers

Conclusions

Firewood and charcoal are the default cooking fuel options and are likely to remain so for the short- to medium-term, based on availability, accessibility, familiarity and suitability. Positive social, economic and environmental benefits can be achieved from measures to enhance woodfuel supply and reduce consumption, with the primary focus on targeting woodfuel value chains. Based on a multi-criteria shortlisting process, char briquettes were selected for in-depth analysis, having been identified as the most viable biomass-based alternative to woodfuels for cooking in the ESDS locations. An analysis of the annualised costs of cooking with char briquettes reveals that using this relatively competitive fuel would cost users around twice as much as charcoal, the next cheapest alternative. Also, the char briquetting business model implies a need for subsidy to close the affordability gap, which has been calculated at around \$3.15m in the first year to meet the needs of 10% of registered refugees, and upwards of \$3m for each successive year for continued subsidy of \$0.11 to \$0.13 per kg. This would ideally be delivered via an e-voucher scheme jointly managed by the donor and briquette companies. There might be limited prospects of raising funds at this scale for the long-term promotion of char briquettes, but mid-term and under certain circumstances could be a viable option.

Recommendations

A package of measures is proposed to address woodfuel supply/demand imbalances and energy access challenges in the ESDS locations, as summarised in the table below:

Location	 Reducing woodfuel consumption	 Enhancing sustainable supply of biomass	 Promoting alternative fuels
<i>West Nile</i>	Support 'last mile' marketing, sales and distribution to get higher tier charcoal cookstoves into the refugee camps, building on existing support to 'energy kiosks'.	Promote higher biomass yields from natural forests, private plantations and homestead planting through interventions in (agro-) forestry and improvements in wood processing.	Conduct a wider cost-benefit comparison of cooking options to fully evaluate investment/subsidy levels, infrastructure challenges and long-term health, social, economic, and environmental benefits.
<i>Gambella</i>	Support the user-centric design and local manufacture of simple clay stoves for refugee use, which can make an affordable and appropriate contribution to easing the fuel sourcing burden on refugees.	Promote conservation-friendly agriculture and agroforestry on farms and around homesteads, support the protection of natural forests. Research the impacts of refugees on forest resources, like those by FAO in W. Nile & Kakuma.	Consider the procurement of firewood from sustainable sources for groups identified as vulnerable.
<i>Kakuma</i>	Strengthen and sustain the promotion of improved cookstoves through EnDev's SNV-managed Market-Based Energy Access programme.	Improve efficiencies in the Prosopis value chain (including better charcoal production), establish and protected 'greenbelts' and plant drought-resistant tree species in micro-catchments.	Conduct a wider cost-benefit comparison of cooking options to evaluate investment and subsidy levels, infrastructure challenges and long-term health, social, economic, and environmental benefits.

In addition to the above measures, a cross-cutting package of measures to provide a supportive **enabling environment** for sustainable cooking fuel solutions is recommended. This should include cross-sectoral coordination, donor engagement, host/refugee working groups, the development of decentralised policies on renewable energy and natural resource management, policy advocacy to tackle unhelpful regulatory barriers and a programme of targeted research. The long-term goal should be to move to electricity for cooking, with effective trials of new technologies to help the transition.

Issuer	Federal Ministry for Economic Cooperation and Development (BMZ), Referat 221	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
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