

# Using prunings from trees on-farms and cleaner biomass cooking appliances reduces women's energy burden and improves human wellbeing

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# Introduction

Fuel	% household using it as main cooking fuel (National Census: KNBS , 2019)			Production /Deficit (MENR, 2013, MoE & CCAK 2019)
	Urban	Rural	National	
Firewood	9	84	67	Deficit 27%
Consumption per household (kg)/yr	1232	1362		MoE&CCAK 2019
Charcoal	18	8	12	Growth by 56% 2002-2013. Deficit 55%
				Worth USD1.6 billion.
Consumption per household (kg)/yr	364	411		MoE&CCAK 2019
Liquid petroleum gas (LPG)	53	7	24	
Kerosene	18	2	8	

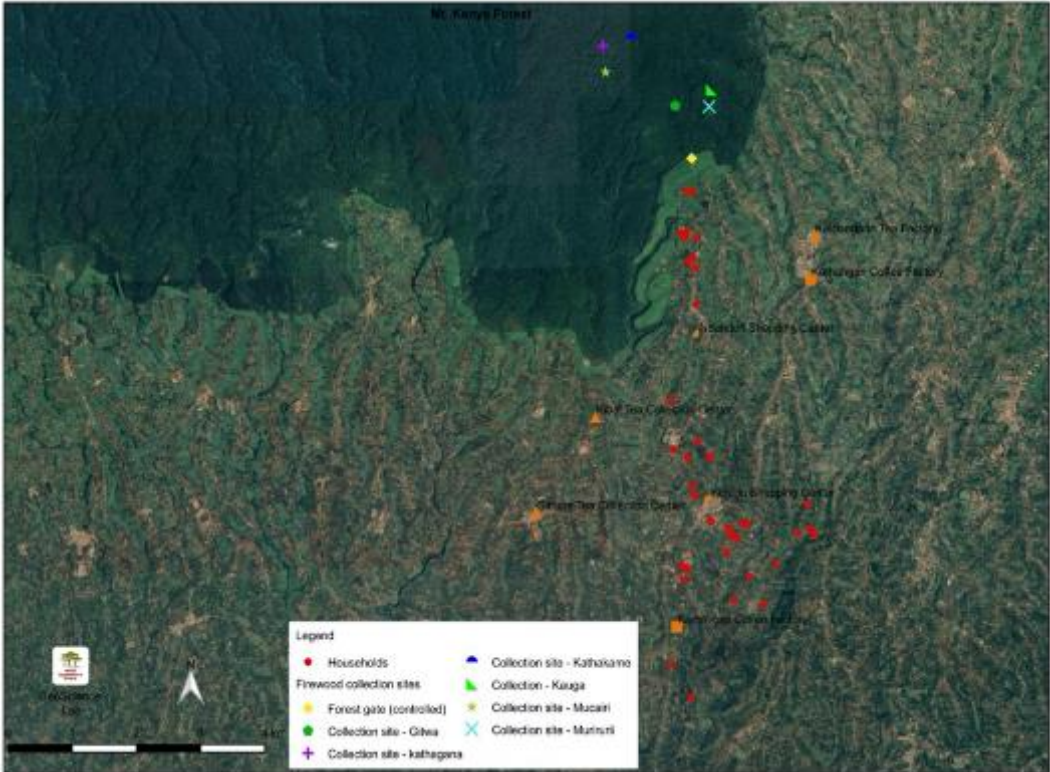
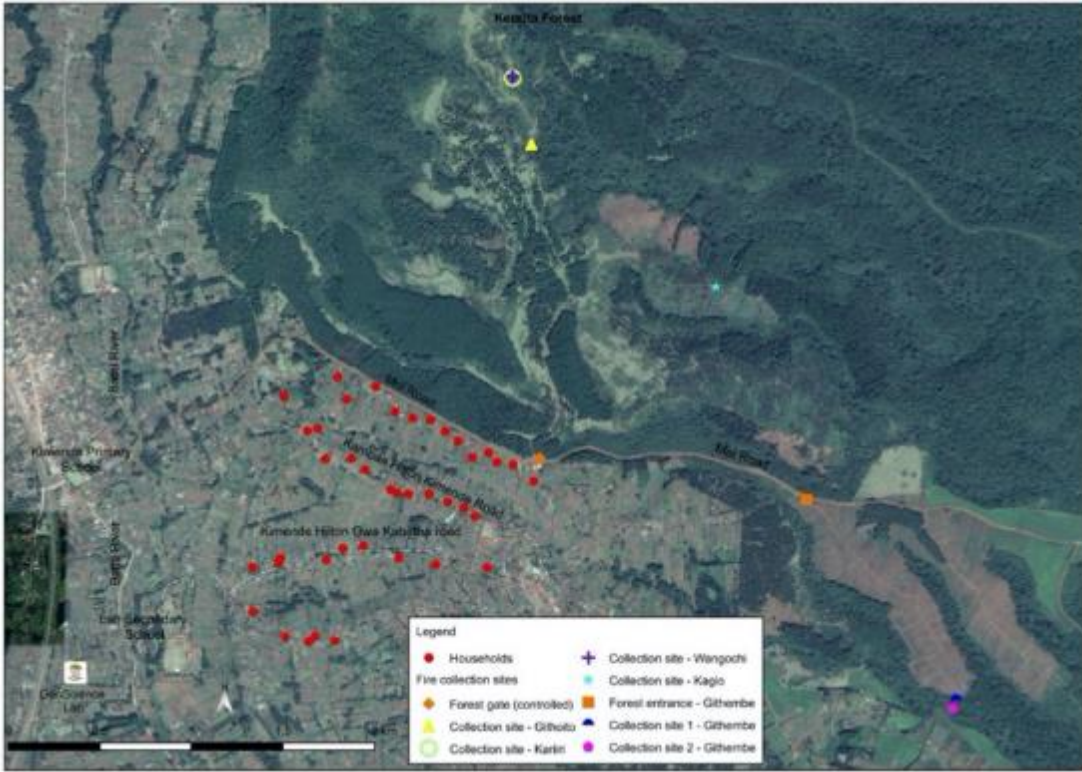


Women and children energy and health burden



# Distance to firewood collection areas at Kereita and Mount Kenya forests

Location of firewood collection sites in Kereita, Kiambu and Kibugu, Embu  
Njenga et al., 2021



Distance (km)		Kereita, Kiambu	Kibugu, Embu	Total two way distance walked  Kereita=6.3km Kibugu=8.4km
From home to forest gate	One way	0.97	1.76	
	Two way	1.94	3.53	
From forest gate to firewood collection site in the interior of forest	One way	2.16	2.43	
	Two way	4.32	4.87	

# Sources of collected firewood by households, time spent and weight of firewood

Characteristic	Kibugu, Embu		Kereita, Kiambu
Households that had each category as their main source <sup>*a</sup> of firewood (%)	Forest	10	23
	On-farm trees	65	5
	Purchase	15	15
Households that depended on agroforestry as their exclusive firewood source (%)	40		5
Households that depended on forest as their exclusive source of firewood (%)	0		25
Households that exclusively depended on buying firewood (%)	3		13
To and from distance to firewood collection areas in the forest (km)	8		6
Average estimated time spent in collecting firewood (hours)	Forest	4	3
	Farm	2	1
Average weight of a 'woman load' of firewood	59kg <sup>*b</sup>		52kg (home use
			69kg (for sale) <sup>*b</sup>

*\*a Main source= Meets 60-99% of household firewood need \*b, measurements were taken from 7 women coming from the forest*



# Agroforestry practices by households

- Agroforestry is more common in Kibugu than Kereita
- Timber and fruit trees are pruned in the early dry months of the year to; reduce shade and get dry firewood for use during the rainy season.
- Use of pruning from on-farm trees saves trees and gives forests time to regenerate
- This will contribute to climate change mitigation in the long-term



Firewood in a rafter



Firewood drying outside



Firewood in a shed

Tree species grown	Kibugu, Embu				Kereita, Kiambu			
	%households practising agroforestry	Ways planted	priority use		%households practising agroforestry	Ways planted	Priority use	
			1 <sup>st</sup>	2 <sup>nd</sup>			1 <sup>st</sup>	2 <sup>nd</sup>
Grevillea robusta	100	intercropped	Firewood	Timber	60	Intercropped	Firewood	Timber
Macademia	97.5	Intercropped	Nuts	Firewood				
Avocado	97.5	Intercropped	Fruits	Firewood				
Eucalyptus	72.5	Woodlot	Timber	Firewood	70	Woodlot	Timber	Firewood
Cyprus					75	intercropped	Timber	Firewood
Plums	21		75		50	intercropped	Fruits	



# Agroforestry for firewood supply

Characteristic	Kereita, Kiambu	Kibugu, Embu
Number of trees pruned	6	16
Number of woman loads of firewood produced	5	22
Amount produced in kgs	215	750
Daily firewood consumption (kgs)	4	5
Annual firewood consumption (kgs)	1460	1825
Period pruned firewood met household firewood need (months)	2	5
Number of timber trees required to be pruned to meet household energy requirements	36	38



# Use of improved firewood cookstoves



Gasifier cookstove



Kuniokoa



Stove	% fuel saving	% reduction in PM <sub>2.5</sub>	% reduction in CO	Source
Gasifier	32	79	57	Gitau et al. 2019b
Kuni moja	20	74(upward)		Njenga et al. 2016
Kuniokoa	46	90	91	Njenga et al. 2018
Three stone cleaned of ashes	Increased by 20	71	40	Njenga et al. 2018

## Improved cookstoves

- Concentrates heat on the pot
- Some are insulated to prevent heat loss
- Smoke less since they are efficient (20%)
- Uses less fuel

Improved stoves should meet the users needs and preferences for enhanced adoption

# Take home messages

- Effective policies and governance systems and awareness creation are necessary to make woodfuel sustainable
- Agroforestry present potential for self sufficiency in household cooking energy
- Feedstock sourcing → processing → utilization is critical in making woodfuel sustainable





# Thank you

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