

Can woodfuel (charcoal and firewood) be modernized in Africa?

Mary Njenga* ,
Tuyeni Mwampamba
and Ruth Mendum

Email: m.njenga@cgiar.org*
tuyeni@iies.unam.mx &
rmm22@psu.edu



Youth Forum-Global Landscape
Forum:

ICRAF 27.8.18

Varied opinions on charcoal

Lets us make it sustainable, lets us do away with it,
mixed feelings

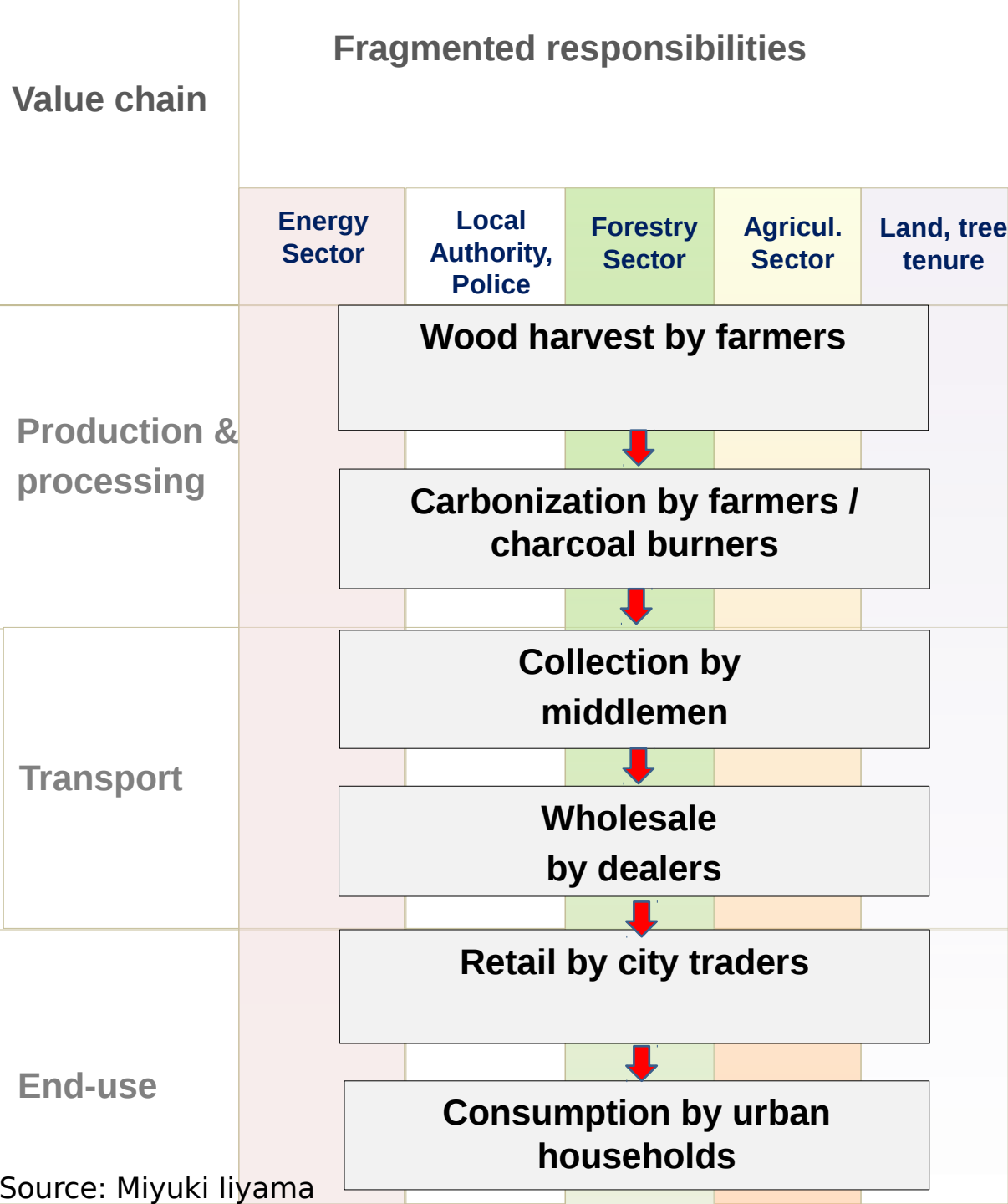
Benefits

- 1/3 of global population and 90% of population in SSA rely on charcoal and firewood
- Affordable, accessible for dependent poor and middle and high income users
- Charcoal is worth US\$14 Billion in Africa
- Charcoal in Kenya US\$1.6 B, (tea 0.8 B) Tanzania US\$650 M, Uganda US\$ 38 M.



Negative impacts

- **Environment:** Rural land degradation, deforestation
- **Health:** Smoke in the kitchen kills >4 million per year (mostly women and children)



Unsustainability resulting into political battles



Drylands

Gazetted forest



Under researched

Majority of producers use traditional kilns with low yields, cause air pollution



Confiscated charcoal at a checkpoint

Charcoal bans or charcoal booms

Booming charcoal business at Busia border



Who suffers

Lorries carrying charcoal from Uganda to Kenya



Footprint on Uganda's landscapes
Political battles

How charcoal ban could work in the absence of viable alternative?



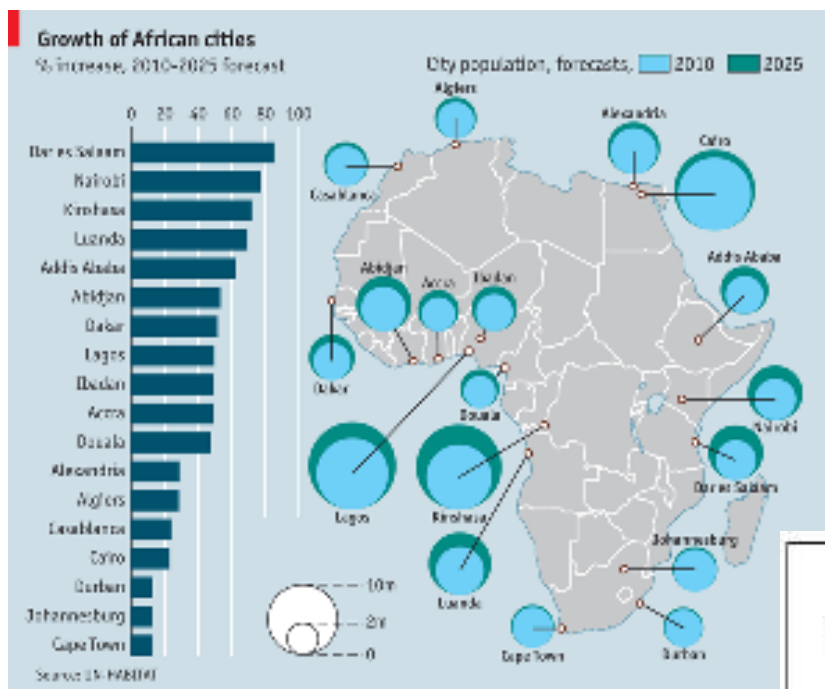
Who suffers

More pain for poor as charcoal price hits Sh2,500 a bag

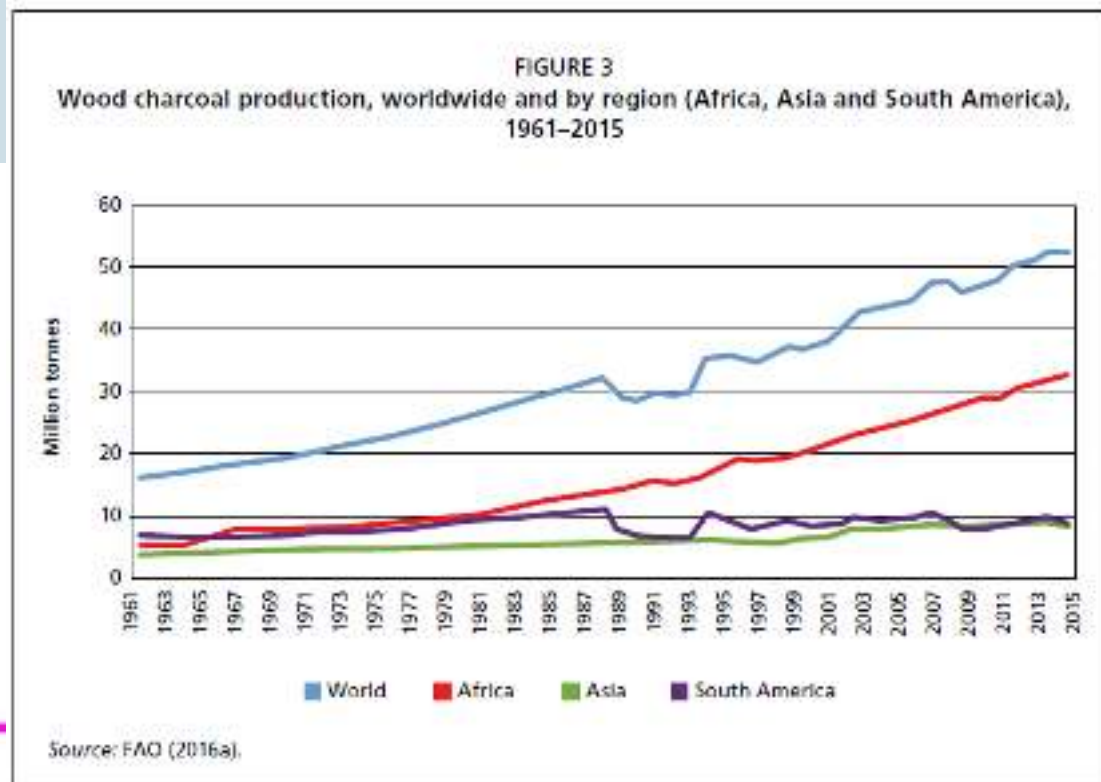


Does making charcoal sustainable make sense? **Yes, a bold decision**

- Majority of urban households depend on charcoal
- Second fastest urbanizing continent
- Population living in urban areas is projected to grow from 36% in



1-0 of consumers in SSA switch to charcoal per year (GIZ, 2014)



Business-as-usual

Cleaner/green charcoal system

Selective one-off cutting of live hard wood species, leading to degradation & biodiversity loss



Earth Kiln - efficiency $\pm 10\%$ low capital, skills required, done on site



Inefficient stoves, waste wood & cause smoke in kitchen



Farmer managed natural (assisted) regeneration



Domestication of preferred Acacia trees (Photo by KEFRI)



Tree nursery in refugee settlement in Uganda. (Photo by KEFRI)

Sustainable harvest of wood on farm ex. agroforestry, reducing pressures on forests

efficiency $\pm 30\%$ but capital intensive, need skills,



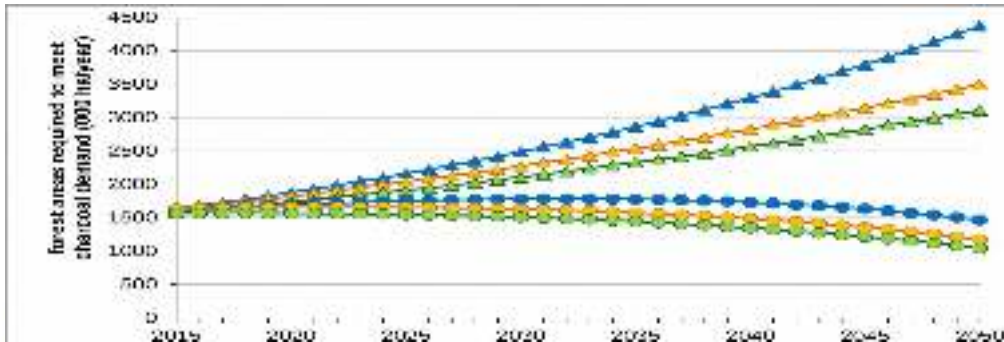
Stationary Kiln - 30% efficiency

- Efficient
- Capital intensive
- Need skills
- Irreversible

Alternative biomass fuel from organic waste-br



Improved stoves, reduce demand for charcoal



Examples of adaptive solutions to modernize charcoal: Charcoal farming

a. Sustainable production

Ai. Community based forest/woodland management



Conserve native species, mark those need to be protected, low inputs



Tanzania Forest Conservation Group

Supported by Swiss Agency for Development and Cooperation Farmer managed natural regeneration (FMNR) by ICRAF in various places



Improved earth kilns

	Year 1 2015/16	Year 2 2016/17
Production (tonnes)	324	1391
Community revenues (fees) US\$	21,830	85,917
Producer incomes US\$	22,746	86,787
Number of producers	308	1053
Villages	8	13

Sustainable wood production can eliminate GHG emission and result into net sequestration

aii. Agriculture with trees (agroforestry): Charcoal



Acacia species

Coppicing
Acacia

6 years rotation

Half orange kiln

KEFRA, Western Kenya. Oduor et al., 2012.

Production system	Tree species	Density Number/ha	Wood (t/ha)	Production cycle (yrs)	Yield depend on kiln efficiency and wood
Boundary	<i>Acacia polyantha</i>	2500	4.41	3-5	Efficient kilns can reduce GHG by 80% on the value chain (FAO, 2017)
Woodlots	<i>Grevillea robusta</i>	2500	2.64	3-5	

Plantations with right species, right place; higher inputs,

Supported by DFID

b. Alternative sources of biomass energy:

Charcoal



Charring banana

Banana char+mollases

Charcoal briquettes

Green Heat, Kampala Uganda. 25t per month. Okello et al., 2018



Sawdust briquettes by Biofuel, Kenya

Molding briquettes by hand

10t/day of sawdust briquettes. Generated Ksh11 million(US\$110,000) in 2017

C. Improved stoves

Why has the adoption and impact of improved stoves been below expectations after efforts for over 70 years?

Switch:
Is a complex process.

Focus on distribution
and stove alone miss
the point

Understanding users
needs and
preferences is key
Reduce consumption
and GHG emissions
by 63% (FAO 2013)



d. Effective marketing and enabling policy framework

Terminologies matter

- Prestigious in global North
- Dirty, primitive, poor man's fuel in global south
- Renewable has a ?



Baitis - ATBC/SBC Charcoal Symposium

Issues

- Formal value chain = high formal costs
- Similar treatment of unlicensed and licensed charcoal/briquettes
- Informality cause loss

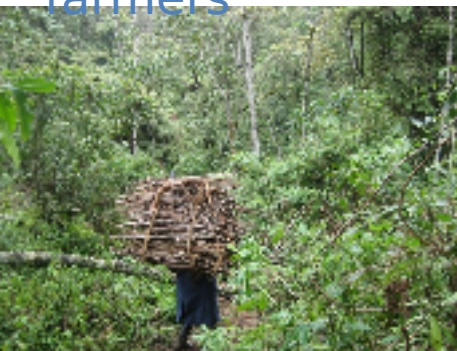
Policy alignment

- Global
- Regional
- Country

Policy coordination

- Land planning
- Energy
- Climate change
- Agriculture

E. Self-sufficiency in cooking fuel from prunings from trees by small-scale farmers



52kg (home use) and 69kg (for sale) from forest. 6Km roundtrip, 1 working day/week, Kenya



40% farmers in Embu/Kwale exclusively source firewood from prunings. A tree give 40-27kg firewood need 45-66 (9-13 per person) trees =meet demand of 1825kg/yr



Participatory kitchen



Measuring gases and particle concentrations from cooking with firewood and fuel use efficiency (transdisciplinary and design ethnography (studying cooking culture linking results to industry producing stoves

Gasifier biochar producing stove save 40% fuel, reduce CO by 45% and PM_{2.5} by 90%, yield biochar 20% of fuel. Njenga et al., 2016 .

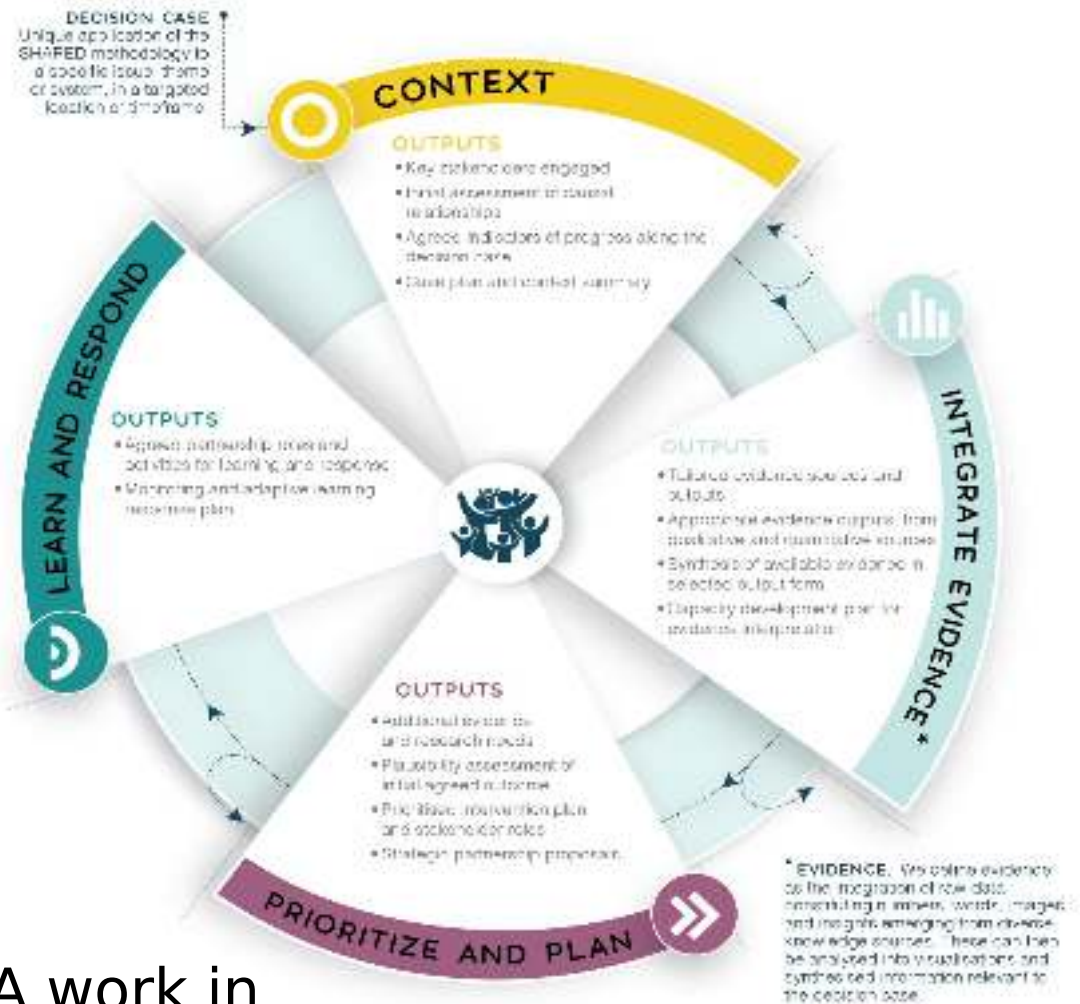
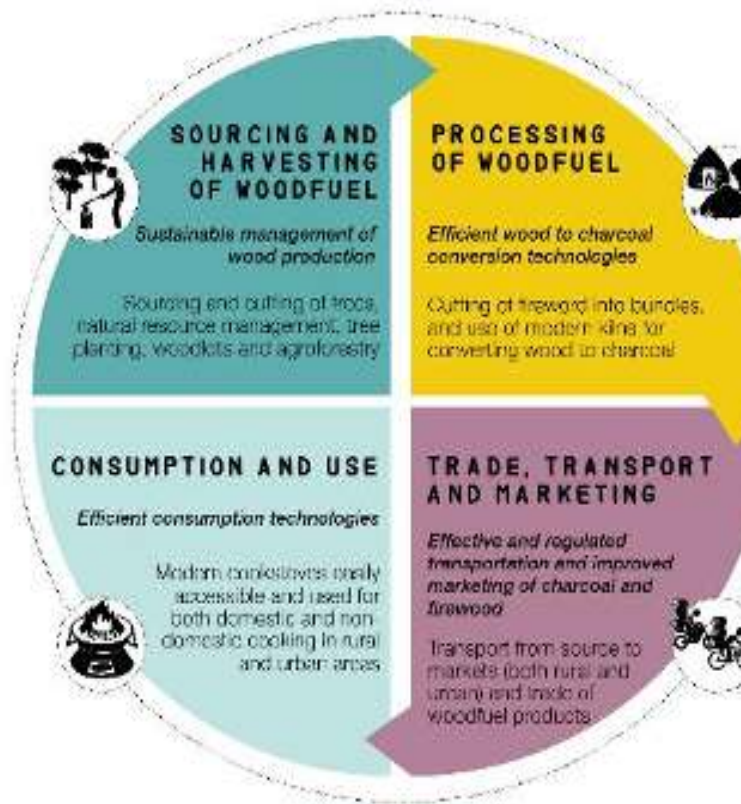


Biochar use in

Women farmers as researchers in energy-food security environment nexus

How can we develop adaptive solutions for

A. System and cross sectoral approach for effective policy development



ICRAF, COSTECH and TAREA work in Coastal Tanzania supported by CTCN.

B .Addressing Women needs and preferences

Farmers select preferred wood production system



friendly steel ring unlockable, portable 24 hour kilns, supported by FAO



Women researchers and not research subjects in participatory kitchen laboratory



Scientists studying cooking



Transdisciplinary teams for co-learning: Social-natural science researchers, north-south, policy makers, development practitioners, community, funders

Conclusion: There are innovations to modernize charcoal and firewood from a social-ecological