Sustainable Woodfuel Value Chains in Africa:
Governance, Social, Economic and Ecological Dimensions

November 23-25
Kumasi

Sustainable biomass production for enhanced energy and food security
- Exploring the potential of improved fallows

Natxo García-López[1], Aida Bargués-Tobella[2], Robert Lindgren[1], Cecilia Sundberg[2], Rosa Goodman[2], Gert Nyberg[2] and Christoffer Boman[1]

[1]Thermocemical Energy Conversion Laboratory (TEC-lab)
Dept. Applied Physics and Electronics
Umeå University

[2]Swedish University of Agricultural Sciences

natxo.garcia@umu.se

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Interlinked challenges

Lack of access to clean cooking

Only 15% of the population in SSA has access to clean cooking

Lack of access to electricity

< 50% of the popullation in SSA has access to electricity

Deforestation and land degradation

Up to 2/3 of the productive land in Africa is affected by land degradation

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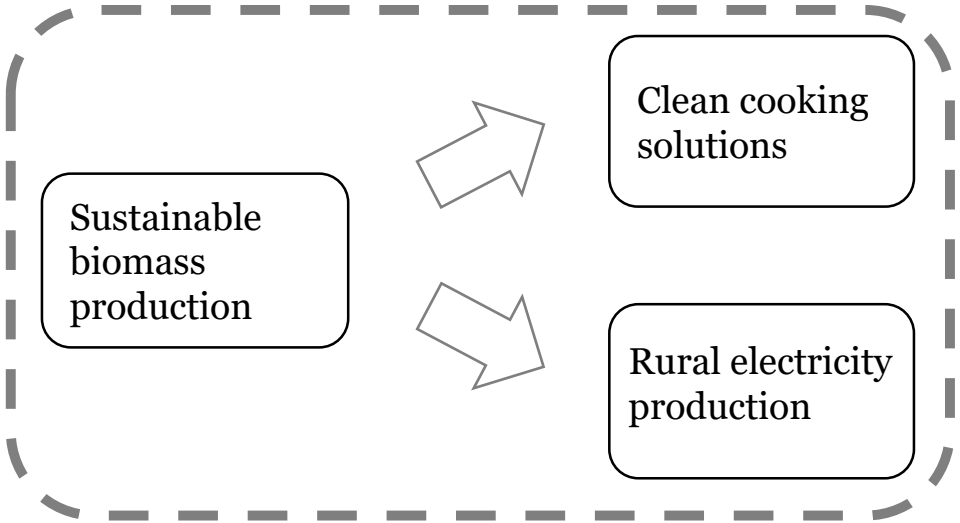
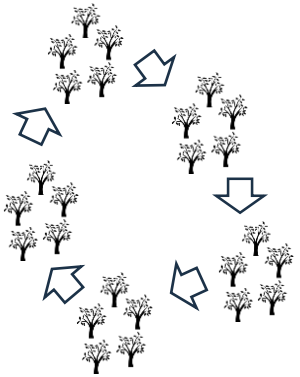
The aim of this study was to explore the potential of a bioenergy system based on sustainable wood production combined with clean cooking solutions and rural electricity production



Sustainable biomass production

Improved fallows of nitrogen-fixing trees



Clean cooking solutions

Improved stoves

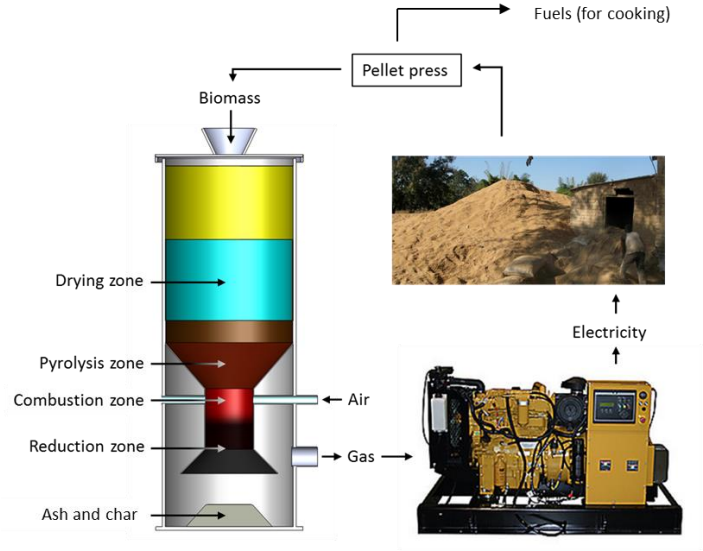
Advanced stoves

Sticks

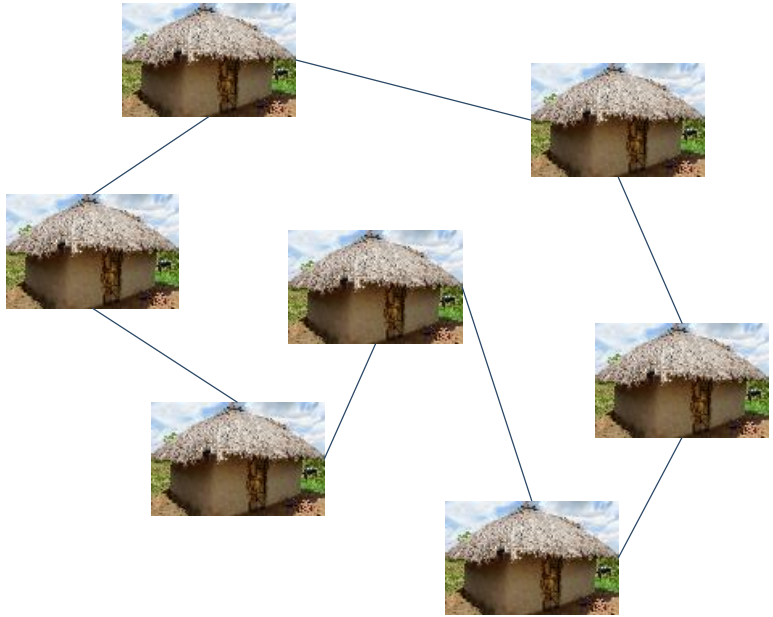
Wood chips

Pellets

Rural electricity production



http://www.cat.com/en_US/products/new/power-systems/electric-power-generation/diesel-generator-sets/18488263.html



Small-scale gasification

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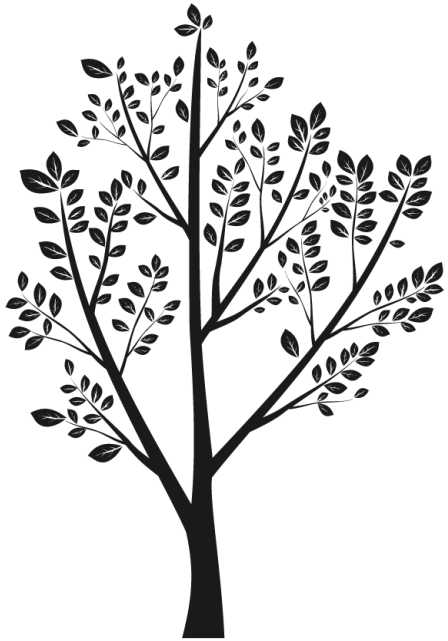
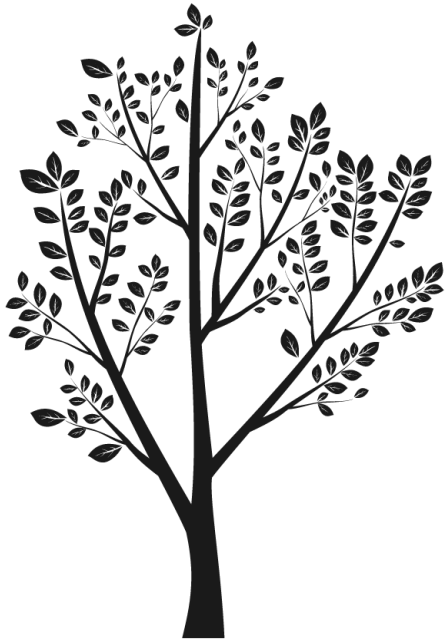
Mini-grids

How we studied the propossed energy system?

. 10 farms in Western Kenya
. Around 5000 trees
. Inventory of the DBH of all trees
. Allometric model based on 40 harvested trees
. Predicted the produced biomass and assessed its potential use



Fraction		Usage
Leaves < 5mm in Ø 	18 ± 1%	Animal fodder Soil amendment
Sticks > 5mm & < 20mm in Ø 	25 ± 1%	Clean cooking solutions
Logs > 20mm in Ø 	57 ± 6%	Rural electricity production through gasification



10 t ha^{-1} year^{-1}

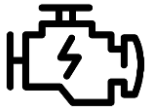
Fraction

Usage

Leaves 1.8 t ha^{-1} year^{-1}

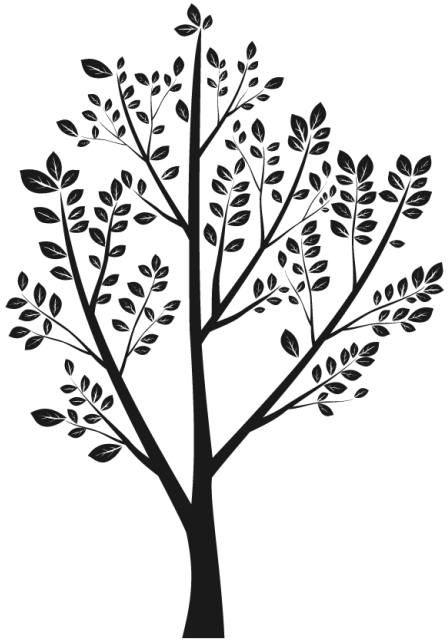
Sticks 2.5 t ha^{-1} year^{-1}

Logs 5.7 t ha^{-1} year^{-1}



Fraction

Usage



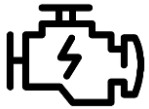
10 t ha^{-1} year^{-1}

Leaves 1.8 t ha^{-1} year^{-1}

Sticks 2.5 t ha^{-1} year^{-1}

2500
Cooking occasions

Logs 5.7 t ha^{-1} year^{-1}

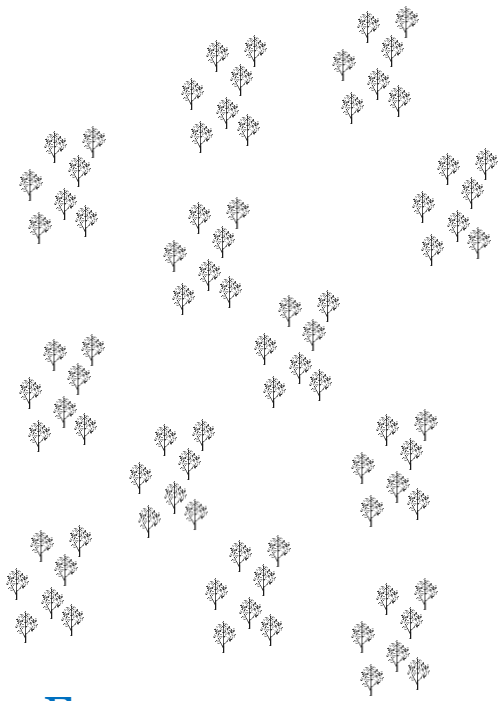


$\eta_{electrical}$ = 18%
$\eta_{charcoal}$ = 15%

4000 kWh ha^{-1} year^{-1}
Electricity

1 t ha^{-1} year^{-1}
Biochar

Village level



50 Farms
0.2 ha per farm

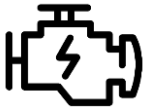
→ 57 t_{logs} $year^{-1}$

Logs

57 t_{logs} $year^{-1}$ → 30 t

↘

27 t
Upgraded fuels



$\eta_{electrical}$ = 18%
$\eta_{charcoal}$ = 15%

20000 kWh $year^{-1}$
Electricity

↓

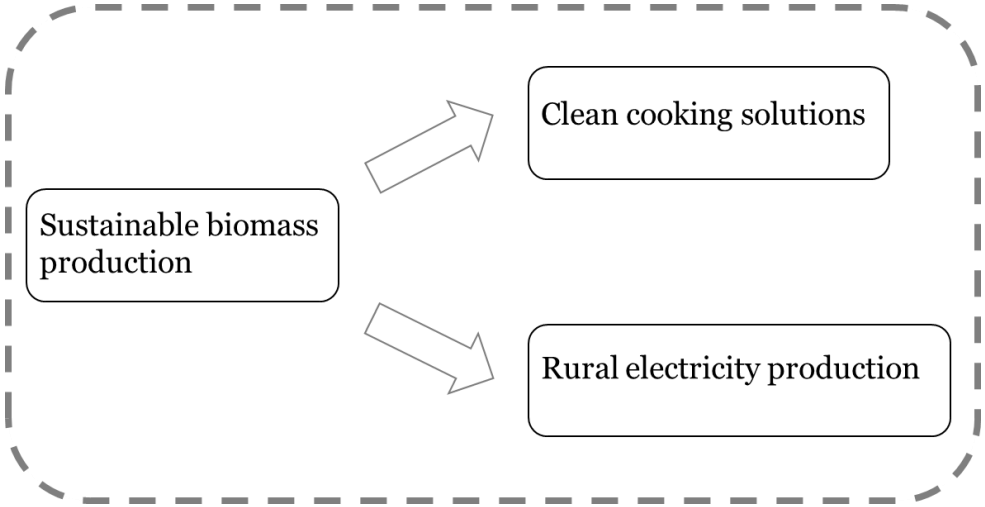
400 kWh $household^{-1}$ $year^{-1}$
(SDG 7: minimum 250)

↓

Supply 50 rural households

ENERGY SYSTEM

(Explored in this study)



Summary

. Allometric model

. The produced biomass for the three different fractions was predicted

. The potential use for the produced biomass was assessed at the farm and local levels

. Sustainable biomass from improved fallows has a large potential to improve bioenergy- and food security.

. There would be a surplus of biomass that can promote transition toward bio-economy in SSA

. The implementation of this system would contribute to the achivement of several SDGs

FORMAS

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SWEDISH INTERNATIONAL DEVELOPMENT COOPERATION AGENCY

Swedish Research Council

Swedish Energy Agency

BIO4ENERGY

Thanks for listening!

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