Wife of Odoch George preparing to boil water using ground stove. (Amale Balla Sunday)

Energy-saving ground stoves (Uganda)

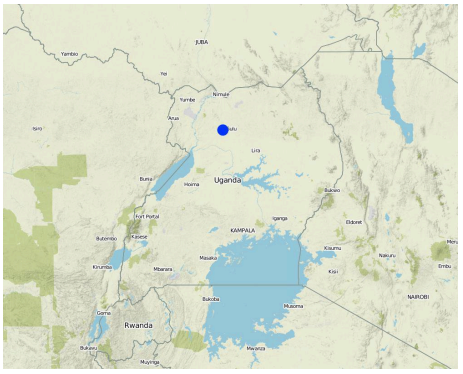
keno di-ot (keno di-kal)

DESCRIPTION

Energy-saving stove is a hole dug in the floor of a hut or in the compound. It helps to reduce the quantity of firewood used for cooking by reducing heat loss and ensuring firewood burning for longer time.

The rate at which forests are disappearing in northern Uganda is so frightening that strategic ameliorative innovations such as reduced wastage of biomass energy need to be envisioned. As such, the technology known as "energy-saving ground stove or energy-efficient ground stove" is being promoted in the region. This technology ensures that (i) smoke is eliminated in the kitchen, thus achieving a healthy environment, (ii) cooking is done faster while the stove retains beat for longer periods, (iii) up to 60% of firewood used with traditional cooking stoves is saved, and (iv) accidents from open fires are prevented.The energy-saving ground stove is constructed by digging a hole inside the kitchen or in the compound. For domestic food preparation, the hole is usually 1 square meter and 15 cm deep. The end where firewood is inserted is about 20 cm wide; while the opposite end where the fire burns is about 30 cm wide. Sometimes, the ground hole is lined with a layer of clay on the floor and walls. During construction, the common wind direction should be noted, especially when the hole is constructed outside the house. Constructing this ground hole does not require much technical skill although making a good one requires some experience. A hand hoe is commonly used for digging the hole, but any ground excavating tool can be used. This technology helps to preserve heat in the soil for further cooking; thus reducing household demand for firewood considerably. Ultimately, this reduces the pressure on deforestation. It also substantially saves women farmers' precious time, otherwise spent looking for firewood. This technology is particularly important for people who use firewood for cooking, because most energy- saving stoves available in the markets are expensive and require charcoal. Other locally made portable stoves also require charcoal. The challenge with the ground-stove technology is that it is not portable, hence, cannot be moved from one point to another. When constructed outside the kitchen, it becomes filled with water during rainy season, a factor that constrains its sustained use.

LOCATION



Location: Anaka, Nwoya, Uganda

No. of Technology sites analysed: 2-10 sites

Geo-reference of selected sites
- 32.10307, 2.73687

Spread of the Technology: applied at specific points/ concentrated on a small area

In a permanently protected area?:

Date of implementation: 10-50 years ago

Type of introduction
- ☐ through land users' innovation
- ☑ as part of a traditional system (> 50 years)
- ☐ during experiments/ research
- ☐ through projects/ external interventions

cooking point in the compound (Amale Balla Sunday)

ground stove (Issa Aiga)

CLASSIFICATION OF THE TECHNOLOGY

Main purpose

- [ ] improve production
- [x] reduce, prevent, restore land degradation
- [x] conserve ecosystem
- [ ] protect a watershed/ downstream areas – in combination with other Technologies
- [ ] preserve/ improve biodiversity
- [ ] reduce risk of disasters
- [ ] adapt to climate change/ extremes and its impacts
- [ ] mitigate climate change and its impacts
- [ ] create beneficial economic impact
- [ ] create beneficial social impact

Land use

Settlements, infrastructure - Settlements, buildings
Remarks: Applied at cooking points or inside kitchen.

Water supply

- [x] rainfed
- [ ] mixed rainfed-irrigated
- [ ] full irrigation

Purpose related to land degradation

- [ ] prevent land degradation
- [x] reduce land degradation
- [ ] restore/ rehabilitate severely degraded land
- [x] adapt to land degradation
- [ ] not applicable

Degradation addressed

biological degradation - Bc: reduction of vegetation cover

other -

SLM group

- energy efficiency technologies

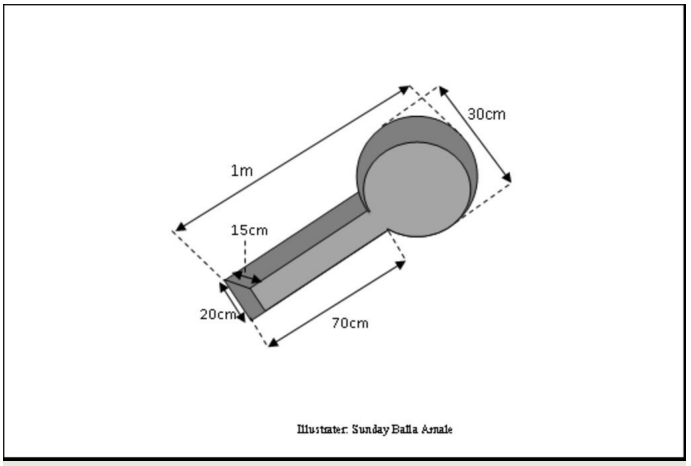
SLM measures

structural measures - S10: Energy saving measures

TECHNICAL DRAWING

Technical specifications

length 1m
burning end : round with diameter 30cm (depends on the purpose and sauce pan commonly used)
firewood input end 20cm (also depends on the purpose)
depth 15cm deep (depends on purpose)



Author: Amale Balla Sunday

ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

Calculation of inputs and costs

- Costs are calculated: per Technology unit (unit: **hole** volume, length: **not applicable**)
- Currency used for cost calculation: **Uganda shillings**
- Exchange rate (to USD): 1 USD = 3600.0 Uganda shillings
- Average wage cost of hired labour per day: 5000 per day

Most important factors affecting the costs

price of the hoe

Establishment activities

1. Identifying a suitable space (Timing/ frequency: anytime)
2. Marking lot (Timing/ frequency: anytime)
3. digging holes (Timing/ frequency: anytime)

Establishment inputs and costs (per hole)

Specify input	Unit	Quantity	Costs per Unit (Uganda shillings)	Total costs per input (Uganda shillings)	% of costs borne by land users
Labour					
persons	person hours	1.0	2000.0	2000.0	100.0
Equipment					
hand hoe	piece	1.0	10000.0	10000.0	100.0
Total costs for establishment of the Technology				**12'000.0**	
Total costs for establishment of the Technology in USD				*3.33*	

Maintenance activities

1. removing the ash (Timing/ frequency: once per week)
2. shaping the corners (Timing/ frequency: once a year)

Maintenance inputs and costs (per hole)

Specify input	Unit	Quantity	Costs per Unit (Uganda shillings)	Total costs per input (Uganda shillings)	% of costs borne by land users
Labour					
personnel	person hours	1.0	2000.0	2000.0	100.0
Total costs for maintenance of the Technology				**2'000.0**	
Total costs for maintenance of the Technology in USD				*0.56*	

NATURAL ENVIRONMENT

Average annual rainfall

- ☐ < 250 mm
- ☐ 251-500 mm
- ☐ 501-750 mm
- ☐ 751-1,000 mm
- ☑ 1,001-1,500 mm
- ☐ 1,501-2,000 mm
- ☐ 2,001-3,000 mm
- ☐ 3,001-4,000 mm
- ☐ > 4,000 mm

Agro-climatic zone

- ☐ humid
- ☑ sub-humid
- ☐ semi-arid
- ☐ arid

Specifications on climate

two rainy seasons separated by short dry spell between june and july. dry season between december to march
Name of the meteorological station: Gulu

Slope

- ☐ flat (0-2%)
- ☑ gentle (3-5%)

Landforms

- ☑ plateau/plains
- ☐ ridges

Altitude

- ☐ 0-100 m a.s.l.
- ☐ 101-500 m a.s.l.

Technology is applied in

- ☐ convex situations
- ☐ concave situations

- [ ] moderate (6-10%)
- [ ] rolling (11-15%)
- [ ] hilly (16-30%)
- [ ] steep (31-60%)
- [ ] very steep (>60%)

- [ ] mountain slopes
- [ ] hill slopes
- [ ] footslopes
- [ ] valley floors

- [ ] 501-1,000 m a.s.l.
- [x] 1,001-1,500 m a.s.l.
- [ ] 1,501-2,000 m a.s.l.
- [ ] 2,001-2,500 m a.s.l.
- [ ] 2,501-3,000 m a.s.l.
- [ ] 3,001-4,000 m a.s.l.
- [ ] > 4,000 m a.s.l.

- [x] not relevant

Soil depth
- [ ] very shallow (0-20 cm)
- [x] shallow (21-50 cm)
- [ ] moderately deep (51-80 cm)
- [ ] deep (81-120 cm)
- [ ] very deep (> 120 cm)

Soil texture (topsoil)
- [ ] coarse/ light (sandy)
- [x] medium (loamy, silty)
- [ ] fine/ heavy (clay)

Soil texture (> 20 cm below surface)
- [ ] coarse/ light (sandy)
- [ ] medium (loamy, silty)
- [x] fine/ heavy (clay)

Topsoil organic matter content
- [ ] high (>3%)
- [x] medium (1-3%)
- [ ] low (<1%)

Groundwater table
- [ ] on surface
- [ ] < 5 m
- [x] 5-50 m
- [ ] > 50 m

Availability of surface water
- [ ] excess
- [ ] good
- [x] medium
- [ ] poor/ none

Water quality (untreated)
- [ ] good drinking water
- [x] poor drinking water (treatment required)
- [ ] for agricultural use only (irrigation)
- [ ] unusable

Water quality refers to:

Is salinity a problem?
- [ ] Ja
- [x] Nee

Occurrence of flooding
- [ ] Ja
- [x] Nee

Species diversity
- [ ] high
- [x] medium
- [ ] low

Habitat diversity
- [ ] high
- [x] medium
- [ ] low

CHARACTERISTICS OF LAND USERS APPLYING THE TECHNOLOGY

Market orientation
- [x] subsistence (self-supply)
- [ ] mixed (subsistence/ commercial)
- [ ] commercial/ market

Off-farm income
- [x] less than 10% of all income
- [ ] 10-50% of all income
- [ ] > 50% of all income

Relative level of wealth
- [ ] very poor
- [x] poor
- [ ] average
- [ ] rich
- [ ] very rich

Level of mechanization
- [x] manual work
- [ ] animal traction
- [ ] mechanized/ motorized

Sedentary or nomadic
- [x] Sedentary
- [ ] Semi-nomadic
- [ ] Nomadic

Individuals or groups
- [x] individual/ household
- [ ] groups/ community
- [ ] cooperative
- [ ] employee (company, government)

Gender
- [x] women
- [x] men

Age
- [ ] children
- [x] youth
- [x] middle-aged
- [ ] elderly

Area used per household
- [ ] < 0.5 ha
- [ ] 0.5-1 ha
- [x] 1-2 ha
- [ ] 2-5 ha
- [ ] 5-15 ha
- [ ] 15-50 ha
- [ ] 50-100 ha
- [ ] 100-500 ha
- [ ] 500-1,000 ha
- [ ] 1,000-10,000 ha
- [ ] > 10,000 ha

Scale
- [x] small-scale
- [ ] medium-scale
- [ ] large-scale

Land ownership
- [ ] state
- [ ] company
- [ ] communal/ village
- [ ] group
- [x] individual, not titled
- [x] individual, titled

Land use rights
- [ ] open access (unorganized)
- [ ] communal (organized)
- [ ] leased
- [x] individual

Water use rights
- [ ] open access (unorganized)
- [x] communal (organized)
- [ ] leased
- [ ] individual

Access to services and infrastructure

health	poor ✓	good
education	poor ✓	good
technical assistance	poor ✓	good
employment (e.g. off-farm)	poor ✓	good
markets	poor ✓	good
energy	poor ✓	good
roads and transport	poor ✓	good
drinking water and sanitation	poor ✓	good
financial services	poor ✓	good

IMPACTS

Socio-economic impacts

energy generation (e.g. hydro, bio)

decreased ✓ increased

Quantity before SLM: collect fire wood once a week
Quantity after SLM: collect firewood after every fortnight after SLM, little wood is required for their cooking activities

farm income

decreased ✓ increased

increased since time spent in collecting firewood is put in

farming

Socio-cultural impacts

Ecological impacts

Off-site impacts

impact of greenhouse gases

increased ✓ reduced

efficient energy utilization

COST-BENEFIT ANALYSIS

Benefits compared with establishment costs

Short-term returns: very negative ✓ very positive

Long-term returns: very negative ✓ very positive

Benefits compared with maintenance costs

Short-term returns: very negative ✓ very positive

Long-term returns: very negative ✓ very positive

CLIMATE CHANGE

-

ADOPTION AND ADAPTATION

Percentage of land users in the area who have adopted the Technology

- [ ] single cases/ experimental
- [ ] 1-10%
- [x] 11-50%
- [ ] > 50%

Of all those who have adopted the Technology, how many have done so without receiving material incentives?

- [ ] 0-10%
- [ ] 11-50%
- [ ] 51-90%
- [x] 91-100%

Has the Technology been modified recently to adapt to changing conditions?

- [ ] Ja
- [x] Nee

To which changing conditions?

- [ ] climatic change/ extremes
- [ ] changing markets
- [ ] labour availability (e.g. due to migration)

CONCLUSIONS AND LESSONS LEARNT

Strengths: land user's view

- Less time needed for collecting firewood since wood demand is reduced.
- Reduced cutting down of trees since demand for firewood is reduced.
- Heat stored in the ground makes food cook very fast.
- After cooking, the heat in the soil is used to roast sweet potatoes or cassava.

Strengths: compiler's or other key resource person's view

- The technology is cheap and does not require technical skills.
- It can easily be scaled up to highly populated areas since it takes up a very small space.
- The technology is cheaper than any portable energy saving stoves available in the market.

Weaknesses/ disadvantages/ risks: land user's viewhow to overcome

- Cannot be moved from one point to another.
- If in the compound, rainwater clogs inside it. Cover it with carpet during rain.

Weaknesses/ disadvantages/ risks: compiler's or other key resource person's viewhow to overcome

- Corners need shaping over time. Use clay to stabilise corners of the ground hole.

REFERENCES

Compiler
Sunday Balla Amale

Editors
Bernard Fungo
betty adoch
Kamugisha Rick Nelson
JOY TUKAHIRWA

Reviewer
Alexandra Gavilano
Nicole Harari
John Stephen Tenywa

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Resource persons
Margret Ayamo - land user

Full description in the WOCAT database
https://qcat.wocat.net/af/wocat/technologies/view/technologies_3324/
Video: https://player.vimeo.com/video/469

Linked SLM data
n.a.

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