Trans-SEC

Innovating pro-poor Strategies to safeguard Food Security using Technology and Knowledge Transfer

Enhanced Food Security via adoption of Improved Cooking Stoves and local wood plantations in Tanzania

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Background

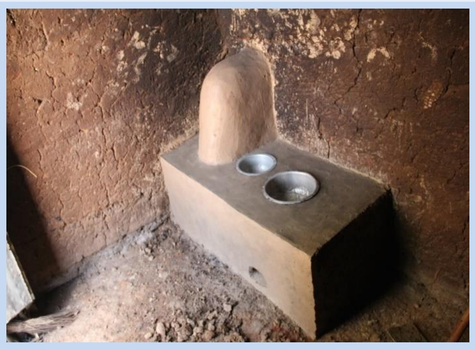
Fuelwood scarcity and food security are reported issues in developing countries. In degraded and deforested areas of Tanzania firewood supply is a severe challenge. Through Improved Cooking Stoves (ICS) the absolute firewood consumption for cooking purposes compared to traditional Three-stone-fire stoves (TSF) can be reduced. More frequent and advanced dishes could be cooked. The integration of on-farm wood plantations can contribute to both – firewood supply and food security. Increased on-farm wood plantations bear the potential – when intercropped with crops – to enhance agricultural yields. Although abundant research has been done on the intercropping farm-systems, little attention has been paid to the simultaneous firewood and crop production. We investigate the biomass production of different intercropping systems with crops and trees.

Research question

- Can ICS with a two-pot design contribute to food security via time savings?
- What are the actual savings of ICS with a two-pot design compared to TSF with regard to firewood consumption?
- How many trees are needed to achieve firewood autarky by on-farm plantations?
- What are the impact pathways of ICS and tree plantations with regard to food security: direct (change of meals, crops/fodder yields); indirect (time savings)?

Strategies to enhance Energy Supply and Food Security

Three-stone-fire stove **vs** **Improved Cooking Stove**



Integration of trees and intercropping systems
(Maize + Pigeonpea + *G. Sepium)*
Monocropping **Intercropping** **crop+tree integration**

Methods

- Controlled Cooking Test (to determine firewood and time consumption of ICS and TSF)
  → Location: Idifu (January 2016, N = 40 households, 2 cooking tasks per household and day)
- Destructive measurement of biomass yield of tree plantations (*Gliricidia sepium*)
  → Location: Laikala (February 2016, Gliricidia sepium 3m by 3m, maize intercropping, area assessed 2000 m²)

Current results

Tab 1: Firewood and time savings (Three-Stone-Fire stoves vs Improved Cooking Stoves)

	Type of Stove: Three-stone-fire stove (N =19)	Improved Cooking Stove (N =19)	
Meal	Firewood consumption (g)	Firewood consumption (g)	Total firewood savings (g)
Rice and vegetables	2187 (SD 879)	1375 (SD 792)	812 * (37.1 %)
Beans and rice	4241 (SD 1540)	3576 (SD 696)	665 (15.6 %)
Meal	Cooking time (min)	Cooking time (min)	Total time savings (min)
Rice and vegetables	82.4 (SD 28.3)	60.3 (SD 13.6)	22.1 * (26.8 %)
Beans and rice	179.7 (SD 43.3)	138.8 (SD 23.1)	40.9 * (22.8 %)

* Differences are significant at a level of significance of 0.05 %

Tab 2: Space demand of Gliricidia Sepium per household to cover the firewood demand for cooking purposes by own plantations

Cropping pattern	3m by 3m	1m by 1m	0.5m by 0.5m
Space demand	16344 m² (4 acre)	1816 m² (0.45 acre)	454 m² (0.11 acre)

- Average firewood consumption per year and household with ICS is **1140 kg** (air-dried)
- Time savings per year through cooking with ICS instead of TSF = **143 hours**
- **1800 trees** of G. Sepium are needed to reach firewood autarky on household level (**2300 kg** wood growth, air-dried, 2-year rotation)
- Potential time savings if all firewood for cooking with TSF is collected on farm = **450 hours** (firewood collection for TSF)

Outlook

Analyze different cropping systems:
Monocropping vs. intercropping with trees

- How to optimize the intercropping production system (Agroforestry-System): Correlation between crop and tree production?
  → Randomized complete block design with three replications and five treatments >> 15 plots

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