

Can small-scale farmers sustain household energy requirements from on-farm produce? A case study from the Uluguru Mountains of Tanzania

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Introduction and objective

- The Uluguru Mountains are embedded in an ecosystem of global importance among the 25 most important "biodiversity hotspots in the world". According to the Tanzania Forest Act of 2002 it is covered by the highest level of habitat protection (Doggert et al. 2004).
- Since cutting trees for firewood and charcoal production is prohibited, shortages in terms of energy supply occur.
- Firewood scarcity is increasingly becoming a problem. In the past, firewood was collected from the neighboring community and government forest. Since the forest reserve is protected, the trend is towards planting trees on-farm to reduce firewood scarcity on household level.
- This study aims to assess the firewood consumption and production patterns at household level.

- In total, 95% of the households collect firewood from own farm sources. However, only 5 % of the households are self-sufficient because they own private woodlots, private forests or trees intercropped with food crops, meaning no other source of firewood is needed.
- Firewood collection from other individual farms such as neighbors and friends is done on a regular basis, but requires an informal permission by the owner of the plot.
- Still, 15% of the households go to the forests collecting firewood.
- The trees cultivated on-farm comprise a huge variety (table 1). Some trees are preferred firewood such as Mango tree (*Mangifera indica*) whereas others are favored for timber such as *Cederella odorata*.
- On average smallholders cultivate 6 different tree species with a number of 50 trees.

Data source and household selection

- The data were collected in a comprehensive household survey undertaken in Tandai village, Kinole Ward, Morogoro District in 2010; applied with a stratified sampling.
- Within this scope, 314 (30%) out of 1015 households were selected.
- Farm households are typically small-scale farmers with an average of 4 acres agricultural land. The agricultural portfolios comprise cash cropping (banana, pineapple, and spices) and subsistence farming.
- This study is part of the Better-IS research project "Biofuel Evaluation for Tanzanian Technological Efficiency using Renewables - integrated Strategies".
- The descriptive results are preliminary from a sub-sample of 70 households, focus group discussion and expert interviews.



Results

- Energy sources used in Tandai include firewood, crop residuals, and charcoal for cooking purposes as well as kerosene for lighting (figure 1).

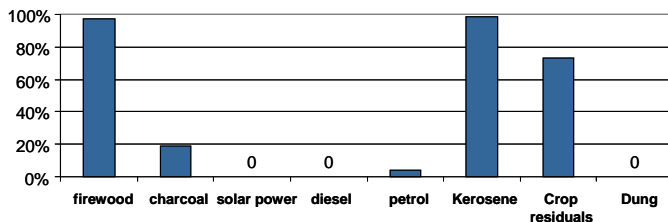


Figure 1: Firewood sources of the households in Tandai village
 Source: Own survey, 2010

- More than 97% of the households use firewood, which highlights the importance to ensure sustainable firewood supply.
- Apart from fuel wood, crop residuals mainly from cassava stems and coconut husks are utilized for cooking, too. In Tandai, these crop residuals are non-tradable goods.
- In Tandai, firewood is obtained through on-farm production, collected from forest reserves, other individual farms, and bought from the market (figure 2).

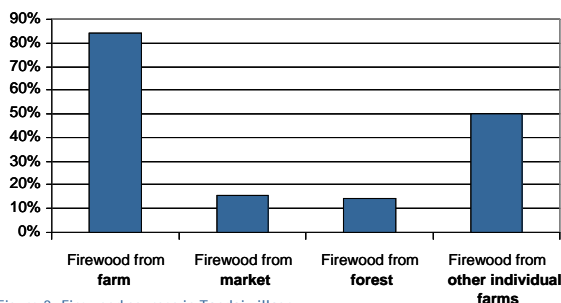


Figure 2: Firewood sources in Tandai village
 Source: Own survey 2010

Trees used mainly for firewood	Trees used mainly for timber
Mango (<i>Mangifera indica</i>)	Mifenesi (<i>Artocarpus heterophyllus</i>)
Mifenesi (<i>Artocarpus heterophyllus</i>)	Mitiki (<i>Tectona grandis</i>)
Mishelisheli (<i>Artocarpus altilis</i>)	Miparachichi (<i>Persea americana</i>)
Karafuu (<i>Syzygium aromaticum</i>)	Mkangazi (<i>Khaya anthotheca</i>)
Mikababu (<i>Faidherbia albida</i>)	Migrevilea (<i>Grevillea robusta</i>)
Mdalasi (<i>Cinnamomum zelanicum</i>)	Msederela (<i>Cedrela odorata</i>)

Table 1: Utilization of trees
 Source: Own survey, 2010

- Survey results show that men prefer timber tree species for income generation whereas women prefer tree species with high quality firewood to reduce smoke during cooking.
- However, tree species suitable for firewood are scarce. Hence, women tend to shift to less suitable tree species for firewood e.g. *Cederella* which is very smoky.
- Altogether, the energy mix of the households consists of 50% firewood, 30 % crop residues (up to 50%). The rest (up to 20%) comes from charcoal and kerosene. The value chain for firewood is illustrated in figure 3.

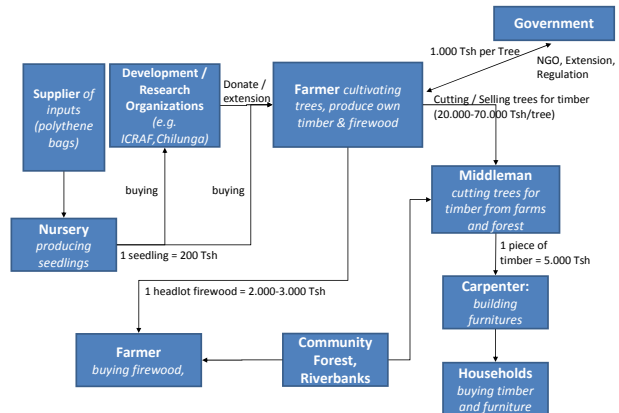


Figure 3: The wood value chain
 Source: Focus group discussion, 2010

- The access to firewood from the farm depends on the farm size, the availability of trees on farm, the market price of firewood, and the accessibility of forests and neighboring farms.
- It should be highlighted that plots, which are rented are often restricted to annual plant cultivation thus ruling out tree cultivation on farm.
- In addition, individual preferences in terms of cooking duration and food taste influence the energy choice.
- It is argued that households with higher income are also more likely to use charcoal for cooking compared to fuelwood.

Conclusion

The results show that only 5% of the farm households are firewood sufficient due to woodlots and tree intercropping on-farm; 95% of the households depend additionally on other firewood sources such as neighbouring farms, forests and markets. In the next step of analysis, the determinants of firewood sufficiency need to be estimated to decide for more tree planting activities on-farm including farm size, wealth, market prices and accessibility.

Reference: Doggert, N., Lovett, J., Mhoro, B. Kiure, J., and N. Burgess (2004): Biodiversity surveys in the Forest Reserves of the Uluguru Mountains. WCST.