ENVIRONMENTAL IMPACT OF HOUSEHOLD FUELWOOD CONSUMPTION IN THE BALE ECO-REGION, ETHIOPIA

SUMMARY

Although use of fuelwood has remained a very important source of energy for the household in the Bale Eco-Region it has its own contribution to forest degradation. As a result, the amount of biomass in the last ten years has been highly depleted resulting in the necessity for people, mainly women not only to travel long distances but also to spend more time in collecting fuelwood from the natural forest. The implication is significant especially for women who are responsible for fuelwood collection. This study found that the use of improved cook stoves (ICS) saves almost 28.6% of fuel compared to traditional stoves, leading to an average annual fuel saving of 875 kg fuelwood. These savings translate to an annual 257 kg of carbon saved annually per stove. In order to reduce demand for wood and ensure the sustainability and benefits of forests it is imperative to disseminate ICS. Despite ICS having received good acceptance in the study areas they are designed primarily for injera baking. Therefore, to enhance their positive impact it is recommended to consider the local culture and disseminate ICS, designed for cooking injera, as well as other cooking activities, as coffee, porridge, wot, and bread.

BACKGROUND

Developing countries account for most of the consumption of fuelwood and more than 75% of wood harvested in these countries is used as fuel (Bearer et al. 2008). Increasing demand for fuelwood has resulted in a looming crisis in shortage of fuelwood in many areas (Macht et al. 2007). In Ethiopia, an extensive demand for fuelwood is causing a widespread degradation on the existing natural forest including the Bale Eco-Region (BER), located in Oromia regional state, southeastern Ethiopia (Fig 1). Initiatives have been taken to improve the efficiency of household energy including the distribution of improved cooking stoves (ICS). Accordingly, a large number of ICS have been distributed to rural communities including those living in the study area. The study described in this brief carried out a comparative analysis of fuelwood consumption between traditional three stone cook stoves and improved cook stoves. It examined their performance with regard to reducing the level of CO2.
METHODOLOGY
The study was conducted in three woredas (nine Kebeles) located in BER. The two major factors considered in selecting the study sites were: distance from forest area and distribution of fuel-efficient stoves. Random sampling technique was used to select the households. A major criterion used to choose the households was whether or not they used an improved cooking stove. Accordingly, 216 people were chosen. A survey on households, key informants and focus group discussions was carried out to collect quantitative and qualitative data. A Kitchen Performance Test (KPT) was computed by weighing the total amount of fuelwood consumed per week for baking purposes. Then, 48 households (24 ICS users and 24 non-users) were randomly selected. Furthermore, the probable impact of fuel savings on carbon stocks was assessed by estimating total carbon savings from the total number of improved cooking stoves disseminated in the study area. Accordingly, the amount of fuelwood consumed per household was measured in kilograms/tonnes (kg/ton) in the form of stack volume and then converted into solid volume using conversion factors. The calculation was based on the clean development mechanism and United Nation Framework of Convention on Climate Change (UNFCCC 2013) with default net calorific values, emission factors and carbon storage in forests.

FINDINGS FROM THE RESEARCH
Household Energy Consumption Pattern
Findings reflected that fuelwood, leaves, charcoal, animal dung and electricity (used by a very few households) are sources of energy in the study area; large proportions of the households in the study area are dependent on traditional fuels (biomass). About 78.9% and 64.6% of the households are dependent on firewood as a source of fuel for baking and cooking, respectively (Fig. 2). Households seem to choose sources of fuel based on source availability, their perception of different sources, their economic status, and household habit. Most households (59%) that use fuelwood choose collecting wood from natural forests, followed by households (22%) that own plantation/homesteads and those (19%) that purchase fuelwood. Purchasing is more common in urban areas. Villages located relatively far from forests tend to own plantations or homestead garden trees to meet their fuelwood demand compared to those villages closer to forests.
GENDER DIMENSIONS

The household survey confirms that fuelwood is mostly collected by women and girls. Accordingly, among the family members this responsibility is spread out according to the following ratios: mother (74%), girls (14%), boys (8%) and father (4%). The focus group discussions (FGD) pointed out that the amount of biomass has been highly depleted in the last ten years. Women travel longer distances and spend more time in collecting fuelwood as the fuelwood in the natural forest is getting scarce. For instance, women in the study area spend, on average, 2.09 hours to collect fuelwood; and this has increased their work burden. A study by FAO (1983) indicated that fuelwood scarcity has impacted children’s education. As fuelwood becomes scarcer, women take the boys and girls out of school to help collect fuelwood. Thus, planting trees around homesteads and the practice of using cow dung have increased in the study areas, especially in villages which are far away from the forest area.

Reduced fuel consumption with improved stoves

The KPT indicated that average weekly consumption of fuelwood when cooking with an improved baking stove per household is 12.6 kg compared to 22.1 kg for using a traditional cooking stove. The result also showed that a significant fuelwood saving (nearly 28.6%) was obtained as a result of using improved cook stoves compared to using the traditional three-stone injera baking stoves, with annual fuelwood savings per household of 875 kg. The equivalent per capita fuel consumption is estimated to be 292 kg for households using improved cooking compared to 409 kg per person in households using traditional stoves. Furthermore, the estimated annual carbon saving from 10,000 improved cooking stoves distributed is 2,570 tons of carbon.

AREAS FOR FURTHER RESEARCH

- It is recommended that further studies need to be conducted to investigate factors affecting adoption of improved cooking stoves and sustained use in rural households;

- A KPT should be conducted in all seasons and for all fuel types so as to better understand the impact of improved cooking stoves on household fuel use.
**KEY RECOMMENDATIONS FOR POLICY MAKERS**

The study has generated findings that could be important for policymakers concerning the role of fuel-efficient stoves and its contribution to wood saving and carbon emission reduction, the last-mentioned factor having its own role in reducing impacts on the environment. Fuelwood collection represents a major driver of forest degradation. Although it is difficult to quantify the actual effect on the rate of degradation it is worth mentioning that distribution of improved cooking stoves is expected to have a positive impact on tackling forest degradation, and can be a possible strategy to conserve forests and mitigate climate change.

**REFERENCES**


FAO (Food and Agriculture Organization of the United Nations). 1983. Wood fuel surveys. UN Food and Agriculture Organization.


FAO (Food and Agriculture Organization of the United Nations). 1983. Wood fuel surveys. UN Food and Agriculture Organization.

FAO (Food and Agriculture Organization of the United Nations). 1983. Wood fuel surveys. UN Food and Agriculture Organization.

**ACKNOWLEDGEMENTS**

This study was supported by the European Union and the Norwegian Embassy.

This brief was largely based on the following MSc thesis; Beyene, Ararsa 2015. Fuelwood consumption and its environmental impacts: the case of Bale Eco-Region, Oromia Regional State, South Eastern Ethiopia. School of graduate Studies. Wondo Genet College of Forestry and Natural Resources, Hawassa University

**EDITORS**

Daniel Van Rooijen (d.vanrooijen@cgiar.org)
Farm Africa: Biruktayet Assefa (BiruktayetA@farmafrica.org)

**ABOUT THE SHARE BALE ECO-REGION PROJECT**

Conservation of Biodiversity and Ecosystems Functions and Improved Well-being of Highland and Lowland Communities within the Bale Eco-Region (BER) is one of the European Union (EU)-funded projects that stands for Supporting Horn of Africa Resilience (SHARE). In Ethiopia, the project covers 16 districts (Woredas) in West Arsi and Bale Zones of Oromia Regional State, with around 22,000 km², comprising a population of about 3.3 million. The life span of the project is 42 months starting in July 2014 and ending in November 2017. Five partners are implementers of the project, which are: Farm Africa, SOS Sahel, International Water Management Institute (IWMI), Frankfurt Zoological Society (FZS) and Population Health and Environment (PHE).