Technology Fact Sheet for Mitigation
Subsector: Forestry
Technology: Improved Cook Stoves (Mud Stoves) [i]

A.1 Introduction:

Most of households in the rural, urban and semi urban areas use the traditional three stones open fire stoves to prepare their food. Some public institutions, especially khalwas, prisons and army camps also use the same stoves to prepare meals. It is recognized that the efficiency of the traditional stoves used are extremely low; hence a lot of fuel wood is burnt unnecessary leading to loss of forest cover which is an important sink for GHGs.

Over-reliance of biomass-based fuels and inefficient technologies such as traditional stoves has placed great pressure on local forests. According to National Forests Inventory the annual clearance of forest area in Sudan is about 36,975 Hectares. This has led to a tangible deficit between the annual consumption of forest products, 21 million m^3, and the annual growth rate and reforestation. The later produces only about 10 million m^3 annually. The result of such a non-sustainable exploitation of forest resources is continuous depletion of forest area. The share of the population with access to modern fuels in Sudan in 2007 was 7%, and made up of 6% LPG and 1% kerosene in absolute terms.

The intensive dependence on fuelwood (firewood and charcoal), in addition to decreased rainfall and land clearance for agricultural use, has led to an increasing depletion rate of these non- renewable natural resources, and has resulted in almost complete desertification in some parts of the Sudan (e.g., Eastern)

The total wood fuel consumed annually in Sudan is estimated to be over 4.4 Million tonnes (Forest Products Survey in Sudan, 1995). The traditional stoves cannot achieve complete combustion. Reason being, *first*; the physical design of these stoves is such that the fuel cannot vaporize and mix sufficiently with air, which is a requirement for complete combustion (Bailis, 2004). *Second*, the stoves have poor heat transfer efficiency to the cooking pot (Mark *et al.*, 2007), and *thirdly*, even though these stoves are individually small, they are usually numerous.

Improved cook stoves both for household and institutional uses are available in Sudan and produced locally by a limited number of trained artisans. The improved stoves are 35 % more efficient than the traditional three stone open-fire stoves. The improved *Badia* stoves proved to be the simplest, efficient, and easy to manufacture by rural artisans using locally available materials (clay, animal dung and locally available metal sheets for lining).

Improved Cook Stoves (ICS) reduce the rate of desertification as it uses small amount of fuelwood compared to traditional stoves. The average annual per capita consumption of fuel wood in Sudan was approximately 24.3 kg and 10.1 kg for rural and urban households, respectively.

A.2 Technology characteristics

Improved Cook Stoves (ICS) can be designed and built in various ways, depending on the local conditions. At their simplest, ICS provide an enclosure for the fire to reduce the loss of radiant heat and protect it against the wind. In addition, attention can be given to methods controlling the upward flow of the combustion gases, so as to increase the transfer of heat to the cooking pot. Many of these stoves are made of mud or sand since both are almost free and readily available. The design of the stove incorporates, among others, use of proper insulating material for insulating the combustion chamber to minimize heat loss and ensure high temperature inside to promote complete combustion. Limiting, limiting the amount of fuel inside the combustion chamber, preheating of combustion air.

A.3 Country specific / applicability

Key economic drivers of deforestation include

- High domestic fuel wood consumption; about 69.5 % of the wood consumption,
- The relative high cost of fuel wood and charcoal in comparison to household energy budget ;
- Minimum change for cooking behaviour.

A.4 Status of technology in country

Different institutions have worked on this issue, since mid-eighties, this include research institutes such as energy research centre, government institutes such as Forest National Cooperation, and NGOs such as Sudanese Environmental Conservation Society. Hence a relative basic state of know-how and experience exists. Improved cook stoves both for household and institutional uses are available in Sudan and produced locally by a number of trained artisans. On strategic level, lowering the deforestation is the main issue in all developmental plans.

A.5 Barriers

- Low budget for dissemination and training
- Administrative and organizational procedures in establishing production units
- Needed Budget to further optimize the design parameters
- Relative high cost of the ICS

A.6 Benefits to economic / social and environmental development

• Minimize the pressure on forests to provide wood fuel for cooking
• Improve economic situation through Job creation; improving house energy budget
• Improve the health conditions delivered from cooking with relatively a clean smokeless stove
• Saving time for women and children in collecting firewood, and reduce the burden of carrying wood long distances are also avoided

A.7 Costs

Main cost of the improved stoves is fixed cost (7 UDS) but the running cost is expected to be less than the traditional stoves.

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[i] **This fact sheet has been extracted from TNA Report – Technology Needs Assessment for Climate Change Mitigation - Sudan. You can access the complete report from the TNA project website http://tech-action.org/**