washplus weekly

Supportive Environments for Healthy Communities

Issue 103 | May 31, 2013 | Focus on Cookstove Fuels

This issue contains recent studies and resources on several types of fuels used in cookstoves: biochar, biogas, wood, charcoal, ethanol, Jatropha, kerosene, and solar energy. Some of the resources include a recent World Bank review of biomass fuels and improved cookstoves in Central America and a country and regional analysis of solid fuel use. Also included is a video by Julie Greene of Solar Cookers International that discusses how solar cookers can benefit the environment and people, especially women and girls.

We welcome suggestions for Weekly topics. Future issues will focus on menstrual hygiene management, innovation, water point mapping, mobile applications, and WASH in schools; more than 100 past issues of the Weekly are archived on the WASHplus website.

GENERAL/OVERVIEW

- **Cookstove Fuels**. Global Alliance for Clean Cookstoves. (Link)
  A wide variety of fuels are currently employed around the world for household cooking purposes. This web page describes how fuels differ in their health and climate impacts, efficiency, and availability.

- **Fueling Benefits: Evaluating the Environmental, Health, and Livelihood Impacts of Fuel Production and Distribution**. Presentations at the Clean Cooking Forum, Mar 2013. (Presentations) (Notes)
  This site includes five presentations about woody biomass alternatives to charcoal, ethanol, and other topics as well as posters, photos, notes, and materials from the March Clean Cooking Forum.

- **Household Energy Access: Achievements and Challenges**. Presentation at the Clean Cooking Forum, Mar 2013. S Pachauri. (Presentation)
  This presentation discusses factors that influence household fuel choice, trends in the usage of household fuels, and other issues.

- **Solid Fuel Use for Household Cooking: Country and Regional Estimates for**

1980–2010. *Env Health Perspec, May 2013*. S Bonjour. (Full text)
The proportion of households relying mainly on solid fuels for cooking has decreased from 62 percent to 41 percent between 1980 and 2010. Yet due to population growth, the actual number of people exposed has remained stable at around 2.8 billion over three decades. Solid fuel use is most prevalent in Africa and Southeast Asia where more than 60 percent of households cook with solid fuels. In other regions primary solid fuel use ranges from almost 50 percent in the western Pacific, to one-third in the eastern Mediterranean, and less than 20 percent in the Americas and Europe.

- **Towards Sustainable Energy Utilisation: An Analysis of Various Cooking Fuel Options in Malawi**. *Jnl Mechan Eng Research, Mar 2013*. L Nkhonjera. (Full text)
A sustainability analysis of potential cooking fuels was conducted in Malawi. It was found that a combination of electricity, ethanol/gelfuel, biogas, solar, and wood fuel (firewood and charcoal) from sustainably managed sources and the use of energy efficient wood fuel stoves can provide sustainable energy for cooking in Malawi with wood fuel remaining dominant in the supply mix.

BIOCHAR

- **Biochar Cookstoves**, 2012. African Christians Organization Network (ACON). (Video)
ACON's biochar cookstove effort is enhancing agricultural results in western Kenya and lowering the need for fuelwood. ACON is a grantee of National Geographic's Great Energy Challenge initiative.

- **North Vietnam Villagers Develop Strategies to Help Combat Global Warming and Improve Household Health; Results of First 18 months of Village Biochar Program**, 2012. S Joseph. (Full text)
This project has met its goals in terms of the development and dissemination of a biochar stove that is acceptable to the majority of users. It has been successful in demonstrating the benefits of the stove in terms of fuel and time savings, reduction in emissions of particulates and carbon monoxide that women and children breathe in the kitchen, improved safety within the kitchen, production of a biochar that can eliminate odors from the composting of animal manure and human waste, and increase in crop and vegetable yields.

- **International Biochar Initiative (IBI)** – (Link)
IBI works to promote the adoption of biochar for agriculture, energy, and climate benefits.

BIOGAS

- **Biogas as an Alternative to Fuelwood for a Household in Uleppi Sub-County in Uganda**. *Agricult Eng Intl*, 15(1) 2013. E Menya. (Full text)
More than 93 percent of Uganda’s population relies on wood fuel in the form of either charcoal or fuelwood for cooking. This article reviews a project whose purpose was the

design and construction of a household biogas plant in Uleppi, which would serve as an alternative fuel source.

- **Bioenergy Consumption and Biogas Potential in Cambodian Households**. *Sustainability*, 5(5) 2013. S Mustonen. (Full text)
  Firewood, plant residues, and charcoal are the prevailing energy sources in Cambodian households while use of more modern forms of renewable energy such as biogas and solar power is still rare according to a nationwide residential livelihood and energy survey conducted in Cambodia in 2009. Bioenergy resources of Cambodian households, based on byproducts of residential agricultural production and animal husbandry, were also analyzed statistically.

- **Household Biogas Digesters: A Review**. *Energies, 5 2012*. K Rajendran. (Full text)
  This review is a summary of different aspects of the design and operation of small-scale, household, biogas digesters. Household digesters are cheap, easy to handle, and reduce the amount of organic household waste. Biogas and fertilizer obtained at the end of anaerobic digestion could be used for cooking, lighting, and electricity.

- **Impact of Biogas Digesters on Wood Utilisation and Self-Reported Back Pain for Women Living on Rural Kenyan Smallholder Dairy Farms**. *Global Public Health, 2013*. C Dohoo. (Full text)
  Women living on rural Kenyan dairy farms spend significant amounts of time collecting wood for cooking. Biogas digesters, which generate biogas for cooking from the anaerobic decomposition of livestock manure, are an alternative fuel source. The objective of this study was to quantify the quality of life and health benefits of installing biogas digesters on rural Kenyan dairy farms with respect to wood utilization.

BIOMASS

- **What Have We Learned about Household Biomass Cooking in Central America?**, 2012. X Wang, World Bank. (Full text)
  The objective of this study is to better understand current developments in clean and efficient biomass cooking solutions, factors that have precluded a larger penetration of improved cookstoves (ICS) within the region, and lessons learned from past programs —both in the region and in other countries—that may be relevant to Central America. The study recommends key actions that may help the region step up its current dissemination efforts and promote sustained use of ICS, a first step toward universal access to ICS by fuelwood users.

CHARCOAL

- **Appraisal of Improved Charcoal Cookstoves in Nairobi, Kenya with Burn Manufacturing**, 2012. University of Colorado. (Full text)
  During cooking tests, on average the improved Burn cookstoves used 168 grams of charcoal whereas the baseline stove, the Kenyan Ceramic Jiko (KCJ), which is readily

available in Kenya, used about 263 grams of charcoal. The improved stove also cooked faster at an average of 13 minutes to boil water, compared to 22 minutes for the KCJ. Marketing studies and user interviews reinforced the idea that consumers value these attributes—fuel savings and speed of cooking.

- **Impact of Charcoal Production on the Sustainable Development of Asa Local Government Area, Kwara State, Nigeria**. *African Res Rev, Apr 2013*. M Tunde. (Full text)
  This study revealed significant negative impact of charcoal production on the ecology of the study area. Legislation on afforestation and reforestation should be enforced on people both at the study area and the country at large. Development of energy-saving meters and solar cookers should be encouraged.

- **Implications of Charcoal Briquette Produced by Local Communities on Livelihoods and Environment in Nairobi- Kenya**. *Int. Journal of Renewable Energy Development, Jan 2013*. M Jenga. (Full text)
  This article presents experiences with community self-help groups that produce charcoal fuel briquettes from charcoal dust in poorer neighborhoods of Nairobi for home use and sale. Households that produced charcoal fuel briquettes for their own use and those that bought them saved 70 percent and 30 percent of money spent on cooking energy, respectively. The charcoal fuel briquettes have been found to be environmentally beneficial since they produce less smoke and increase total cooking energy by more than 15 percent, thereby saving an equivalent volume of trees that would be cut down for charcoal. Charcoal briquette production is a viable opportunity for good quality and affordable cooking fuel.

- **The Real Story on Charcoal for African Cookstoves**. *Triple Pundit, May 2012*. J Boynton. (Blog post)
  The market research of CleanStar Ventures reveals that standard charcoal stoves take a long time to heat up (20-30 minutes); the black soot makes women and their homes dirty; they must be cleaned constantly; and the temperature of the stove is hard to control.

- **Special Issue on Charcoal**. *Energy for Sustainable Development, Apr 2013*. (Link)
  This special issue deals mostly with charcoal production and use for cooking and is dedicated to understanding the role of charcoal in current discussions about energy security, environmental protection, and human and economic development.

- **Thermal Efficiency of Charcoal Fired Cookstoves in Ghana**. *Global Advanced Research Journal of Engineering, Technology and Innovation, Mar 2013*. G Boafo-Mensah. (Full text)
  The performance indicators (boiling time, burning rate, thermal efficiency, and specific fuel consumption) of three popular charcoal-fired cookstoves in Ghana were assessed

using the water boiling test.

ETHANOL

- **Comparative Analysis of Performance of Locally Used Cook Stoves,** 2012. P Oketch. (Full text)
  This study investigated the use of bio-ethanol gel as fuel, which has the potential to reduce deforestation, reduce indoor emissions (that cause health problems), and slow down climate change.

- **Ethanol-Kerosene Blends: Fuel Option for Kerosene Wick Stove**. *Eng Res and Applications, Jan-Feb 2013.* M Khan. (Full text)
  In this experimental investigation, blends of ethanol and kerosene were used as an alternative fuel in a kerosene wick stove without any modification in stove design.

JATROPHA

- **Fuelling Sawdust Stoves with Jatropha Fruit Coats**. *Sustain Energy Technolog Assessments, Volume 2, June 2013*. L Grimsby. (Full text)
  Jatropha fruit coats constitute a substantial byproduct of the Jatropha harvest. Due to its texture, the fruit coat is unsuitable as a substitute fuel in firewood stoves. Using a controlled water boiling test among households involved in Jatropha harvesting, the fruit coats were tested in a sawdust stove. Although burning Jatropha fruit coats in a sawdust stove did not replace the three stone fire completely, the sawdust stove could complement other stoves in a multiple fuel use regime in areas where Jatropha fruit coats are available in abundance and are free.

KEROSENE

- **Household Air Pollution and Stillbirths in India: Analysis of the DLHS-II National Surve**y. *Environ Res, Feb 2013*. P Lakshmi. (Abstract)
  Biomass and kerosene cooking fuels are associated with stillbirth occurrence in this population sample. Assuming these associations are causal, about 12 percent of stillbirths in India could be prevented by providing access to cleaner cooking fuel.

- **Kerosene: A Review of Household Uses and Their Hazards in Low- and Middle-Income Countries**. *J Toxicol Environ Health B Crit Rev*, 15(6) 2012. N Lam. (Abstract)
  Considering the widespread use in the developing world of kerosene, the scarcity of adequate epidemiologic investigations, the potential for harm, and the implications for national energy policies, researchers are strongly encouraged to consider collecting data on household kerosene uses in studies of health in developing countries. Given the potential risks of kerosene, policymakers may consider alternatives to kerosene subsidies, such as shifting support to cleaner technologies for lighting and cooking.

- **Household Light Makes Global Heat: High Black Carbon Emissions from Kerosene Wick Lamps**. *Env Sci Technol, Dec 2012*. N Lam. (Abstract)
  Kerosene-fueled wick lamps used in millions of developing-country households are a significant but overlooked source of black carbon (BC) emissions. This study presents new laboratory and field measurements showing that 7 to 9 percent of kerosene consumed by widely used simple wick lamps is converted to carbonaceous particulate matter that is nearly pure BC. These high emission factors increase previous BC emission estimates from kerosene by twentyfold.

SOLAR

- **Harnessing the Sun to Improve Health and Environments**, 2012. J Greene. (Video)
  Julie Greene, executive director of Solar Cookers International, discusses how the simple idea and basic technology of harnessing the power of the sun with solar cookers can benefit the environment and people, especially women and girls.

- **Performance Evaluation of Parabolic Solar Disc for Indoor Cooking**. *IOSR Jnl of Mechan and Civil Eng, Jan/Feb 2013*. S Yogesh. (Full text)
  In this study the cooker was found to provide adequate temperatures needed for cooking. Most of the recipes could be cooked within one to two hours on bright, sunny days. The ambient temperature affects the performance of the concentric solar cooker on a minor scale in the morning hours. A unique feature of the cooker is the sun tracking arrangement.

- **Performance Studies of a Multipurpose Solar Energy System for Remote Areas**. *MIT International Jnl of Mechan Eng, Jan. 2013*. A Saxena. (Full text)
  Energy consumption for cooking, water heating, drying, heating and cooling of buildings, and water distillation in the developing world is a major component of total energy consumption in various households and commercial sectors. Demands and prices of fuels are increasing day by day. As an alternative fuel, solar energy is a good option to use for various heating and cooling applications. Many countries are using solar energy devices for the above-mentioned activities through an individual component like a solar cooker, water heater, dryer, air heater, or solar still. This study evaluates the Multipurpose Solar Energy System, which was designed and fabricated especially for domestic use or for remote areas.

Each WASHplus Weekly highlights topics such as Urban WASH, Indoor Air Pollution, Innovation, Household Water Treatment and Storage, Hand Washing, Integration, and more. If you would like to feature your organization's materials in upcoming issues, please send them to Dan Campbell, WASHplus knowledge resources specialist, at dacampbell@fhi360.org.

About WASHplus - WASHplus, a five-year project funded through USAID's Bureau for Global Health, creates supportive environments for healthy households and communities by delivering high-impact interventions in water, sanitation, hygiene (WASH) and indoor air pollution (IAP). WASHplus uses proven, at-scale interventions to reduce diarrheal diseases and acute respiratory infections, the two top killers of children under five years of age globally. For information, visit www.washplus.org or email: contact@washplus.org.

Please let WASHplus know at any time if you have resources to share for future issues of WASHplus Weekly or if you have suggestions for future topics. An archive of past Weekly issues is available on the WASHplus website.