

ADB FINESSE Africa newsletter



Financing Energy Services for Small-Scale Energy Users-ADB FINESSE AFRICA NEWSLETTER 1.8, JANUARY 2005

contents

Editorial

Forthcoming FINESSE Activity.

Information on the Regional Consultative workshop.

ADB Group to have direct access to the GEF resources.

Experiences in promoting solar cookers.

A perspective on complimenting household energy needs through the use of solar cookers

Energy News

Opportunities



The FINESSE Africa program is funded by the Government of the Netherlands through its Ministry of Development Co-operation and executed by the Sustainable Development and Poverty Reduction Unit (PSDU) of the African Development Bank

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From the Editor's desk

Increasing access to modern forms of energy does remarkably empower people by increasing their capacities and opportunities. For this reason, provision of adequate and sustainable energy services should be an integral part of poverty reduction efforts. Experiences from various sustainable energy interventions do now confirm that not one solution will address the energy question in the developing world completely and adequately. While large-scale energy projects seem to be 'the ultimate solution' to the energy question, it has to be recognised that small-scale sustainable energy technologies have a role to play. The use of these technologies does provide both an immediate and long-term solution to the energy question. Just as these technologies can be used in rural areas, they can as well be effectively used in urban areas.

The commercialisation and privatisation of the power sector dictates the application of cost-effective tariffs. These tariffs are, in most cases, higher than the current tariffs. Higher tariffs pushes the majority of people in urban areas, who marginally afford electricity, to seek means to reduce electricity consumption. In cases where available, people are pushed to resort to 'free' energy carriers like firewood. The adoption of low-cost energy technologies can minimise the impact of such a shift in energy use patterns on standards of living.

This issue of the newsletter focuses on one of these low-cost alternative energy technologies that in most cases is not given due attention, the solar cooker. Articles in this edition can arguably be used to reinforce the relevance of solar cookers in various situations. Notwithstanding the barriers this technology faces, it is obvious that solar cookers will not completely substitute the use of firewood due to reasons that include dependency on weather, but can partially substitute other energy carriers. The advantages of solar cookers are distinct and they should be used to overcome some of the barriers.

As the FINESSE regional consultation approaches, we look forward to the support of those who will take part directly and indirectly to ensure a successful event.

Forthcoming FINESSE Activity

Event : FINESSE Regional Consultative Workshop.

Theme : 'Developing Sustainable Energy for Poverty Reduction in Africa'

Venue : Hotel Africa, Tunis, Tunisia.

Dates : 23-25 February 2005.

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FINESSE to hold a regional consultative workshop, 23-24 February 2005

The FINESSE Africa program will be holding a regional consultation workshop in Tunis, Tunisia, from 23rd to the 25th of February 2005 with the theme 'Developing sustainable energy for poverty reduction in Africa'.

The overall goal of this workshop is to consult the countries in Africa and other key stakeholders in the energy sector on strategies to promote sustainable energy systems for poverty reduction in Africa with a special focus on assessing their technical assistance and training needs in order to develop appropriate interventions. The workshop is part of the strategy and work plan development of the FINESSE program. This consultation process is in line with the major objectives of the FINESSE program that include establishing the ownership and commitment to alternative energy programs by countries in Africa as well as identifying alternative energy components to be included in the Bank's portfolio. The specific objectives of this consultative workshop are:

- ~ to familiarise participants with the FINESSE Africa program and its implementation plan;
- ~ to expose the Bank's regional member countries (RMCs) to the Bank's activities in the energy sector;
- ~ to present the outcomes of the sub-regional assessments and use the findings and country reports to develop appropriate capacity building programs;
- ~ to familiarise participants with the expectations and approaches for preparing and implementing business plans; and
- ~ to share information and knowledge on other development themes in sustainable energy that can be of benefits to the Bank's RMCs.

This consultative workshop will set the basis for activities at country level for the FINESSE program. Among other things, the workshop is expected to produce the following:

- ~ consensus on the outcomes of the subregional assessment exercise;
- ~ sub-regional plans of action to address technical assistance and training needs;
- ~ integration of the sub-regional work plans into one long term program to address capacity development needs.
- ~ establishment of contacts for the implementation of the FINESSE Africa program;
- ~ integration of issues raised at the workshop in the FINESSE program strategy; and
- ~ exchange of information on other initiatives in alternative energy that will benefit the Bank's RMCs.

Invitations to participate in the workshop have been have

been extended to :

- The Bank's regional member countries;
- Bank personnel;
- Private sector investors;
- Research Institutions;
- Other donors;
- NGOs and sub-regional research institutions; and
- Bi- and other multi-lateral development organisations.

Workshop Agenda

The agenda of the workshop and other documentation for the workshop are available online on http://www.afdb.org/psdu/finesse_africa_program and then click on activities or regional consultation workshop. For more information, please get in touch with the FINESSE Africa program on finesse@afdb.org

ADB Group to have direct access to Global Environment Facility (GEF) resources.

Following the Boards of Directors approval, at its meeting on the 18 January 2005, the Bank Group is now one of the Executing Agencies with Direct Access Agreement to GEF resources. This status will mean that the Bank will have direct access to GEF grant resources to compliment some of the Bank Group projects. The Bank Group has to date financed a lot of projects that could leverage GEF resources to meet the incremental costs of measures to achieve global environmental benefits. Some of the direct benefits of this direct access to the Bank's regional member countries include:

- ~ increased attention to the environmental aspects of projects being implemented by the Bank;
- ~ complementation of the Bank Group financial resources provided to countries in Africa by grant and concessional funding from GEF; and
- ~ enhanced collaboration between the Bank Group and partners in developing and implementing GEF projects thereby ensuring complementation in reducing poverty in Africa.

Introduction

Cooking fuel is the minimum energy requirement for a third of the 6.2 billion people alive today. The majority of our current diet is impossible to successfully digest without first cooking. Population growth coupled with years of intensive land clearing has created "energy traps". Presently just over half the population in Africa relies on biomass energy forms such as firewood, crop and animal waste for daily cooking requirements. Typically firewood harvested in a growing circumference around settlements forces predominantly women and children collecting cooking fuel to spend more time and energy to meet the same needs. These energy traps have far reaching impacts that are only beginning to be understood now. Some of the direct impacts include loss of biodiversity, loss of productive topsoil due to run-off and energy dependency from previously self-sufficient communities. The indirect or 'hidden' costs include reduced time for social activities, loss of school time and less money for other needs. The scarcity of biomass results in affected communities resolving to expensive options such as paraffin. Besides the high cost paraffin, people are exposed to other dangers that include, fires and high levels of pollution. This is however so despite of the existence of low-cost renewable energy technologies like solar cookers that can substantially alleviate the situation. Recent improvements in the design of solar cookers offer a potential solution to the growing cooking fuel crisis.



Animals are currently being used to carry firewood from very long distances

Solar Cookers

In response to the growing cooking energy fuel crisis in Southern Africa, Rapid Dawn, a Johannesburg based company is promoting effective solar cooker designs throughout Southern Africa. So far, the parabolic dish or Sunfire series (SF) have proven to be the best performing solar cookers due to their effectiveness, comparatively low prices and availability. Parabolic dishes concentrate light onto a central grill or focal point generating sufficient heat to cook in a comparable time with conventional stoves. The parabolic dish being promoted should be

manually tracked every 20 minutes for maximum performance. The SunFire series comes in two sizes, the SF 10 is a 1-meter dish able to cook for 4 - 6 people and the SF 14 is a 1.4-meter dish able to cook for 10 - 15 people. Other advantages of this cooker include, high portability and high durability i.e. life expectancy of 6-20years. Research into cookers for institutions and food vendors is currently underway.

There are a wide variety of box cooker designs available on the market with varying performance levels. Box cookers are slower than concentrator type cookers but retain heat for longer using the greenhouse effect to trap heat. It is easier to bake using box cookers as they maintain a constant temperature and require less tracking. These small solar cooker models or so-called "stand alone" systems are perfectly suited for Africa's inaccessible regions and are easy to use, assemble and maintain.



Demonstrating the use of solar cookers

Reaching out

In a project in the Linakanakaneng area in Lesotho, where solar power has already been identified as the most cost effective solution to electrifying over 650 households, Rapid Dawn took steps to encourage the inclusion of solar cookers in the planned Solar Home Systems (SHS) program and test community reaction to the technology. The area is completely stripped of vegetation and the local school community relies on twigs and leaves to cook the school's daily meals. Paraffin is currently the primary cooking fuel in Linakanakaneng but most households barely afford it. The villagers are unable to pay a once off cost of R800 (\$125) for a Sun Fire 14 despite spending over R1200 (\$185) per year to meet their cooking needs. The price of paraffin varies with season. The planned 650 solar home systems (SHS) will provide lighting and include media access (radio, TV's) but does not include a cooking component. Electrical stoves are available at the local trading store but are extremely energy inefficient, break often and waste more energy than needed. Most households would rather have a cooking component than access to media. Inevitably households will be forced to continue spending time and energy collecting biomass or buying paraffin to meet their cooking needs.

Experiences in promoting solar cookers in Southern Africa. By C. Menzies

Some of the advantages of introducing solar cookers to this community include:

- ~ easy of assembly of the equipment;
- ~ solar cookers can be distributed independently of the solar home systems;
- ~ solar cookers can be used to test the market for solar technology; and
- ~ introducing solar cookers before the SHS are installed can contribute towards sensitizing the community to solar energy and building trust and awareness of this technology.

Experiences in Linakanakaneng highlight some key barriers to the uptake of solar cookers in Africa namely:

- solar cookers are not widely available and remain virtually unknown,
- there is need for government and institutional support,
- micro credit facilities are needed to improve affordability, and
- high staff turnover within government departments can hamper continuity of work.



Training is an integral part of technology development

Another example of how solar cookers can be introduced using governmental and institutional assistance is highlighted by Rapid Dawn's demonstration in Botswana. Rapid Dawn was invited to Botswana by the Botswana Technology Center (BOTECH) at the end of March 2004 to introduce solar cooker technologies to government representatives and other possible partners. Despite having nationwide rains for the first time in four years the solar cooker demonstrations were successful and were received with great enthusiasm. BOTECH purchased one of each design to test their performance and last month we made a small start by

delivering twenty SF10 designs to Rural Industry Creations (RIC) one of BOTECH's partners invited to the demonstrations. RIC is able to offer micro credit facilities to customers thanks to government support and purchased enough units to conduct a small pilot project on the use and acceptance of solar cookers in Botswana. Past barriers to the introduction of solar cookers include mismanaged initiatives and ineffective designs.

Rapid Dawn continues to develop ideas and formulate comprehensive solar cooker introduction strategies for Africa. Solar cookers and related renewable energy products will be useful tools in assisting potential "solar entrepreneurs" to establish their own business. This strategy has a high value in South Africa as many households recently connected to Eskom (South African National Utility) continue to use any other available cooking fuel due to high monthly electricity bills. South Africa has a 40% unemployment rate and needs to create jobs. Rapid Dawn is looking to identify suitable candidates to promote and distribute solar cookers and related products in every province and is already receiving positive feedback from potential entrepreneurs.

Last year 100 parabolic type Cookers were introduced into Osire refugee camp in Namibia on the Angolan border. Families wanting to use solar cookers were asked to work a certain amount of hours to "buy" the cookers. Preliminary results are encouraging with 90% acceptance and use of all cookers available, interestingly every family using SF10's (smaller unit) wanted to upgrade to the SF14's for more cooking power. The refugee camp is currently in the process of being dismantled and most families will return to Angola taking their solar cooker with them. Regionally Rapid Dawn has received interest from and sent cookers to Angola, Namibia, Zimbabwe, Mozambique, Swaziland and Madagascar and also further to the USA, Australia, Columbia and Israel. Unfavourable import policies and heavy taxes combined with expensive and underdeveloped transport infrastructure facilities restrict Rapid Dawn's ability to service enquiries in other parts of Africa. To overcome this problem Rapid Dawn is actively seeking strong partners to assist in promoting and distributing solar cookers in each country or region.

Aside from obvious drawbacks like not working at night or during thick cloud every person using the new solar cooker designs recognises their performance advantages and ability to raise living standards for all users. Rapid Dawn has begun local production of the SunFire series in South Africa and is still researching the feasibility of producing other appropriate cooker designs.

Conclusion

- ~ Local production helps create employment and stimulates a long-term sustainable solar cooker industry in Africa.
- ~ The ultimate success of solar cookers and other renewable energy products in Africa depends on the ability of African energy policy makers and international banking and private institutions to recognise peoples needs and take appropriate actions. Banks need to formulate more user-friendly approaches for accessing micro-credit facilities for the people who need access the most. A successful example is the Grameen Shakti model implemented in Bangladesh (<http://www.grameen-info.org/index.html>).
- ~ NGO's should integrate renewable energy technologies in all sustainable development projects throughout Africa. Studies on the privatisation of the energy industry in Uganda and Senegal (1994- 2002) reveal a disturbing decrease in connections for rural areas and poor population surrounding urban areas (GNESD report April 2003).



A demonstration at a popular beach

ning. Installing renewable energy technology infrastructure from the outset negates the need to change energy systems at a later date.

Many countries in Africa already spend over 60% of their GDP's on importing fuel and will remain increasingly under pressure to source even more funds to keep up with the inevitable price rises in the oil industry.

Developing renewable energy technologies and strategies helps to establish a culture of sustainable development through energy independence. By using renewable energy technologies from the start we can assist future generation's ability to sustain a reasonable quality of life. Africa is home to the richest biological inheritance on earth and every effort to introduce products able to maintain our way of life and our shared ecosystems should be encouraged. Rapid Dawns vision is to see 500 million dishes turn towards the sun each morning as it rises over this beautiful continent. Sunlight is Africa's most under utilized resource and offers the most viable solution to unlocking Africa's vast energy potential placing the continent at the forefront of human development without destruction. For more information, please contact Crosby Menzies, e-mail:

bob.menzies@absamail.co.za or visit <http://www.sunfire.co.za> .



The press is critical is promoting technologies.

Looking ahead

As we begin the new millennium the use and distribution of resources represents the biggest challenge ever faced. It is increasingly obvious new technologies need to be vigorously promoted and developed in order to be able to support future generations' quality of life and energy needs. Investment in Renewable Energy technology encourages the growth of a new industry globally

Policy makers in Africa have to seriously consider the long-term benefits of developing alternative energy versus continued reliance on petroleum imports to satisfy the continent's needs.

Sub Saharan Africa has the least access to energy of any area in the world and therefore stands to gain the most from using clean and cost effective energy from the begin-

A perspective on complementing household energy needs through the use of solar cookers.

By Z. Chiguvare

Introduction

The dissemination of solar cookers, in general, has so far not been targeted to the people who desperately need an alternative. For that reason, in Zimbabwe (~18°S, 30°E), and indeed in many other countries, people prefer using their traditional fuels and use solar cookers only as a hobby. More than 70% of Zimbabwe's population (rural area based) has no access to electricity and depend on firewood for cooking. Those based in towns, either use electricity, liquid petroleum gas or kerosene. This is the situation in most Southern African countries, and possibly in many other developing countries. In the Zvimba-Chirawu and Nenguo-Chihota areas of Zimbabwe, people no longer have trees from which they could get firewood. This is because people have used up the trees without caring to plant more for replacement, typical of many developing countries, where externalisation (i.e., just using without investing anything) of costs is the norm. The idea of 'free' energy is as exciting as it is self-destructive. Such is the tragedy of the commons. In the said regions, many people now have kerosene stoves, but they generally have very low income, mainly from the sale of agricultural produce, and cannot afford to buy the kerosene. Even cow dung has become a scarce commodity and some families guard the cow dung from their cattle for their own use as a cooking fuel. Those without cattle collect dry maize stalks and some have started to cut down fruit trees and to uproot garden poles for use as cooking fuel, worsening their conditions of poverty. These people desperately need an alternative, and solar cookers may just be the appropriate alternative for them. However, solar cooking should not be imposed on a people, but rather if it is need driven, then it will be successful.

Gender in cooking

The society regards woman labour as free and compulsory when they have to fend for the family. The rural and poor Zimbabwean woman (and girl child) is regarded as an energy provider for traction of fuel wood into the home. Her health is vulnerable. She is not given time to think of, or participate meaningfully in, developing the society. Each is busy thinking of how to make the next meal possible, and by the time it is ready, she is so tired that she just goes to

sleep. By complementing fire wood with the proposed solar cooker, the bundle of firewood that a healthy woman can carry on her head for 2 km without resting lasts up to more than twice the time as compared to when used alone. Similar testimonies have been given by those who use kerosene, and electricity. They spend less than half the money needed for cooking energy by using the solar cooker as a complement.

The art of cooking

Cooking is based on the transfer of heat to food, no matter what the source of that heat is. Boiling food in water is done so that the temperature at which the heat transfer takes place is regulated, otherwise the food would burn. The transfer of heat to the food will only be at the boiling point of water if all the food has reached the same temperature as the water, otherwise it takes place at a lower temperature. Pasteurisation of water at 60°C destroys disease organisms, and it has been demonstrated that most foods can cook at this temperature, though slowly. The same food will cook faster at higher temperatures, but beyond the boiling point of water the risk of burning becomes high.

Solar cooking

Solar cooking is based on the conversion of sunrays to heat and conducting that heat into the food. Many different cooker designs are available, but in general they are too expensive, too complicated or not adapted to the local environment, thus making them inappropriate or uncomfortable to use. In general solar cookers can be classified into reflector cookers, based on the concentration of sunrays on the pot, and box cookers, based on an insulated enclosure with a transparent glass window. Solar cookers have been made and tested under different conditions and for that reason, it has been difficult to compare the efficiencies and other characteristics of solar cookers reported by different researchers.

A perspective on complementing household energy needs through the use of solar cookers.

By Z. Chiguvare

Box-reflector solar cooker

We designed and constructed a low cost (~US\$20) compound box-reflector solar cooker, adapted to local operating conditions, using 100 % locally available materials, and a standard testing procedure was employed to determine its efficiency. The design consists of two wooden boxes, open at the top and separated by 3 cm thick polystyrene foam. The inside of the inner box has two reflector planes inclined 45° to the horizontal such that radiation passing normally through the aperture area is reflected inwards at right angles to the incident rays. All the other walls are vertical. The top is double glazed, with 3mm thick ordinary window glass. Temperatures of 95± 5°C can be maintained inside the cooking chamber for more than 4 hours on a typical clear day in Harare, Zimbabwe. This is sufficient to cook most foods, including potatoes, rice, fish, chicken, beef, boiled eggs etc., but not for frying. Typical rate of temperature rise obtained at an insolation of 700 W/m² is about 4°C per minute. The calculated standard cooking power from the equation obtained by averaging the results of cooking power vs. temperature difference, yielded a specification for the designed box-reflector solar cooker to be 18 W for a 50°C temperature difference, which corresponds to 2.6 % efficiency.

Dissemination strategy

Several solar cookers, with the described design, have been constructed and sold to people and organisations both in rural areas and in cities in Zimbabwe. Demand is high and the feedback is very positive. This has been solely based on personal motivation of the author, but the overwhelming response has prompted business ideas that are being currently developed. However putting up a manufacturing concern is not very easy with the current economic hardships facing the country. The solar cooking business will be viable, the main problem is to secure initial capital to set it off. A private limited company has been registered with the manufacture of solar cookers as one of its main concerns, and an industrial stand secured, where workshops have been constructed. The main problem facing this company is the cost of tools, which mainly include a

circular saw, an electric planer, polisher, guillotine for cutting sheet metal, a sheet metal bender, and a spray gun. The tools being used currently are all manual, compromising on the quality of joints, grooves, and outward appearance of the constructed solar cookers. Such tools are essential for any small to medium enterprise (SME) that eventually will be expected to manufacture the box solar cooker described herein.

Conclusions

A compound box-reflector solar cooker has been wholly designed and constructed using locally available materials. The box solar cooker can be used successfully in Zimbabwe on sunny days, about 60 to 70 % of the year. The solar cooker cannot be used alone; it has to be introduced as a complement to the conventional cooking fuels, reducing fuel consumption by more than half. The proposed dissemination strategy is to train small to medium-scale enterprises so that manufacture can be countrywide, at all major growth points. Seed capital is needed to boost the efforts currently under way. A three day training workshop in solar cooking for end-users is sufficient for them to be independent solar cooks.

Acknowledgements

We acknowledge the support given by T. Chiguvare in trying the so many delicious solar cooking recipes, and hence providing a first experience of solar cooked food for the neighbours.

For more information, please contact Z. Chiguvare on e-mail - Chiguvare@eng.uz.ac.zw



A typical solar box cooker

Energy News

Major solar cooking study available

The State of the Art of Solar Cooking, a 232-page comprehensive review of the field by Dr. Barbara Knudson, is now available online. The monograph was commissioned by Solar Household Energy, Inc. The landmark research effort outlines the demand, origins and rationale for solar cooking, describes different kinds of solar promotion efforts, and catalogs where programs have occurred, are ongoing and aren't but are needed. The study concludes with a series of policy recommendations. The report is available online at <http://www.she-inc.org/sam.pdf>

Climate change not going away, Blair warned.

Business and the global economy need to know that climate change is not an issue that is going away, UK Prime Minister Tony Blair told the World Economic Forum in Davos, Switzerland.

Blair has called the UK a leader in the fight against global warming, and the issue was on the agenda as Blair addressed the Forum. "I support the Kyoto Protocol. Others will not and that position is understood. But business and the global economy need to know that this is not an issue that is going away," he said, according to The Times. "My clear view, for what it is worth, is that that debate will be how and on what timescale it is confronted: not whether."

<http://www.pointcarbon.com/article.php?articleID=6236&categoryID=147>

World Bank buys 100% green power for its headquarters

The World Bank announced it will purchase renewable energy for all of its electricity usage at its Washington, D.C. office from WindCurrent, a Maryland based company that sells wind power to the mid-Atlantic power grid.

This purchase will represent enough electricity to power almost 8,000 average homes for a year, and is equivalent to eliminating the carbon dioxide emissions of more than 10,000 cars for a year or planting roughly 15,000 acres of

trees, according to U.S. Environmental Protection Agency (U.S. EPA) figures. Produced using conventional electricity sources, including coal and gas, this would have generated an estimated almost 60,000 tons of carbon dioxide emissions. The Bank will purchase 85,000,000 kilowatt hours (kWh) of renewable energy certificates (RECs) which are allocated for each unit of power from a renewable energy power plant (such as a wind farm). "Wind power creates none of the hazardous emissions or mercury pollution that is associated with producing electricity from burning coal," said Jim Maguire, the founder of WindCurrent. "The World Bank is serving as a role model for other organizations who want to be environmentally responsible."

http://www.greenbiz.com/news/news_third.cfm?NewsID=27542

Opportunities

Program Officer - Sustainable Energy Africa is looking for a Project Officer with limited experience but willing to learn to join their dedicated team. Some of the required qualifications include; a four year degree (in any of the following - energy, town & regional planning, engineering, environmental economics, environmental science or similar with a focus on environmental and/or energy subjects), good spoken & written communication ability; analytical and pays attention to detail and ability to produce quality outputs within deadlines. A detailed job description is available on request at info@sustainable.org.za. For more information on SEA please visit www.sustainable.org.za.

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Web Resources

ADB FINESSE Africa Program : http://www.afdb.org/psdu/finesse_africa_program

The Solar Cooking Archive : <http://solarcooking.org/>

Soar Household Energy : <http://www.she-inc.org/>

Solar Box Cooker: A journey to forever : <http://journeytoforever.org/sc.html>

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