PARTNERSHIP FOR CLEAN INDOOR AIR

PCIA Bulletin - *Solar Cooking*

January 2010 Issue 22

This quarterly newsletter provides updates on the activities of the Partnership for Clean Indoor Air (PCIA) and its Partners to improve health, livelihood and quality of life by reducing exposure to indoor air pollution, primarily among women and children, from household energy use. Currently, **337** governments, public and private organizations, and multilateral institutions are working together to increase the use of affordable, reliable, clean, efficient, and safe home cooking and heating practices. Visit www.pciaonline.org to join!

A special thanks to Patricia McArdle, President of the Board of Directors for Solar Household Energy (SHE) and Solar Cookers International Board Member, who wrote this issue's introduction and helped coordinate this Bulletin's overall content, including the Myths vs. Facts boxes scattered throughout.

Given ongoing respiratory diseases and deaths from smoky kitchens, the atmospheric brown cloud that looms over South Asia and other parts of the world and the rate at which the world's forests continue to vanish into charcoal pits and cooking fires, we can no longer ignore the power of the sun to perform the simple task of cooking food and heating water for hundreds of millions of people around the world. There is an urgent need for the deployment of all possible clean cooking technologies, including solar, to help the world's poorest people cook as efficiently and cleanly as possible. Solar cooking advocates in Washington DC and in other world capitols have struggled for years with limited success to convince policy makers that small scale solar thermal devices should be promoted as part of an integrated cooking system along with fuel efficient stoves and retained heat cookers.

Part of this challenge is due to a barrage of misinformation about solar thermal devices for household use. We hope that this issue of the PCIA Bulletin will help debunk some of the most common myths, and clarify for readers the different types of solar cookers and how they are being used around the world. We also hope that promoters of fuel-efficient stove and biogas technology will consider future integrated cooking partnerships with the more than 100 solar cooking and food processing NGOs that have introduced this technology to households around the world.

The goal of Bulletin 22 is to increase collaboration and exchange of information between organizations that promote improved cookstoves and those who work with solar cooking, and the replication of successful approaches to solar cooking highlighted in this issue.

As always, we welcome your feedback. Please let us know how this issue has helped you, especially if it leads you to integrate solar technology into your current programming— we'd love to hear about it! Please send feedback to moderator@pciaonline.org.

Don't forget to update your Partner Profile!

*We have set a goal to have **100% of PCIA Partners update their profiles** within 12 months!*

See page 22 for details on how to update your profile and for a list of prizes that Partners who make substantive updates by January 29th can win!

In This Issue

☼ FEATURE ARTICLES

The History of Solar Cooking

Based on "The State of the Art of Solar Cooking" by Barbara Knudson, Ph.D.: bknudson@waldenu.edu / bknudson1@comcast.net, additions by Pat McArdle

The idea of concentrating the light of the sun to generate heat for cooking remains as unfamiliar in much of today's world as microwave oven technology was fifty years ago. And yet thousands of years ago ancient Greeks, Romans and Chinese were using curved mirrors to concentrate the sun's rays and cause objects to burst into flames. Sadly their use for this technology was purely military. There was little incentive for serious research on solar thermal technology for cooking until recent decades when firewood—the traditional fuel for most of human history—became a rapidly diminishing resource and an increasingly expensive commodity. Fossil fuel subsidies even in the poorest countries have also slowed the development of solar cooking technology.

In 1767 Horace de Saussure, a French-Swiss scientist who is considered the father of solar cooking, built a miniature greenhouse with five glass boxes, one inside the other on a black table. Fruit placed in the innermost box cooked nicely and solar cooking was born. English scientist Sir John Herschel, and American Samuel Pierpont Langley, later head of the Smithsonian, also experimented with 'hot boxes', the forerunner of today's solar box cooker.

French mathematician Augustin Mouchot, working almost a hundred years later, combined the heat trap concept with that of a concentrating mirror to create an efficient solar oven from an insulated box which could bake bread, steam vegetables and distill alcohol. Unfortunately humanity's growing access to cheap coal and petroleum overshadowed his solar research and that of others into the last century.

The contemporary solar cooking movement began in the mid-twentieth century with the work of M.I.T. scientist, Maria Telkes. Her focus was on the use of solar thermal energy to heat buildings. That interest led her to construct an insulated solar box cooker made of plywood with an inclined top of double pane glass and four large flared reflectors.

Increasing global energy shortages, coupled with expanding populations in China and India, encouraged governmental research on alternatives in the 1970s, with the Chinese government holding its first seminar on solar cooking in 1973 and distributing solar cookers starting in 1981.

Additional impetus for investigating the potential of solar energy came from the oil shocks of the 1970s. The ULOG group in Switzerland and EG Solar in Germany were founded in the 1980s in response to the oil crisis. During the Soviet invasion of Afghanistan and the evacuation of millions of Afghans to Pakistan, the NGO SERVE distributed 20,000 solar box cookers to Afghan refugees. After the Soviets were driven out, Afghans took the technology home and set up workshops to build and sell solar box cookers.

In the 1980s Barbara Kerr of Arizona and her neighbor Sherry Cole designed a cardboard box cooker "kit" that could be built at home. The work of these two women and that of UC Sacramento microbiology professor Robert Metcalf inspired the formation of Solar Cookers International in 1988 by seventeen founders including SCI's current executive director Beverly Blum.

Barbara Kerr and Sherry Cole with their cooker "kit"

In the late 1990s, French scientist Roger Bernard built the first collapsible, low cost, solar panel cooker (made of cardboard and aluminum foil). Kerr and other SCI members refined Bernard's design and the Cookit was born. This inexpensive device weighs less than one pound, folds into a 12 x 12 inch square for easy storage and transport and cooks at 250 degrees F.

In 1998, a group of solar cooker pioneers in Washington DC formed Solar Household Energy and developed the Solar Hot Pot with the aim of promoting the sustainable commercialization of solar cooking. Thousands of Hot Pots are in use today in Mexico and elsewhere in Latin America and Africa.

Deepak and Shirin Gadhia of India, working with Austrian physicist Wolfgang Scheffler, the inventor of the Scheffler reflector, can be credited with moving solar cooking in India to an industrial level. Their company Gadhia Solar has constructed many rooftop parabolic solar thermal arrays that provide the power for large scale cooking in military installations, ashrams and schools throughout India. The largest of these systems can cook tens of thousands of

(Continued on page 3)

(Continued from page 2)
meals each day in modern steam kitchens powered only by the solar thermal energy of the sun. Their non-profit Eco Center ICNEER has been responsible for the establishment of small-scale solar cooker and other energy conservation projects throughout India.

Tens of thousands of Cookits are being used in Africa, where the world's largest solar cooker project is helping to reduce trips by Darfur refugee women outside their camps in Chad to search for firewood. Small NGOs are training people to build and use solar cookers in the Andes of South America, the tropics of South Asia and the mountains of Nepal. In China, where that government continues to sponsor solar cooker research, almost a million solar cookers are in use. The government of India recently proposed giving one parabolic solar cooker to every rural family. The rapid deforestation of the African continent and the expanding black carbon-based atmospheric brown cloud over South Asia argue for a massive global effort to share this technology with the hundreds of millions of families who still cook every day over wood, dung and charcoal.

References:

1. Buti, Ken, Perlin, John, "The Golden Thread" Van Nostrand Reinhold, NY 1980
2. Pejak, E., ed. (1992). Advances in solar cooking: Proceedings of the first world conference on solar cooking
3. Nandwani, S. S., ed. (1994) "Developments in solar cooking: Proceedings of the second world conference on solar cookers - use and technology"
4. UNESCO World Solar Programme, World Solar Academy (1999). World solar cooking and food processing: Strategies and financing"
5. Department of Mines and Energy, Government of South Africa. (2000). International conference on solar cooking 2000: Conference proceedings

Opening The World's Eyes And Ears To Integrated Solar Cooking

Darwin O'Ryan Curtis, Solar Household Energy:
darwincurtis@comcast.net
http://www.pciaonline.org/she

Solar cooking advocates have long faced resistance from opponents who argue that cooking with the sun is not a viable technology because "you can't cook at night or on cloudy days." Expanding partnerships between solar cooking and fuel efficient stove promoters have given rise to a new, energy saving concept: the Integrated Cooking System, which promotes a combination of both cooking methods enhanced by a third—retained heat or fireless cooking.

Nothing is more enduring than resistance to change. In 1992 I wrote a paper for a world conference on solar cooking to encourage my colleagues who were facing almost universal resistance to their efforts. I reminded them that it took 155 years to get from the first horseless carriage to the Model "T" Ford and 120 years from the first flight of man in a balloon to the Wright Brothers' experiment at Kitty Hawk.

The world's leaders are well aware of indoor air pollution-induced respiratory disease, mass deforestation caused by fuel wood harvesting and the illegal charcoal trade, the black carbon-based atmospheric brown cloud over South Asia and elsewhere and the looming crisis of global warming. The half billion biomass cooking fires that are lit around the world every day play a significant role in this environmental degradation. And yet, solar cooker technology hasn't gained widespread acceptance in the intervening 17 years since that conference. Why is this?

Cooking food with sunshine remains an improbable concept to many. It provokes skepticism, the 'what if it's raining?' kind of questions. Disbelief is rampant and enduring even with the most sophisticated and highly educated audiences. Fuel-efficient stove advocates have been some of the most vocal critics of solar cooking.

Those of us who have promoted solar cookers for decades took a while to recognize that we must offer a complete solution to the fuel shortages faced by almost half the cooks in the world. For many years, we unwisely advocated solar cooking as a free standing but incomplete alternative to traditional cooking practices. We now acknowledge that a solar cooker is but one wing of the phoenix destined to rise from the ashes of the three stone fire. The other wing is the fuel-efficient stove— enhancement for both technologies is provided by retained heat (fireless) cooking technology.

This three-part combination cooking method, which we call the Integrated Cooking System, (ICS), must be the basis for solar cooker and fuel efficient stove advocates in the future. ICS offers the most complete and efficient use of available resources to minimize the consumption of combustible fuel for cooking and heating water. The first rule of ICS is to cook with free solar thermal energy whenever the sun is shining, using one of the many solar cooking devices available to bake, boil or fry food. The second is to conserve scarce combustibles for use in fuel-efficient stoves after dark and on rainy days. The third is to enhance the efficiency of both cooking methods with the use of retained heat devices.

(Continued on page 4)

(Continued from page 3)

A demonstration of Integrated Cooking

Wilfred Pimintel, a California Rotarian, pioneered the integrated cooking concept. He has organized and led integrated cooking workshops around the world in partnership with prominent 'stover' partners like Ken Goyer and Larry Winiarski. The use of ICS can reduce by half again the already substantial savings in biomass burning accomplished by fuel-efficient stoves. Its promotion will put an end to the often-heard refrain "Solar cooking isn't viable because you can't cook when there is no sun." Our new reply is that with ICS people can cook anything, anytime of the day or night using the least possible amount of fuel.

A concerted, coordinated program of ICS advocacy can broaden the scope and impact of both the FES stove community and solar cooking advocates. It can increase the effectiveness of our educational efforts about the depredations of the three-stone fire. It can enhance our ability to get the attention of decision makers and acquire the capital to introduce ICS at scale.

It is time for the solar cookers and stovers to join forces.

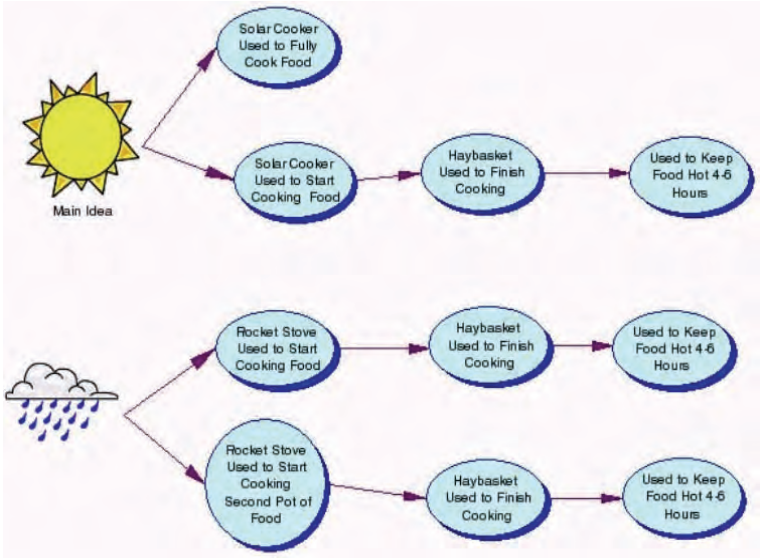
OFFERS: To that end, Solar Household Energy, Inc. is prepared to offer solar cooking expertise to stovers conducting fuel efficient stove projects in the developing world. This support could include:

- Site assessments to ensure favorable conditions, including adequate insolation; hardship caused by diminishing access to traditional fuels or increases in fuel costs; cultural predilection to accept change.
- Advice on selecting solar cooking equipment type based on indigenous cooking practices, family size and cost.
- Identification of local resources to support the introduction of solar cooking, such as instructors, manufacturers and evaluators.
- Assistance in finding funding for integrated cooking programs.

REQUESTS: We are interested in dialoging with stovers willing to consider adding fuel efficient stoves to communities which have adopted solar cooking.

In addition, we need ideas to move ahead research and development of solar cookers. The most critical solar cooker research requirement at this time is for more reflective and stronger water resistant materials that can be used to construct all types of solar cookers but especially the Cookit. This small panel cooker currently made of cardboard and aluminum foil folds into a 12 x 12 inch square and can reach temperatures up to 250 F when opened and pointed at the sun. An equally important research requirement is to develop a replacement for the plastic bag that is currently used to create a heat -retaining greenhouse effect around the cooking pot used with the Cookit. Alternatives developed to date, including an origami-like folding aluminum reflector to replace the cardboard Cookit, and thick tempered glass to replace the plastic bag, have been too expensive for widespread distribution in the developing world. More durable options for box cookers, including wood, plastic and metal designs have always been expensive because construction and insulation are complicated. The expense of complex construction could be dramatically reduced if a rigid, thick, durable, inexpensive material could be found that does not conduct heat. **What great ideas do you have for us?**

Please contact Solar Household Energy at info@she-inc.org with ideas, expertise, funding, and contacts that can help provide R&D on solar cooking!



Options and Challenges for Using Solar Cookers in Developing Countries

Lisa Feldmann, GTZ/HERA: lisa.feldmann@gtz.de
http://www.pciaonline.org/partners/gtz-hera

During the last decades solar cookers have repeatedly been seen as a solution to the firewood problem. It is indeed a fact that almost all developing countries are relatively close to the equator, so levels of insolation are high virtually all year round. "Cooking with the sun" also allows the use of a free, effectively inexhaustible source of energy, relieves the workload on women, and reduces the harmful effects on health arising from traditional cooking. Moreover, fewer trees are chopped down, thus reducing deforestation and the advance of desertification, while at the same time guarding against global warming.

Until now, however, decades of efforts have not helped solar cookers to achieve a breakthrough. The successful implementation of solar cookers is still challenged by consumer-acceptance. So far it is only in the treeless plateaus of Tibet that solar cookers have truly become established and fit in with customary cooking methods. In other cases sophisticated and energy-efficient solar cookers, especially parabolic cookers, have proven to be too expensive. Furthermore it has so far not been possible to set up independent local production in Africa because in most cases important parts still have to be imported from other countries. The simple and inexpensive but less efficient box cookers are usually incapable of competing with traditional stoves.

Based on experiences and lessons learned in the various regions and GTZ projects, ten basic rules have been developed to set out how the dissemination and use of solar cookers can be achieved and accepted by the target group.

1. Solar cookers are more successful in regions where biomass is difficult to obtain.
2. It should be ensured that there are no subsidized energy supplies. Within a region where any sort of energy is subsidized the comparable high costs of a solar cooker would be economically unviable for the end-user.
3. It must be possible to prepare the most important local dishes on the solar cooker.
4. The handling must be easy and the cooker must be stable.
5. Using a solar cooker should not affect local cooking traditions. In practical experience most cooking activities in developing countries are done in the early twilight when solar cookers are not utilizable. In these cases it is necessary to store solar energy for daily use and availability at any time.
6. While promoting solar cookers it is essential to train the users in its correct use.
7. Cookers with a good price-performance ratio must be available locally.
8. After-sales services and maintenance must be assured.
9. Cookers should never be offered as a sole solution but as a package with other energy-saving household technologies.
10. And finally when it comes to disseminating solar cookers it must be borne in mind that they can also fulfill important additional functions, depending on the situation – for example sterilizing drinking water, preserving jams or fruits or heating clothes irons.

In conclusion it remains to say that the favourite stove is still a stove that is adapted to the way people are used to living and cooking and also conserves energy. It is only under specific geographical conditions- for example on the high plateaus of Asia- that solar cookers have so far been able to take on a significant role in the provision of energy for households.

For more detailed information of options and difficulties for using solar cookers in developing countries please see “Here Comes the Sun – Options for Using Solar Cookers in Developing Countries”. The brochure was published by HERA, the household energy programme of the Deutsche Gesellschaft fuer Technische Zusammenarbeit (German Technical Cooperation, GTZ) GmbH. It is available for download at: www.gtz.de/hera.

Solar Cooking Myths vs. Facts

Myth #1 Food can only be solar cooked in the middle of the day and during the warmest months of the year.

Fact

- In all of the tropics and into the temperate latitudes it is possible to cook year round with a clear sky. Direct sunlight rather than temperature is the primary heat source.
- Retained heat cookers (RHCs) allow meals cooked in the afternoon to be served as hot meals after dark.
- Gadhia Solar of India has developed a large heat retention unit, which stores solar thermal energy, allowing for after dark cooking.
- Parabolic solar cookers in direct sunlight can reach the cooking temperature of an open flame from early morning until just before sunset.

Safe Water from Sunshine

Pat McArdle, SHE/SCI: solarwind1@mac.com
http://www.pciaonline.org/she

How can people living in developing countries be certain their water is safe to drink? How can they purify it if they're not sure it's safe? Even if chlorine tablets are widely distributed as part of regional public health programs, are they really sustainable? Is there any guarantee that tablets will be available in the necessary quantities for years to come? Might there be a more sustainable way to ensure safe drinking water using a free, renewable energy source? Finally, is it really necessary to boil water to make it safe?

The answers to the last two questions, according to California State University, Sacramento microbiology professor Dr. Robert Metcalf are: "Yes, there is a sustainable way to make water safe to drink using a solar cooker and a Water Pasteurization Indicator (WAPI) and, "No, you do not need to boil water to make it safe to drink. You need only to pasteurize it at 65°C" (149°F).

Dr. Metcalf challenges the widespread claim that water can only be made safe to drink by bringing it to a rapid boil for several minutes. He approaches the topic of water pasteurization using well-established concepts of food microbiology. If it actually took several minutes of a roiling boil to pasteurize water, then what heat treatment would be required to pasteurize milk? Since microbes survive better in milk than in water, and since the relatively heat-resistant bacteria that cause tuberculosis need to be inactivated in milk, one might assume that the dairy industry would have to boil milk for an extended period of time. But that is not the case. Most milk is flash pasteurized at 71.7°C (161°F) for 15 seconds. Raw eggs are pasteurized at 60°C (140°F) in 3.5 minutes.

In his work, Dr. Metcalf cites extensive literature on the times and temperatures needed to kill pathogens in foods. He reports that the cysts of protozoa, bacteria and rotavirus, which cause most water-borne disease are inactivated rapidly at 60°C (140° F), and inactivated very rapidly at 65°C (149°F). He also notes that these cysts are sometimes able to resist treatment by chlorine, which is not always able to penetrate the cyst walls unlike 65°C water which heats the interior of the cyst and denatures critical enzymes.

Although he endorses the safe water system approach of the Centers for Disease Control using Water Guard, and the use of Aquatabs, he has found that solar water pasteurization with the WAPI provides another option for people who do not have access to chlorine, or find the taste of chlorinated water objectionable. Furthermore, solar pasteurization is a sustainable method since the world will never run out of sunshine.

To pasteurize water in 4-5 liter batches, Dr. Metcalf uses a panel solar cooker (the Cookit, which can be constructed at minimal cost from scrap cardboard and aluminum foil) to heat the water. A WAPI is suspended in the pot of water while it is being heated in the Cookit. When the water reaches 65°C, the wax plug at the top of the WAPI melts and falls to the bottom of the tube, indicating that the water has reached pasteurization temperature and is now safe to drink. Dr. Metcalf stresses that safe storage of the water in a clean container after pasteurization is essential to maintain its purity.

WAPI before and after reaching 65°C

Dr. Metcalf has conducted microbiology tests in Sacramento, Kenya and Tanzania comparing the solar cooker/WAPI method of pasteurizing water with the SODIS (solar water disinfection) method in which water is placed in clear plastic bottles and exposed to sunshine for a recommended six hours. He found that the SODIS method was not always able to completely inactivate E. coli in contaminated water even after six hours. He also noted that with the SODIS method there is no way to know for certain if and when pathogenic bacteria, viruses, and protozoa have been neutralized. In addition, this practice may also lead to elevated chemical ingestion from the bottles being reused and heated. Dr. Metcalf has posted a detailed presentation on his work at: http://imageevent.com/bobmetcalf/watertestingpasteurizationinafrica.

Solar Cooking Myths vs. Facts

Myth #2 Solar cooking takes too long.

Fact

- Parabolic solar cookers can heat food as fast as an open flame.
- Most box and panel cookers require a quick readjustment every one or two hours to keep them pointed at the sun. Since they cannot burn food, they can otherwise be left unattended during the entire cooking process. Their use eliminates the time needed to gather fuel and stir food while it is cooking.

The Commercialization of Solar Cooking Equipment

Darwin Curtis, Solar Household Energy, Inc:
darwincurtis@comcast.net
http://www.pciaonline.org/she

A decade ago we calculated that solar cooking technology could relieve the energy burdens of around two billion people. All the philanthropies in the world, government and private alike, couldn't begin to meet such a huge need. Only the private sector could. Our aim had to be to achieve commercialization.

To that end, Solar Household Energy viewed our first task as demonstrating two things: 1) that the technology actually worked efficiently and, 2) that it would be culturally acceptable around the world. We have done that, but our evidence has failed to inspire any significant response from the private sector. Here are some possible contributing reasons:

- Part of the reluctance to embrace solar cooking is rooted in the understandable disbelief that simple sunlight can actually cook food. For many it's just too incredible.

- Solar cooking only works when there is sun. This limitation discouraged many, but now we advocate an Integrated Cooking System, which is comprised of a solar cooker, a fuel-efficient stove and a simple retained heat device, which can keep food hot for hours.

- Back in the 80s and early 90s there were numerous field experiments in solar cooking conducted by well-meaning people of great enthusiasm. Most of these experiments failed for a variety of reasons rooted in marginal equipment[1] and inexperience. These failures, in turn, led to skepticism about the viability of the technology on the part of professionals in international development, a skepticism which persists in some quarters to this day.

- In order to mount solar cooking projects in the developing world, we needed local infrastructure. In most cases, this can only be provided by philanthropic community development projects. The communities we targeted were all poor to destitute. They did not have the disposable income to buy solar cooking equipment at a commercially viable price. Demand could only be spurred by the offer of heavy subsidies.

- While initial enthusiasm at the demonstration of solar cooking has been universal, its adoption has been more tentative. Experience has taught that a serious investment in training and follow-up is required to bring solar cooks to a level of proficiency that insures full use of their solar cookers. It is difficult for entrepreneurs to deal with this reality.

- It has proven almost impossible to find developing world entrepreneurs with the capabilities and the interest, much less the capital, to undertake the marketing of solar cooking equipment.

- Micro-banking schemes in the developing world provide capital for commercial purposes, but not for purchases of domestic appliances such as solar cookers, even though repayments can be made from savings in traditional fuel costs.

- Only recently have all the damaging consequences of burning biomass come to public attention.

- Insufficient advocacy in the solar cooking community.

At this writing, commercialization of solar cookers in the developing world awaits cheaper equipment, capable entrepreneurs, and significant capital investment. Exceptions may be found in India and China where manufacturers are claiming expanding markets. Additionally, in India, the profitable establishment of huge institutional solar cookers is already well underway.

Although barriers to commercialization prevail, there is surprising hope from another sector: developing world governments. Three state governments in Mexico are purchasing Hot Pot solar cookers by the hundreds for their needy citizens. In Sénégal, the national government is funding facilities to manufacture solar box ovens in nine of its eleven regions (UNDP will subsidize the first 1000 units). The Indian Government has been conducting and supporting solar cooking initiatives for a number of years.

In the West, commercialization of solar cooking equipment is off to a good start. A Google search for "solar cooking" returns 1,320,000 hits. There are numerous manufacturers already selling in the U. S. and European markets. Some of these products including the Sun Oven, the Sport, the Tulsi, the SK and the HotPot are also distributed in the developing world, but mostly with philanthropic funding.

(Continued on page 8)

(Continued from page 7)

While our advocacy has failed so far to commercialize solar cooking in the developing world, it has broadened awareness and desirability of the technology. The next trick is to enable the creation of indigenous industries via the development of new inexpensive materials and designs for quality affordable solar cookers. That should bring out the reluctant entrepreneurs and that, in turn, should finally achieve: Commercialization!

[1]A spectacular exception is the CooKit of Solar Cookers International. The simplest and cheapest of all viable cookers, it has served hundreds of thousands of refugees and other dispossessed in many corners of the world. It is now being made and distributed to thousands more in the camps for Darfur refugees. It is not considered here because it was never intended for commercial markets.

The Solar Cooking Archive Wiki

Tom Sponheim: webmaster@solarcooking.org

The Solar Cooking Archive Wiki (http://solarcooking.wikia.com) acts as an information hub for the hundreds of NGOs and individuals that are part of the Solar Cookers World Network or otherwise interested in solar cooking and the integrated cooking method. We currently have articles detailing the activities of 350 NGOs and 450 individual promoters.

The Wiki works just like Wikipedia in that it is editable by everyone. With the help of hundreds of individuals around the world, the Solar Cooking Archive Wiki has become the Internet's best resource on solar cooker theory, design, promotion, and activity. We currently have articles on over two hundred solar cooker designs, fifty construction plans, and over one hundred manufacturers and vendors. If you are involved in promoting solar cooking and don't yet have an article on the Wiki, you are encouraged to add yourself.

It is possible to post anonymously on the Wiki, but we encourage you to register and create a user name so that your contributions are acknowledged. Also, it is easier for site administrators to isolate vandals if legitimate posts are credited. For more information on account creation, and to view a simple tutorial on how to make edits and format content, visit www.wikia.com/wiki/Help:Tutorial.

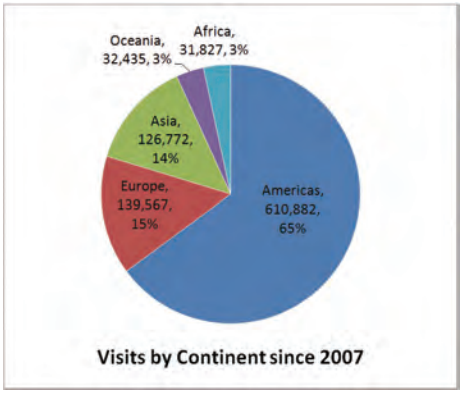
The wiki was inspired by requests to make the former Solar Cooking Archive (http://solarcooking.org) more interactive. For example, NGOs or individuals interested in starting a solar cooking project can visit the "Country Page" for their own country and see local solar cooking news and the history of solar cooking in their country. Additionally, the page displays a list of individuals and NGOs active in solar cooking in that country making it possible to network with others there already active in solar cooking promotion.

The "Watchlist" feature allows registered users to receive notification when changes are made to articles of interest. If you were interested in CooKits and water pasteurization in Kenya, for example, you simply click the "Watch" link at the top of each of these articles. Then when you click the "Watchlist" link in the future, you will see all the changes that have been made on those pages. You can also set an option in "Preferences" to receive an e-mail notification whenever changes are made to a page that you are watching.

Automatic translation into 30 different languages is also available through links at the top of each page. In addition, Spanish- and French-language wikis have also been created, located at http://es.solarcooking.wikia.com and http://fr.solarcooking.wikia.com respectively.

The Wiki also makes use of an extensive system of categories that allows related pages to be found easily. For example, an article about an NGO in the Gujarat State of India will have categories that provide links to "NGOs," "Gujarat," and "India." Clicking any of these will display a page with links to all other articles in the given category.

The site traffic has been very good. Approximately 1500 unique users visit the Wiki every day. Virtually every country in the world is represented among the approximately 300,000 page views each month.



SCI is looking for volunteers to work on a growing list of expansions and improvements to these wikis. If you are interested or have questions, contact Tom Sponheim at webmaster@solarcooking.org.

Assorted Facts and Recipes from the Solar Cooking Archive Wiki

Did you know...
The world's largest solar kitchen is located in India and serves approximately 20,000 people a day!
Read more about this and other India-related solar news at:
http://solarcooking.wikia.com/wiki/India

Helpful Hints for Using Solar Box and Panel Cookers: (suggestions from long time solar cooks)

- Time for cooking depends on the amount of food in the pot and the angle of the sun (as determined by the time of day, the season of the year and the latitude where the cooking is done).
- Box and panel cookers do not get hot enough to burn food, and they retain moisture so it is almost impossible to overcook or dry out meat. Rice, beans, fish and vegetables, however, can be turned into mush if left to cook too long.
- Use dark covered pots with tight fitting lids.
- You do not need to stir food while cooking.
- Meat cooks faster and more thoroughly when cut into bite sized pieces.
- Place the hard-to-cook or larger quantity items in the back of the box cooker where they will receive more direct sun. When using several pots, place the easy to cook food in the front of the cooker.

Average cooking times* (assuming a clear sky in all cases)

Barley, corn, millet, oats, quinoa, rice, wheat	2 hours
Beans - dried	3-5 hours
Beets, carrots, potatoes and other root vegetables	3 hours
Fish	1-2 hours
Chicken	2 hours cut up, 3 hours whole
Beef, lamb, etc.	2 hours cut up, 3 - 5 hours for large pieces
Turkey	all day if large, whole

*taken from http://solarcooking.wikia.com/wiki/Introduction_%26_Cooking_Tips "Introduction & Cooking Tips: Guidelines by food type." Original source: *Solar Cookers: How to make, use, and enjoy*, Solar Cookers International, 2004.

The following recipes were taken from the Solar Cooking Archive Wiki Recipes pages:
http://solarcooking.wikia.com/wiki/Recipes

Sunshine Chili

1 pound small red beans (dry)
1 pound ground chuck beef
2 medium onions
1 small green pepper
1/2 cup fresh parsley, minced
dash of salt and pepper
1 28-oz. can tomatoes (may be blended first)
1 tablespoon chili powder
4 cups tomato or vegetable juice

Soak red beans in water overnight. Brown ground chuck, onions, green pepper, parsley, salt and pepper. Drain well after about 1 hour. Add tomatoes, red beans, tomato juice and chili powder. Cover and bake about 4-5 hours in solar oven; serves 10. You may add more tomato juice as cooking proceeds.

Barbequed Chicken

1/2 cup vinegar
2 tablespoons Worcestershire sauce
1 teaspoon dry mustard
1 teaspoon paprika
1 tablespoon sugar
1/2 teaspoon pepper
1 clove garlic, minced
cut-up chicken
1/2 cup catsup

Place chicken pieces in a dark pan. Combine ingredients and pour over the chicken pieces. Cover and bake in solar oven for 2 to 3 hours.

Baked Potatoes

Clean potatoes and rub with shortening or butter. Place in a dark dish. Cover and bake 3 hours or until done.

☼ COUNTRY SPOTLIGHTS

Rural Communities in Mexico: Towards a Better Quality of Life through the Use of Integrated Cooking

Eglé Flores, Mexican Fund for the Conservation of Nature: eflores@fmcn.org
http://www.pciaonline.org/fmcn

Sustainable Rural Life is an ambitious three-phase project designed by Fondo Mexicano para la Conservación de la Naturaleza (FMCN; www.fmcn.org) with the objective of encouraging the utilization of integrated cooking technologies that improve public health and foster a stable family economy in rural Mexican communities, promoting the sustainable use of natural resources, diminishing biodiversity loss and reducing greenhouse gas emissions.

FMCN initiated the first phase of the project, Sustainable Rural Kitchen, in the fall of 2009 in partnership with Protección de la Fauna (Profauna) and with the support of the International AIDS Society and the National Commission of Protected Areas. Hot Pot solar ovens and fuel-efficient cooking stoves have been distributed to the 140 participating families living in six rural communities at the Sierra de Arteaga, Coahuila in northern Mexico.

The Hot Pot was designed by FMCN, Solar Household Energy and the Florida Solar Energy Center. It was first introduced in Mexico in 2003 with funding from the World Bank's Development Marketplace, and was scaled up with funding from the U.S. Environmental Protection Agency from 2005-2007. As part of this effort, FMCN and Solar Household Energy educated a large segment of the population in the states of Oaxaca, Querétaro, Coahuilla and Nuevo León about solar cooking. All Hot Pots are manufactured in Mexico. In-country FMCN donations of the Hot Pot solar oven are estimated at over 10,000.

FMCN's Sustainable Rural Kitchen workshops teach families to efficiently use their Hot Pots in combination with their new fuel-efficient stoves. Not only do these devices have an environmental impact, they also allow each family to save money they would otherwise spend on firewood, which can total up to 15% of their income. *By minimizing exposure to smoke, they also decrease risks of respiratory and other health problems.*

A 70% reduction in firewood consumption is expected through the complementary use of the Hot Pot and fuel-efficient stove. With the assistance of a technician provided by Profauna, each participating family measured its typical weekly firewood consumption before receiving the new cooking devices. This baseline data will be compared with firewood consumption after the new technologies are being used on a daily basis to determine their potential positive impact in rural communities as a tool to decrease families' reliance on firewood.

Gathering wood for fuel in Mexico

Participating families will be monitored for six months in order to ensure the adoption of the technologies. This will be the first documented effort in Mexico to promote the use of integrated cooking technologies.

Initial results of the project will be available by June 2010, by which time FMCN hopes have secured funding to start the implementation of the second phase of the initiative. Sustainable Rural Life Phase II: Sustainable Rural House will introduce important water saving technologies into the rural home.

Solar Cooking Myths vs. Facts

Myth #3 All solar cooking must be done outside.

Fact

- Online designs are available for through-the-wall solar box cookers for indoor cooking. (See http://www.solarcooking.org/wallovn1.htm for more information).
- Once cooking is well underway, a pot can be transferred to a retained heat cooker to complete cooking indoors.
- Scheffler reflector parabolic solar cookers work indoors by focusing a concentrated beam of light through a small opening in the wall onto large cooking pots, ovens or griddles. (Click here to see diagrams of the Scheffler reflector).

Integrated Solar Cooking and Water Pasteurization Model Village in Uganda

Kawesa Mukasa, Solar Connect Association:
scacooking@yahoo.com
http://www.pciaonline.org/solarconnect

In the village of Kikokwa in Isingiro District in Uganda, Solar Connect Association (SCA) enabled most households to adopt the use of solar cookers coupled with efficient wood stoves and hay baskets. The model village stopped using 3-stone fireplaces. There are ten villages using integrated cooking in Isingiro and Mbarara Districts but Kikokwa village was chosen as a model village because more than 50% of the households own the mix of cooking appliances that comprise an integrated cooking system: a solar cooker, a hay basket and an efficient wood stove (either rocket or Lorena stove). Every household agreed to use only solar cookers and hay baskets whenever there was enough solar radiation. Hay baskets keep food warm for long periods and are very convenient for both efficient wood and solar cooker users.

In this village, 80% of the water used for drinking is pasteurized using solar cookers. Every participating household has a water pasteurization indicator to ensure that water heated in a solar cooker is fully pasteurized and safe for drinking. The result is that incidences of water borne diseases in the village are low amongst the population. As weather is unpredictable, when the solar cooker cannot be used, households use efficient wood stoves. These efficient wood stoves are supplied by our partners from other parts of the country and when used in combination with solar cookers, there is little or no smoke from kitchens and carbon emissions are minimal. In SCA's opinion both solar cookers and efficient wood stoves should be promoted together by governments and other environmentally conscious people and organizations. In the case of Kikokwa model village, people who use integrated cooking report that they save more money than people who use old stone fireplaces or who use only efficient wood stoves. *Integrated cooking households report no water borne diseases or smoke related diseases since implementation of the project.*

Some 400 households in Kikokwa use integrated cooking. Trees are growing again in this village and women and school going children now spend less time collecting fuelwood. Concentrating on one village has taught us many lessons. SCA has operated in many villages across the country but Kikokwa is the first model village in which only sustainable energy devices are in use.

Many people dismiss solar cookers as slow and unreliable during weather changes, but efficient wood stoves and hay baskets can be used as back-ups. Solar cookers produce no dangerous gases that affect climate negatively and households save money as well as wood lots and forests. With good training, solar cookers are easy to use for cooking and baking. Since 1994 to date, Solar Connect Association has distributed 20,000 solar cookers, 3,000 efficient wood stoves and 8,500 hay baskets. Some of the organizations with whom we have worked to promote solar cooking in Eastern Africa include World Wildlife Fund, Solar Cooking the Netherlands, and Wild Geese.

We promote solar cooking using local village women marketers through group cooking sessions and home parties. In that way, through fun and work, many households learn about solar cooking and efficient wood stoves by word of mouth from neighbors and friends. We have established in Mbarara a shop and in the village of Kikokwa a production unit/resource centre for integrated cooking appliances. We train people at our resource centre for a small fee.

We would like to learn to do the water boiling test (WBT) to evaluate solar cookers and efficient wood stoves. If there is anybody who has done WBT for both solar cookers and wood efficient stoves, please pass on the results to us. Organizations and people interested in promoting solar cookers and efficient firewood stoves in Eastern Africa are encouraged to partner with Solar Connect Association.

Solar Cooking Myths vs. Facts

Myth #4 The glare from a solar cooker can cause blindness and cataracts.

Fact

- Users of box and panel solar cookers spend very little time outdoors tending the meal. The intensity of sunlight reflected by solar box and panel cookers is less than that of direct sunlight, and the blink reflex protects the eyes from any reflected glare.
- Concentrating (parabolic) solar cookers require more careful handling, but in all cases as long as a pot is on the cooker, the concentrated beam of light poses no danger. Users can avoid glare through proper training and positioning, and can wear UV sunglasses for extra protection.
- The possibility of eye damage from solar reflectors is insignificant compared to the actual pandemic of eye disease caused by the smoke of cooking fires.

Mfuwe Solar Cooker Project and Solar Entrepreneurs Program

Crosby Menzies, SunFire Solutions, Solar Cookers for Africa: crosby@sunfire.co.za
http://www.pciaonline.org/sunfire
http://www.pciaonline.org/solarafrica

The Mfuwe Solar Cooker Project based in Zambia's South Luangwa Valley started when Manda Chisanga, a guide at Mfuwe lodge, won the Paul Morrison Guide Award run by the UK-based Wanderlust magazine in 2007. Manda had heard about solar cookers from visiting guests and decided to spend his prize money on a project alleviating an increasingly serious situation facing his community.

Mfuwe village is located at the entrance to the South Luangwa National Park widely regarded as one of the most pristine environments anywhere in Africa. The village comprises around 15,000 people and is only separated from the animals in the park by the Luangwa river and a small strip of land known as a "game management area."

Recent years have seen a dramatic increase in fatal human-animal encounters occurring mostly between elephants and women and children out collecting firewood for their families. The area is increasingly denuded of trees forcing firewood collectors to walk further and further each day. At least 10 people a year are killed in these encounters and many more severely injured representing a serious problem for the community, the game lodges and the animals in the park.

The Mfuwe Solar Cooker project aims to improve this situation by introducing 500 – 1000 SunFire14 parabolic dishes, drastically reducing the chances of human-animal encounters, as solar cookers save an estimated 50-60% of firewood. Solar cookers also help to preserve natural habitats ensuring tourism continues to provide the much-needed income for the area. This project is already gaining international notice for pioneering a unique solution to problems facing wildlife reserves and neighbouring communities throughout the African continent. The Mfuwe Solar Cooker project is a good example of a win-win situation whereby the lodges support the introduction of solar cooker technologies to halt deforestation and improve villager's quality of life by providing access to clean energy cooking technologies.

Although no studies have been conducted, many of Zambia's newest solar chefs happily confirm that "food cooked with the sun just tastes better!" Please view a short documentary covering the introduction of the solar cookers in March 2007 at www.solarcookersforafrica.com (click on Zambia)

A second pioneering project is an entrepreneurs program based in the Northern Provinces of South Africa. Entrepreneurs sell a range of solar technologies including basic lighting systems, cell phone chargers, solar cookers and related products such as fuel efficient stoves and retained heat cookers used to either finish cooking meals or keep food warm long after dark. They are able to offer these products to clients at substantially reduced prices through a voluntary carbon offset scheme whereby funds from travellers in the UK offsetting their flights support this project in South Africa. The project is not financially viable without the carbon funding, accessible because the renewable energy technologies introduced reduce the need to burn fossil fuels such as coal (heating), paraffin/ kerosene (lighting) and firewood (cooking).

Studies reveal that the poorest urban households spend 20-40% of their income meeting daily cooking requirements, and the poorer the home, the higher the percentage of income spent. This project provides immediate environmental, economic, health and social benefits and is based on a model that engages local communities and encourages grass-roots sustainability. It seeks to stimulate Southern Africa's largely ignored solar potential using locally based entrepreneurs. It is initially focused on South Africa but aims to establish a model that can quickly be replicated in neighbouring countries with similar socio-economic situations including Swaziland, Lesotho, Namibia, Botswana and Mozambique.

The Mfuwe Solar Cooker and entrepreneurs projects are managed and run by Solar Cookers for Africa, an NGO formed in January 2007 to highlight and co-ordinate solar cooker activity across the continent. Solar Cookers for Africa relies on donations to support solar cooker activities across the African Continent. For more information on how you can support solar cookers please go to www.solarcookersforafrica.com or www.sunfire.co.za.

Solar Cooking Myths vs. Facts

Myth #5 Solar cookers are too expensive.

Fact

- Solar cookers save money through fuel savings and reduced health costs.
- The CooKit (which can be assembled from locally available materials) can be made for under $5.
- Solar box cookers can be constructed from online plans using cardboard, wood, metal or plastic.

Solar Cooking in Madagascar

Pat McArdle, on behalf of Regula Ochsner, ADES Schweiz-Madagaskar: regulaochsner@adesolaire.org

The island nation of Madagascar near the east coast of Africa has lost 90% of its forest cover, endangering the survival of the unique animal population it shelters. Soil erosion in cleared areas has resulted in a scarred and agriculturally unproductive landscape. The average family in Madagascar consumes 100 kg of charcoal (which equals 700-1000 kg of wood) per month. In more remote areas, the use of traditional three stone fires wastes vast quantities of wood with its inefficient combustion. The southern half of Madagascar has ideal conditions for using solar thermal energy to cook food and heat water.

The Association for the Development of Solar Energy (ADES) is a Swiss-based non-profit that produces and distributes solar cookers in Madagascar. Their aim is to provide that country's poor, rural population with a sustainable means of cooking that can lessen their dependence on biomass fuel and reduce deforestation in their country. ADES also promotes other renewable energy solutions including solar PV lighting.

ADES has established solar cooker workshops employing local artisans in three southern cities. The box cookers they produce can hold two pots and reach 150°C (300°F). Since food cannot be solar cooked early in the morning, ADES is also introducing fuel-efficient stoves to allow families to cook their breakfast using a minimal amount of fuel.

ADES realizes that convincing people to change their cooking habits, even when their nation faces environmental destruction, is not an easy task. In their campaign to change public attitudes, they have used radio, TV, movies, school programs, newspapers and magazines to explain and promote the use of solar cooking in Madagascar.

By the end of 2008, ADES had produced and sold over 3,800 solar box cookers. It has also established a cooperative agreement with Soltec, a German-Madagascar NGO, which produces parabolic solar cookers. ADES has sold 166 Soltec parabolic solar cookers. All of the solar cookers are offered at a subsidized price to poor families who are able to recoup their investments in 5 to 6 months with the money they save on fuel. ADES' vision for the future is to have a significant portion of southern Madagascar's population using solar thermal devices as their primary method of cooking.

Women carrying solar cookers in Madagascar

Solar Cooking Myths vs. Facts

Myth #6 Solar cookers must be continuously adjusted to track the sun.

Fact

- To maintain maximum cooking temperatures, solar box and panel cookers should be reoriented to track the sun once an hour, however at certain latitudes and seasons of the year, up to four hours of cooking can be accomplished without turning.
- Parabolic solar concentrating cookers generate as much heat as an open fire and must be adjusted every ten to fifteen minutes. These cookers should never be left unattended or operated by children.

More Solar Cooking Articles and Links

- Sunshine Cooking by S. Narayanaswamy: http://she-inc.org/art.php?id=28
- "Get Beyond Firewood," Women's Refugee Commission, http://www.getbeyondfirewood.org/
- Knudson, Barbara, "State of the Art of Solar Cooking." http://www.she-inc.org/sam.pdf
- Coyle, Raymon ,"Solar Cooker Dissemination and Cultural Variables," http://www.solarcooking.org/advocacy/dissemination_and_culture.htm
- Curtis, Darwin, "Solar Cooking and Health," Boiling Point Number 52, December 2006, p.30-32, http://practicalaction.org/print/docs/energy/boilingpoint52.pdf
- "Solar Cooking: Rays of Transformation" by Darwin O'Ryan Curtis Solar Household Energy, Inc. and Louise Meyer Solar Household Energy, Inc.: http://she-inc.org/art.php?id=42
- Get the What, Why and How of Integrated Solar Cooking at: http://www.integratedsolarcooking.com/

Darful Refugees Cooking with the Sun

Derk Rijks, Kozon Foundation:
rijks.agrometeo@wanadoo.fr (reprinted from the 2007 Solar Cooker Review)

NOTE: In February 2007 Derk Rijks of the Netherlands-based Kozon Foundation along with Marie-Rose Neloum and Gilhoube Patallet of Chad Solaire received the Prize for Humanity from the Immortal Chaplains Foundation. Oscar-nominated actor Don Cheadle presented the award on behalf of the victims of the Darfur crisis. The three received this award for the remarkable project Rijks started in 2005 and continues to manage with Neloum and Patallet. It has provided more than 30,000 locally made solar cookers to Darfur refugee women in three camps in Eastern Chad.

In the Iridimi refugee camp in Chad about 17,000 refugees from Darfur, Sudan have found temporary shelter in a camp situated in a semi desert region, where rainfall is less than 120 millimeters per year. While firewood for cooking was sufficient for the few small, dispersed villages located along the wadis, it was not nearly enough for the sudden influx of thousands of refugees.

After Iridimi camp was established, the U.N. High Commissioner for Refugees (UNHCR) imported only a limited supply of firewood, forcing the women to search the countryside for more. Indigenous villagers saw this as a threat to their own supply. With more than 330 sunny days each year in the camp, it seemed to me that solar cookers could provide some relief.

Derk Rijks at a solar cooker festival in Touloum Refugee camp Eastern Chad

We decided to introduce solar CooKits due to their ease of use and the potential for local manufacture and maintenance by refugees. After conducting a series of well-received demonstrations, we formulated a project outline and sought funding for materials and remuneration of trainers and refugee helpers. Chadian citizens Marie-Rose Neloum and Gilhoube Patallet led trainings, managed supplies and funds, and provided general support.

After a short period of hesitation, the Iridimi women were convinced that the sun could cook. They embraced solar cooking wholeheartedly. Even most men are now happy with the new techniques and even like the taste of the food, although the final decision clearly rests with the women! Virtually all of their traditional meals can be made with solar cookers including boule (a traditional Chadian and Sudanese dish made with boiled cornmeal and eaten with sauce).

Sudanese refugee men waiting for their solar cooked meal at the festival

During normal security conditions about 1,000 Cookits are produced each month by a rotation of 20 "artisans"; two from each camp zone. A workshop was built for this purpose. Forty refugee women are trained as auxiliary trainers, and in groups of two they teach six women each week how to solar cook. There are more than 4,500 women in the camp, of which over 2,500 have received training. Once trained, the women each receive two to three CooKits and pots, depending on family size.

The project has suffered twice from a slow-down in activity because of security concerns. The daily meal strategy adopted by UNHCR is as follows: breakfast, cooked on improved woodstoves with UNHCR-distributed firewood; lunch, cooked in solar cookers; and dinner, cooked in solar cookers and/or retained heat cookers. Also known as "hay baskets," these are insulated enclosures in which a pot of food is set which has been brought to a boil, allowing it to continue to cook after being removed from its heat source. The women weave the retained heat cooker baskets using materials that are brought in from other parts of the country.

(Continued on page 15)

(Continued from page 14)

Refugee comments on the benefits of solar cooking include:

> "We keep clean, do not have tears in our eyes and have no running noses from smoke"
>
> "We do not have to go and look for firewood in far away places where we do not want to go [for safety reasons]"
>
> "There is no fire danger for our children or our tents"
>
> "We can use the saved firewood collection time to do handiwork [for sale and buying extra food or milk], to be with our children, or to learn from the classes taught in the camp"

At one point, in our absence, an independent subcontractor with UNHCR decided arbitrarily and without consultation to halt solar cooking trainings because the majority of the older women had been trained. There was a camp-wide protest that was immediately resolved upon our return. Now, training is guaranteed for those women 15 years and older, though we do not check ages and are happy to train younger girls pretending to be 15! Women in many other regional refugee camps have expressed great interest in having their own solar cooking projects, and UNHCR has given its support to the idea.

Addendum: The Iridimi project has since expanded into two more camps, Toulom and Oure Cassoni. Jewish World Watch, the primary funder of this project has raised more than a million dollars to provide the women of these camps the materials they need to make solar cookers and hay baskets and to help them start grey water gardens and other sustainable projects. The first assessment of this project in 2007 showed that women using their solar cookers along with fuel-efficient stoves and hay baskets were able to reduce their trips outside camp to gather fuel by 86%. A second assessment of this project took place in October/November 2009.

Solar Cooker Development and Application in China

Chen Xiaofu, China Association of Rural Energy Industry (CAREI): chxiaofu@126.com (from a presentation made at the Solar Food Processing Conference in Indore, India, January 2009)
http://www.pciaonline.org/carei

Although solar cookers have been developed and widely promoted in China for more than 30 years, the Chinese government has found that commercialization of solar cookers is still a challenge. Financial support from the government and international organizations is still necessary to promote the widespread use of this technology in sun rich Western China.

Solar cooker research in China has focused on design, materials, technical standards, manufacturing, dissemination, promotion and sales. In the past thirty years, China has moved from independent research to national cooperation in the production of solar cookers. China has also moved from laboratory experiments to industrial production and from government subsidies to semi-commercialization. Currently with a total of more than 1.4 million sets of solar cookers in use, China is the number one country in the world promoting solar cookers. Although box cookers are made and used in China, the most common solar cooker used is the parabolic model.

The first Chinese solar cooker was built in Shanghai in 1956. In 1983, solar cooker research was included under the Science and Technology Key Tasks of the "7th Five-Year" plan. Major parameters were analyzed and calculated to optimize the light efficiency of the solar cooker. Since the primary users of solar cookers reside in rural parts of China, it has been designed for ease of manufacture and operation. Low cost and competitiveness with traditional energy sources have also been important factors.

Solar parabolic cookers in China

The shell of solar parabolic cookers can be made of concrete, cast iron, steel, aluminum and fiber reinforced plastics, among other materials. Cast iron models have a highly accurate focal point. They are easy to transport, last a long time and are mass-produced and sold commercially. Concrete solar cookers are durable and cheap but due to their weight they must be produced for local use. Glass fiber-strengthened concrete solar cookers are lighter

(Continued on page 16)

(Continued from page 15)
than the solid concrete models but they are less resistant to breakage.

Two types of reflective materials are used in Chinese solar parabolic cookers: glass mirrors and vacuum aluminum film. Mirrors used on concrete solar cookers last 4-5 years. Aluminum film used on cast iron solar cookers lasts 3-4 years.

There are three types of solar cooker production in China: at demonstration sites with government support, industrial production for commercial sales and family workshops where concrete solar cookers are made for local use. Solar cooker use in Gansu province (which has the highest rate of solar cooker use in the country) has reduced fuel consumption by 15%. In Tibet around 50,000 cast iron solar cookers are sold each year.

Social benefits of solar cooking in China include: saving labor that is currently used for firewood collection in Western China, where one member of the household must spend all their time at this task; reducing coal consumption; and improving indoor air quality. An important environmental benefit of the solar cooker is allowing people to use crop waste for fertilizer instead of burning it in their ovens for fuel.

Solar Cooking Myths vs. Facts

Myth #7 Parabolic solar cookers blow away in the wind.

Fact

- Using the cooker inside a walled compound or anchoring it to the ground can prevent this. Concrete butterfly solar cookers used in China, are heavy, sit close to the ground and are minimally affected by the wind.

A Quarter Century of Solar Cooking in Afghanistan

Kevin Porter, Solar Cookers International:
kevin@solarcookers.org
http://www.pciaonline.org/sci

Gordon Magney and his wife Grace have devoted over 25 years to the spread of solar cooking knowledge and skills in Afghanistan and Pakistan. When Gordon passed away last year, the Afghan people lost a dear friend, and the international solar cooking community lost a tireless promoter and leader.

The Magneys moved to Afghanistan in 1969. In 1972 they organized food aid in response to a famine in the Ghor province of central Afghanistan, and also began a vocational training program for orphans. Known as SERVE (Serving Emergency Relief and Vocational Enterprises), these programs continued through 1974 when the situation improved. Magney re-established SERVE in 1980 to provide emergency relief to Afghans who fled the Soviet invasion and were living in refugee camps in Pakistan.

Grace Magney demonstrating solar cooking in Afghanistan

A 1983 survey conducted by SERVE and United Nations experts revealed that the refugees' most urgent need was assistance in obtaining cooking fuel. Magney felt that solar cookers would be a boon in this region with nearly 300 sunny days each year. In a small pilot project 50 families were given solar cooking training and loaned solar box cookers similar to models in India. By the end of the nine-month project, 80% of the families used solar cookers whenever possible. The cookers were modified based on project feedback, and a workshop was created to build solar cookers. The cookers cost $60-70 to produce but were sold to refugees at a subsidized price of about $18.

Over time, many of the refugees returned to Afghanistan with their solar cookers. Friends and relatives saw these cookers and demand began to rise, due in part to the danger, during firewood collection, posed by landmines that were left from the war years. As an example of the level of demand, a shipment of 780 solar box cookers in a Kabul market sold out in five days. SERVE continued to provide solar cooker training and equipment in the region through the end of the 1990s, when subsidies dried up. Under Taliban rule, SERVE was forced to close in 2001 because it was considered to be a Christian organization. By then, Magney and SERVE

(Continued on page 17)

(Continued from page 16)
had distributed more than 20,000 solar cookers in Pakistan and Afghanistan.

The Magneys returned to Afghanistan in 2003 after Taliban rule ended, and again began promoting solar cookers. This time they opted to import a solar box cooker called the SOS Sport, because it was cheaper, lighter and more attractive than earlier SERVE models. The SOS Sport proved to be a popular cooker in Afghanistan, and the initial delivery of 400 units sold out quickly at a subsidized price of $15, made possible by the Global Hope Network.

Solar cooker in Afghanistan

In the past few years, the Magneys began to advocate the use of parabolic solar cookers, which could be built in Afghanistan, creating employment and providing more families with a way to cook and boil water using Afghanistan's abundant sunshine. Grace still resides in Kabul and remains active in the solar cooking advocacy work that she and Gordon began so many years ago. Several NATO Provincial Reconstruction Teams in Afghanistan have funded solar cooker construction projects in remote provinces of Afghanistan. The expansion of solar cooker production in Afghanistan could provide hundreds if not thousands of green jobs, while providing fuel starved families with the means to cook using Afghanistan's abundant sunshine.

(Note: The details for this story came from the SERVE 2008 annual report, and Barbara Knudson's manuscript "The State of the Art of Solar Cooking.")

☼ NOTES FROM THE FIELD

Solar Cooking in Nepal

Allart Ligtenberg, Friendly Appropriate Solar Technologies (FAST): Aligtenber@aol.com (from a presentation made at the International WRERCE Conference, Nov. 5-7, 2007, Jakarta, Indonesia)
http://www.pciaonline.org/fast

Nepal's rapid growth in population and tourism is putting dangerous pressures on a very delicate environment. Fuel wood, which provides almost all of Nepal's energy needs, is being depleted rapidly. Deforestation and landslides are increasing. Smoky interiors cause severe lung and eye problems. Burns from cooking fires scar people for life. Women must collect firewood at increased distances. Solar cooking and water pasteurization can significantly reduce Nepal's critical health, environmental and energy problems.

After trekking in Nepal in 1979, I fell in love with this beautiful country, its people, diverse cultures and mountains. During subsequent visits and solo-treks in remote regions, I documented Nepal's severe environmental deterioration and health problems. After retiring from Hewlett-Packard in 1992, I followed my dream of promoting solar power in developing countries, with an emphasis on Nepal.

In 1992 solar cooking and solar water pasteurization were not practiced in Nepal. My objective was to build a sustainable solar cooking/water pasteurization program, and expand it later to other sustainable technologies. All devices would be made locally providing jobs and income.

Allart Ligtenberg with parabolic solar cooker at Mt. Everest Base Camp

My strategy was to find a "champion" organization. In 1992 I found and convinced PCIA Partner Centre for Rural Technology to be the first organization in Nepal to put solar cooking/water pasteurization in their programs. I helped the Vajra Foundation with contacts in Nepal. They have had great success in Bhutanese refugee camps where solar cookers are being produced and used. I have created additional awareness of this technology with demonstrations of solar water testing and pasteurization and the construction and use of solar food driers that can provide income by producing high quality dried fruits, herbs, vegetables and meats.

Each year I return to Nepal to follow-up for two to three months to ensure success, start new projects and go trekking. I spend an additional two months on solar projects in either Mongolia, Indonesia, Mexico or South America. To have a fast effective way to demonstrate solar cooking in remote rural

(Continued on page 18)

(Continued from page 17)

areas as well as in cities, I designed a roll-up backpack cooker (400 grams). Because it is compact and lightweight, I always carry it with me just in case the opportunity presents itself to demonstrate solar cooking. This solar cooker pasteurizes a beverage can-size pot of water from snow or prepares soup or tea in twenty minutes. Rice takes only 35 minutes to cook even in very cold weather. Dawa Steven Sherpa carried my cooker to the summit of Mt. Everest in 2008.

I also designed a powerful, collapsible, lightweight (3.5 kg) parabolic solar cooker for trekking agencies and households. In 2000, I installed this one-meter in diameter cooker at Everest Base Camp for use by the Everest 2000 Environmental Clean-up Expedition.

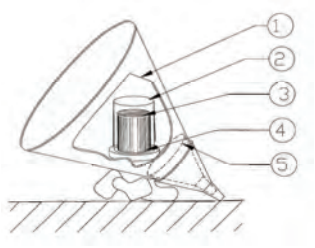


Diagram of Solar "Trekkers"

If trekking groups and expeditions use solar and heat retention technologies, they can help disseminate solar cooking technology, providing a multiplier effect. My design is available free to reputable Nepalese organizations such as the Foundation for Sustainable Technology (PCIA Partner, PCIA Forum 2009 Award Winner, and another "champion" NGO), which is currently fabricating them in Nepal.

It is essential that we teach responsible eco-tourism to minimize environmental degradation. I have given workshops to trekking agencies and the Nepal Tourism Board. My interviews with trekking lodge keepers have revealed that the average lodge of ten trekkers consumes one backload (40 kg) of wood each day. With two SK-14 parabolic solar cookers at each of 1,428 trekking lodges, more than 5.4 million kg of wood can be saved every year in Nepal. Using solar cookers for Clean Development Mechanism projects can dramatically improve health, reduce poverty and save the environment in Nepal's delicate mountain areas.

Lodgekeeper learns solar cooking

Critical to the success of all these projects is continuous follow-up. It is also essential

Preparing lunch with Solar Backpack "Trekkers" Cooker

to come up with new project strategies that advance Millennium Development Goals (MDGs). So in 2000 the following technologies have been added: 1) Integrated cooking method, adding fuel-efficient stoves and heat retention boxes. 2) Further integrated/inclusive approach offering complete health, energy, environment-friendly solutions with solar space heating, photovoltaics, efficient WLED lighting, composting, toilets, and biomass briquettes from waste.

We also started a Renewable Energy School, teaching RE technologies, plus carpentry, metalworking and small-business. The aim is to create skilled workforces of RE entrepreneurs that disseminate RE technologies, create jobs, and provide sustainability.

Since 2002 I initiated Rotary International matching grant projects to support these programs and provide long-term help to 22,000 people in Nepal in health, water, energy, environment, sanitation, women's empowerment and income generation. I encourage others to become active members of Rotary or other service organizations to promote and start such projects.

I encourage business-driven dissemination of solar technologies and products so that in the long-term, programs become self-sustaining and will not rely on donations. Spreading solar cooking/water pasteurization is still my main goal, but expanding it with other technologies will give people more choices so that MDGs will advance faster.

Topic and Deadline for Bulletin 23

We are pleased to announce that PCIA Bulletin #23 will focus on the topic of **Carbon Finance and Carbon Project Development**. Organizations and individuals with experience in this field should submit **proposed topics** for articles to moderator@pciaonline.org no later than **January 25, 2010** to confirm space availability and receive submission guidelines. Confirmed articles will be due **February 18th**.

After a Decade of Work, Solar Cooking Expert Concludes Solar Cooking is Not THE Answer

David Whitfield, CEDESOL: david@cedesol.org
http://www.pciaonline.org/cedesol

One of the reasons for Centro de Desarrollo con Energía Solar (CEDESOL) and Sobre la Roca's success with the uptake of our integrated cooking technology is that we don't present solar or efficient biomass as THE answer. We try to help people see that there is an interconnectedness involving education, health, economy, environment and their participation. We've found that change is not going to come until appropriate value is perceived, so we help them recognize the advantages and disadvantages related to the use of each technology and their own intelligence prompts them to value implementation.

Preparing rice on a rocket stove to be cooked in a box solar cooker in retained heat mode

Solar cooking (primarily with box cookers), retained heat cooking (including using the solar box cookers as retained heat cookers when there is not enough sun) and fuel-efficient biomass are the elements of our integrated cooking program. In 1998, after studying many solar cooking projects and consulting with experts associated with Solar Cookers International (SCI) we began our solar cooking adventure. In 1999 we partnered with a French group who later became known as Bolivia Inti. Our partnership lasted 4 years until they were sure how to proceed with our methodology and they had acquired our integrated technology. We can proudly say that Bolivia Inti has expanded part of our version of integrated cooking into several countries around the world. They continue to be active in Peru, Bolivia and part of Chile, producing about 500 solar cookers a year, using the same week-long workshop program they learned from us.

Our decision to reach more people and improve our methods resulted in a split. Sobre la Roca became owned and managed by Ruth Saavedra, a Bolivian entrepreneur, and David Whitfield went on to found the Center for Development with Solar Energy (CEDESOL). Sobre la Roca focuses on manufacturing and CEDESOL on technology development and networking; both organizations provide training.

A recent solar cooker training for 50 solar cooks, financed by Kyoto Twist Society

Because of our interactions with others such as Solar Household Energy we subscribe to the line of thought that commercialization is the true key to long-term uptake of integrated cooking. CEDESOL's old approach involving week long workshops occupied too much time and our monitoring showed us that few people went on to commercially build solar cookers after taking the workshops. One of the problems of these workshops was that solar cookers were not always well built by their owners creating a bad name for solar cooking. We found that better quality control could be achieved with a central manufacturing center. As a result, Sobre la Roca has been able to provide an 18 month guarantee on all of their products.

While solar cooking is not THE answer, it is the best solution we know of to immediately reduce indoor air pollution, pasteurize water, sterilize medical instruments, reduce deforestation and the human burden of looking for and carrying biomass fuel. There is no air pollution while using a solar cooker and combined with an efficient rocket stove, indoor air pollution can be reduced by more than 95%. To learn more please visit www.cedesol.org or http://www.sobrelarocacocinassolares.com/.

Solar Cooking Myths vs. Facts

Myth #8 The plastic bag used with the CooKit is unsustainable since a new one is required for each meal.

Fact

- Food is not put directly into a heat resistant plastic bag. Raw ingredients are placed in a cooking pot with a lid, which is then placed inside the plastic bag to keep heat from escaping.
- If handled with care, one heat resistant plastic bag can be used for up to a month.
- A plastic bag, which can then be recycled, is still more sustainable than a month of burning wood or dung.
- The solar HotPot, a tempered glass bowl and lid with a black cooking pot inside the glass, is one solution.

☼ HAPPENINGS

Recent Partner Activity

Solar Cooking In Nigeria

Joseph A. Odey, Odey Renewable Energy Technology Co. Ltd, Nigeria: joeodey2003@yahoo.com

Environmental problems associated with draught and desert encroachment are increasing in Nigeria. One solution is the application of solar cooking. Odey Renewable Energy Technology Co. Ltd, in Nigeria has introduced the low cost and effective solar "Cookit," which provides an alternative to wood and fossil fuel derivatives. Solar cookers are environmentally friendly and do not emit carbon monoxide. We are running an ongoing awareness campaign and our organization is determined and focused on achieving its objective of spreading solar cooking technology throughout the entire country by 2015.

Odey Renewable Energy Technology Co. Ltd's (ORETC) attendance at the 2009 PCIA Forum in Uganda has contributed a lot to its successes recorded already, especially through the encouragement and network of partners gained. ORETC has tested cookers to determine their efficiency in performance before distribution, and is teaching solar cooking technology to over 5,000 students across the country. We have solicited the government's attention for partnership and collaboration in spreading access to solar cooking. Our PCIA membership can help show that our organization is part of a larger network of partners scattered around the world, and that we are representing Nigeria in contributing to sustainable development.

Solar cooking workshop in Nigeria

We are working in both rural and urban areas to spread awareness about solar cooking. Low income people who make less than one US dollar per day will benefit most, since the cost of fuel wood is high while the sun is abundant and free. One solar Cookit can save a ton of fuel wood per year. People can find gainful employment with our ongoing training program that has started in the northwest zone. So far we have trained over 3,000 people in three years (2006 – 2009) on the uses of solar cooking. We will provide future updates to PCIA with information on the number of households reached and the number of cookers in use.

Sri Lanka's National Workshop on Indoor Air Quality Management

More than 60 experts and stakeholders gathered together in Minuwangoda, Katunayaka, November 5-6 for a National Workshop on Indoor Air Quality Management, jointly organized by the Air Resource Management Center (AirMAC) of Air Resource Management & International Relations Division of the Ministry of Environment and Natural Resources and Clean Air Sri Lanka. The goal of the event was to prepare a National Action Plan of various sectors to abate indoor air pollution.

Whereas urban air quality management efforts in the country have been increasing in the last few decades, limited attention has been directed towards indoor air quality which has resulted in low levels of awareness, few studies on monitoring and insufficient policies and programs.

The opening sessions shed light on the sources, issues, health impacts and trends of indoor air pollution. Representatives from government agencies, academic and non-governmental organizations singled out cooking stoves as the primary contributor to household indoor air pollution in Sri Lanka. This is further linked to cross-cutting concerns on poverty because it is the majority of poor families (including those in plantation estates and remote areas of the country) who rely on biomass for fuel and whose houses have restricted air circulation. Additionally, gender concerns arise because women in Sri Lanka generally spend more time in the kitchen to prepare food for the whole family.

Aimed at sharing information, the other sessions focused on the link between ambient air and indoor air quality, alternative fuels and technologies to minimize indoor air pollution, design principles for buildings, and past studies. The tea and lunch breaks likewise allowed the participants to network amongst each other and establish partnerships.

The National Building Research Organization (NBRO) of Sri Lanka also gave a demonstration on methodologies and equipment used for monitoring

(Continued on page 21)

(Continued from page 20)

levels of indoor air pollutants. An interactive exhibit was set up by non-governmental organizations such as Integrated Development Association (IDEA) which showcased improved designs of cooking stoves in Sri Lanka and abroad, and a demonstration on the water boiling test to assess efficiency of various types of stoves.

The 2-day event was capped by the presentation of outputs of the sub-plenary session wherein the stakeholders, divided into four groups, identified data gaps, implementable measures and lead organizations for indoor air pollution and health, indoor air quality monitoring, manufacturing processes to enhance stove performance, and alternative fuels and technologies.

Contact Ruwan Weerasooriya at airmac@sltnet.lk to learn more or join the effort to implement the National Action Plan.

News...

New Biomass Resource Available

The Atlas of Thermal Data for Biomass and Other Fuels, 2nd edition, by Thomas Reed and Siddhartha Gaur has recently been released. The Atlas contains measurements of the reaction of over 100 different substances to heat and effectively shows an analysis of the substance and temperature at which pyrolysis starts and ends and the amount of charcoal and ash formed in each case. This is an updated edition from the 1998 version and includes a new section on biomass analysis and thermogravimetric analysis. It is aimed at those engaged in biomass and biochar research, development, and implementation, as well as the wider community of energy and fuel research. The Atlas is available at BEF Press at www.woodgas.com.

New National Initiative for Cookstoves, India

The Ministry of New and Renewable Energy (MNRE) in India recently announced the launching of a new initiative on biomass cookstoves. It will utilize a variety of current technologies, while also encouraging the development of new ideas. For more information, please visit: http://iapnews.wordpress.com/2009/12/03/india-launching-of-the-national-biomass-cookstove-initiative/.

Check out the recent NEW YORKER article on stoves, featuring many PCIA Partners!
http://www.newyorker.com/reporting/2009/12/21/091221fa_fact_bilger

Upcoming Events...

Solar Culture Course in Nicaragua
January 4 -14, 2010
Managua, Nicaragua

This hands-on course hosted by Groupo Fenix covers the theory behind solar energy and the challenges of development. Students learn how to construct solar cookers and photovoltaic panels, and how to install photovoltaic systems. Most activities and classes are held in the new adobe Solar Center. Housing will be simple, like that of a typical rural Nicaraguan family. The course has been run twice a year since 1999 and includes several site visits and touristic activities. For more information contact thegrupofenix@gmail.com or visit www.grupofenix.org.

2010 ETHOS Conference
January 29-31, 2010
Kirkland, Washington, USA

The 2010 ETHOS Conference will include participation of Southern partners, international stoves experts, and development specialists. Themes for the 2010 conference include**:** Lab research (stove testing, emissions monitoring, and design); Field monitoring of performance, indoor air pollution exposure, health impacts, user satisfaction; Awareness raising; Stove promotion; Involvement of volunteers; Technology standards; and Policy issues. For more information and to register, please visit: http://www.vrac.iastate.edu/ethos/conference.php.

Environmental Film Festival,
March 16-28, 2010
Washington, DC, USA

The 18th annual Environmental Film Festival in the Nation's Capital, March 16 through 28, 2010, will present more than 130 films selected to provide fresh perspectives on environmental issues facing our planet. Filmmakers will discuss their work at the festival along with scientists, environmental experts, and special guests. PCIA Partners Solar Household Energy Inc. and Solar Cookers International submitted several films that were shown during the 2009 festival. The complete schedule will be posted when available at www.dcenvironmentalfilmfest.org.

American Solar Energy Society (ASES) National Solar Conference
May 17-22, 2010
Phoenix, Arizona, USA

The 39th ASES National Solar Conference will cover a range of topics such as technology, buildings, policy, workforce development, and education. It will

(Continued from page 21)
include plenary sessions with guest speakers, forums featuring case studies and panel discussions, and technical sessions with several short presentations grouped around common themes. There will also be a number of public events surrounding the conference. For more information, and to register, please visit: http://www.ases.org/index.php?option=com_content&view=article&id=18&Itemid=147

Announcements...

Please update your Partner Profile!

This will help you extend your network, share resources, and discover new opportunities.

If you already have a username and password:

1. Log in to the website (www.pciaonline.org) using the username and password you set up when you registered. If you have forgotten your password, please click on the "Request new password" link on the homepage.
2. Once logged in you can edit your organization's profile. If you have trouble logging in, please contact us at moderator@pciaonline.org.

If you do not have a username and password:

1. Email us at moderator@pciaonline.org with your desired username, initial password, first and last name and the organization name. You can later change your password so that only you know it.
2. You'll receive a confirmation email with detailed instructions. You can then log in to the website from the homepage (www.pciaonline.org) to update your profile.

If you have any questions, please contact us at moderator@pciaonline.org.

We have set a goal to have 100% of PCIA Partners update their profiles within a 12 month period. We will even provide additional incentives to help reach this goal. Those who provide substantive updates by January 29th will be entered into a drawing for one of the following prizes:

- Round trip airfare expenses for one participant to the 2011 PCIA Forum [1 winner]
- Lodging expenses for one participant at the 2011 PCIA Forum [1 winner]
- An organizational profile in an upcoming PCIA Bulletin [2 winners]
- Highlighted profile status on the PCIA homepage [3 winners]

Get ready for 2009 Results Reporting!

We will have the new, user-friendly results reporting up on the website soon for Partners to upload results from their work during 2009. Please start compiling information now to share with other PCIA Partners so we can provide an accurate view of the community's achievements over the past year! Some areas to start thinking about include: key accomplishments from 2009; types of stove performance testing conducted and use of testing results; number of households served and stoves distributed; and plans for 2010.

WBT Version 4 comment period closed!

Many thanks to all of you who responded to PCIA's request for public review and comments on the Water Boiling Test Version 4. The compiled comments are now available at http://www.pciaonline.org/testing/wbtcomment. Responses from a technical review committee will also be posted on this page soon.

Happy New Year!

Did you miss PCIA's holiday greeting email? If so please email us at moderator@pciaonline.org so that we can get you back into the system, and check out the New Year message now at http://www.pciaonline.org/holidays09!

PCIA Photo request!

Do you have fantastic photos to share? Please email us at moderator@pciaonline.org!

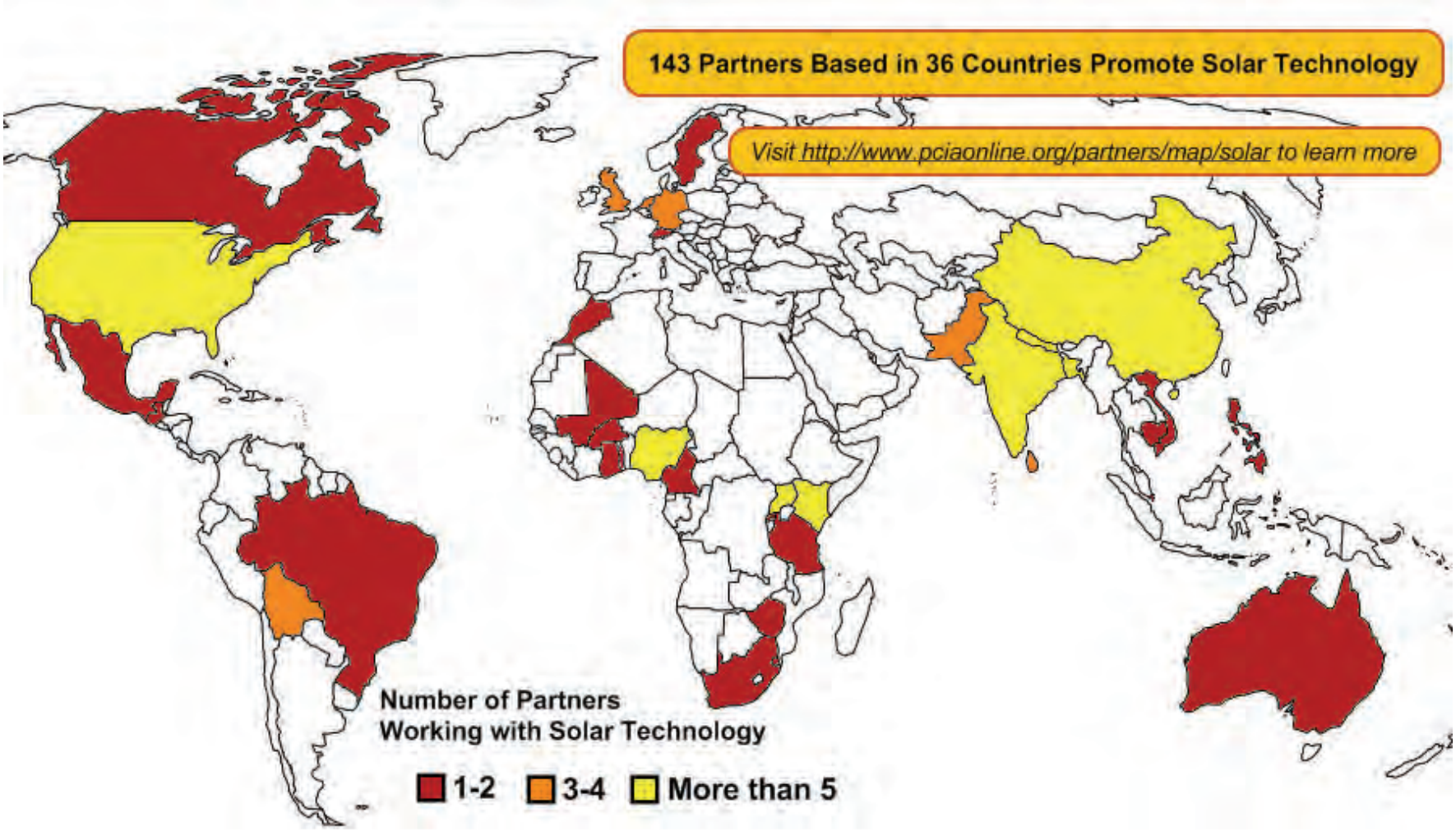
Bonus Solar Cooking Recipe!

(from http://solarcooking.wikia.com/wiki/Recipes)

Cornbread A La Sol

Dry Ingredients:
1/2 cup corn meal
1/2 cup corn flour
1 cup white flour
2 tablespoons baking powder (preferably aluminum-free)
3 tablespoons sugar
pinch salt
Liquid Ingredients:
1 cup milk
1 egg
3 tablespoons oil

Blend the liquid ingredients together. Add the dry ingredients and mix thoroughly. Pour into a 7 x 11 inch pan (preferably one with the underneath painted black). Bakes in about 1 to 2 hours. Consider it done when 'fault lines' appear to be running along the top.



Over 140 PCIA Partners incorporate solar cooking into their work! Partners with a particularly strong solar focus include: Center for Rural Technology Nepal; Centro de Desarrollo con Energía Solar (CEDESOL); Fondo Mexicano para la Conservación de la Naturaleza A.C. (FMCN); Gadhia Solar Energy Systems Pvt. Ltd.; Solar Connect Association; Solar Cookers International (SCI); Solar Cookers World Network; Solar Household Energy, Inc. (SHE); Solare Brücke e.V.; Sun Ovens International; SunFire Solutions and Sun Smile.