Solar Cooking and Health

From Appropedia

The good news is that it is

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possible to breathe fresh air at the same time as cooking – using a solar cooker. Solar cooking produces no smoke at all.

In the past, the main reason for people adopting solar cooking was to reduce the environmental degradation caused by using too much fuel wood. More recently, respiratory diseases caused by toxic smoke from cooking fires have been recognized as a major health problem. They kill 1.5 million women and children each year, according to the World Health Organization (WHO). Solar cookers address these major threats to health as well.

Solar cooking technology has been around for decades, but has been poorly understood and has not been widely disseminated. Here are some ideas on what solar cooking is about, and its capabilities – as well as its limitations.

Overcoming barriers to acceptance

Solar energy was promoted as an alternative cooking fuel from the 1980s. Two principal barriers blocked its initial acceptance, however:

• Cultural resistance; people have used wood to cook since the inception of the domestic fire. Acceptance of so radical a change as cooking with solar energy can only happen where there is real need. With ever-increasing desertification on one hand and population increases on the other, the need is growing rapidly.

• The other initial barrier to solar cooking's broad acceptance was the indifferent quality and/or high cost of available solar cooking equipment, and the lack of experience introducing it. Today, several efficient solar cookers are available at relatively modest cost; experience has sharpened advocates' understanding of how to achieve cultural acceptance.

Where is solar cooking practical?

A major requirement of solar cooking is, of course, plenty of sun. The US space agency, NASA, created a database for those wishing to cook with solar energy. This database helps people determine where there is adequate sunshine. The term 'insolation' is a measure of the amount of sunshine and thus is a measure of how much energy is available for solar cooking. As a technical rule of thumb, monthly insolation should exceed 4 kWh/meter squared/day on average, to merit consideration for solar cooking promotion.

Another requirement for successful introduction of solar cooking is the pressing need for alternative energy. (Places in the world where solar cooking is done as a matter of preference are few. They occur where there is a well-educated population and rising prices of traditional biomass fuels.) Otherwise, the greatest demand is where biomass fuel shortages are most severe. Considerations of health should one day become another strong incentive.

Solar cooking seasons are much longer and the need for alternative energy generally much more urgent in tropical and semi-tropical areas. These

include most of Africa, South Asia, Australasia, Central and Northern South America. Solar cooking may also be a useful alternative in a band running from Turkey through the Middle East to the Himalayas and southern North America. For example, for eight months of the year solar cooking is practical as far north as Mazar-e Sharif in northern Afghanistan. There, critical shortage of household energy could make its adoption worthwhile. We have counted 67 countries where abundant insolation and varying degrees of need coincide.

Benefits to health

Here are some health problems, apart from respiratory diseases, and ways in which solar energy is being used to alleviate them:

Polluted drinking water

Dr. Mercy Bannerman won a World Bank Development Marketplace prize in 2002. With this funding she distributed 1600 solar cookers in northern Ghana and provided training in their use to pasteurize water. She noted an immediate and lasting reduction of endemic water-borne diseases like

guinea worm.

Glaucoma

Glaucoma is the name for a group of eye conditions in which the optic nerve is damaged at the point where it leaves the eye. This is identified as a major health problem, and it is believed that people are considerably more at risk when exposed to toxic smoke. The danger from open fires Thousands of small children are maimed each year through falling into cooking fires. For example the Burn Unit of the Red Cross War Memorial Children's Hospital, Cape Town, South Africa admits almost 1000 patients a year, ranging from newborn babies to 13-year-old children (Children's Hospital Trust).

Violence

Wherever there is political unrest, as in Darfur and Somalia now, women are at high risk of rape and murder when they leave their villages to forage for fuel wood. And, because of the environmental degradation caused by this practice, they have to go ever farther to find it.

Insufficient and unsafe diet

Increasingly, the diets of people in the developing world are being adversely affected by shortages of fuel wood. Improving food safety, through making it cheaper and easier to cook food so that it contains less pathogens, can improve health. In some places, people are forced to barter some of their limited food supplies to obtain fuel with which to cook the rest. Reducing the cost of fuel increases money for food.

Cultural acceptance of solar cooking

There are very large numbers of reports of uses of, and demands for, solar cookers. For example, we have letters from village officials in Bolivia pleading for more solar cookers; similar letters from women's groups in Senegal; the assertions of Haitian women that they often solar cook two meals a day; pictures of a solar restaurant in northern Chile, and so on.

In addition, there are scientific evaluations of solar cooking education and distribution programs. For example:

• In 1995, Solar Cookers International conducted a training program at the

Kakuma refugee camp in northwestern Kenya. In 1998, the program was evaluated. A random sampling of the women who had been trained three years before continued to solar cook 54% of their meals.A similar evaluation conducted at the Aisha refugee camp in Ethiopia in 2001determined that fuel wood usage in the camp was down 32% following the introduction of solar cookers.

• In 2005, an evaluation was completed in a series of Bolivian villages. It assessed promotions conducted by David and Ruth Whitfield in preceding years. It found that solar cooking families had reduced their fuel expenses 40% in the dry season and 35% in the wet season.

Unlike photovoltaic solar devices that convert solar energy to electricity, passive ones simply catch solar energy and convert it directly to heat. They are much simpler and much less costly. Other 'passive' solar devices contributing to good health include: food driers, through-the-wall solar ovens permitting access from indoors, autoclaves which sterilize equipment for rural hospitals, and ovens that can burn medical waste. In India there is a giant solar oven, designed by Wolfgang Scheffler, that cooks for 20,000 pilgrims a day! The fuel, of course, is free.

The utility of a solar cooking device should be judged by what it can do in

the location in which it is set to work. In the right location, it can reduce exposure to toxic smoke, protect from the dangers of fire, improve women's quality of life. It can also reduce fuel costs and alleviate stress on the environment. What solar cookers won't do is cook in the dark, or under overcast or rainy skies. (Thus, it will not prepare one's morning tea unless, of course, one stays in bed till very late!)

Many people say that solar cooked food is better because little or no water needs to be added, which would otherwise dilute the taste. Try it and see.

Frequently asked questions

Growing realization of a need for alternative ways to cook has stimulated new interest in solar ovens. Here are answers to some of the things people want to know:

How fast does it cook?

Many things affect cooking speed: closeness to the Equator, altitude, time of year, time of day, weather conditions, type of food. To give some idea, assume you need about twice as long as if cooking over flame. (However,

when the time required to obtain fuel wood and tend the fire are considered, solar ovens demand less of the cook's time.) Solar-cooked food will not burn on the bottom of the pan, so stirring is unnecessary. Pots require no scrubbing, nor are they covered with soot. Furthermore, solar energy in the tropics and at high altitudes is so powerful that cooking speed is not necessarily an important issue. Considerations of simplicity, durability, ease of use, pleasant appearance, and low cost are considered of comparable importance.

How quickly will it boil water?

Parabolic solar ovens can do that in a matter of minutes. Box and panel ovens take longer – but will in fact boil water. It should be noted that cooking does not even require boiling in most cases – food cooks at 82°C, and water is pasteurized at only 65°C.

What if the main meal is eaten after dark?

There is an elegant solution. It used to be called the 'hay box' but today, the more descriptive 'retained heat cooker' or 'fireless cooker'. It is simply a container lined with insulation in which a pot of cooked food can be kept

hot for several hours. It was once in common use in Europe and the U.S. Figure 1 shows a model that Wietske Jongbloed designed for use in the Sahel. How do you solar cook in the early morning or when the sky is overcast? You don't. Solar cookers can be an important, sometimes main, means of cooking, but never the only one. There must be another way to cook, and lowemission, fuel-efficient stoves are best. However, it is as unnecessary to burn fuel under a blazing sun as it is foolish to deploy a solar cooker at night.

How can people cook when there isn't any sun?

They have to use combustible fuels. The percentage of time a solar oven can be used varies widely with factors like weather, skill of the cook, and the urgency of the need. (The GTZ conducted a solar cooking project in South Africa and concluded that solar cookers were used an overall average of 40% of the time. Solar cookers will never be THE solution. They are an important addition to the kitchens of the world.

What are the problems associated with solar cooking?

With some cookers, even though tough, tempered glass is usually used,

there is the possibility of breakage. This danger must be compared to the risks presented by open fires. There is a possibility of a burn if the black cooking pot used for solar cooking is touched while hot; but this is true of any cooking pot. There is no danger of burns from the other components of solar cookers. There are undoubtedly places where it is inadvisable to leave a solar cooker unattended because of animals or children or thieves or, as has been suggested to us, poison. The same problems confront those who cook outdoors over three stone fires. We know of no solution but to keep an eye on the cooker from a shady place nearby.

Figure 1: Retained heat cooker. Photo:Darwin Curtis

Are solar ovens affordable in the developing world?

Not by the people who need them the most – virtually nothing is. However, there are now durable, efficient modern designs which can retail for $50 or less. There are continuing efforts to reduce that cost further. Creative

financing will always be necessary to achieve the widest possible distribution. This includes micro banking, lay away plans, barter arrangements and subsidies. And since solar energy is free, people eventually pay for their ovens with the money they have saved by reducing their need for traditional fuels.

The basics of solar oven design

Figure 2: Box oven, Bolivia. Photo; David Whitfield.

There are three practical models of solar cookers. The box oven was introduced in the 1950s by Dr. Maria Telkes. A popular model has a hinged, transparent top of glass or plastic and the inside of the box is black. Sunlight passes through the glass, strikes the blackpainted inside of the box and the light is converted into heat, which cooks whatever is in the box. Box cookers can be of any size and can contain several pots. They can be hand made, even out of cardboard, and work well. The way

they work is very similar to ovens (Figure 2).

The most powerful solar cooker is composed of a paraboloid reflector and a bracket to hold a pot. The reflector bends the rays of light so that they are concentrated at a focal point under the pot, making it very hot indeed. The focal point is so hot that this kind of solar cooker can fry food, unlike the other types of solar cooker. These cookers work like the burner on an LPG stove. Dr. Dieter Seifert developed a series of very efficient cookers of this type that are now in use around the world. Wolfgang Scheffler designed an 11-square meter reflector that concentrates intense solar energy onto an area about 30 centimeters in diameter. It is used for solar cooking on an institutional scale. (Figure 3).

The third and most recent design is the panel cooker. Its major features are low cost and

Figure 4: HotPot panel cooker. Photo: Christine Danton, SHE Inc.

Figure 3: Scheffler cooker. Photo:Heike Hoedt.

increased portability, as the panels are hinged and can be folded up. Invented by Dr. Roger Bernard, it was initially adapted by Solar Cookers International for use in refugee camps. A commercial model developed by Solar Household Energy,

Inc. is now available. In this model, called the HotPot, a black steel cooking pot with a wide flange is suspended inside a transparent glass bowl with a space of 1.3cm between the two. This assembly is covered with a glass lid and placed in front of a foldable reflector designed to deliver solar energy through the glass bowl to the black pot. The resultant heat is retained between bowl and pot by the pot's flange (Figure 4).

How to Do It Yourself Designs

- Box cooker
- Parabolic basket and tin can solar cooker
- Papasan Chair Solar Cooker

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Further reading

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• Moving Ahead with Solar Cookers: Acceptance and Introduction to the Market, GTZ, March 1999.
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Technology for Life

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This organization produces Solar Cooker Review detailing a wide range of solar cooking equipment and related projects occurring throughout the world.

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The organization has designed a box type solar

cooker, they do not manufacture the item but allow the manufacture to be carried out at a local level.

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