

Solar Cooking for Sustainable Living

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Abstract

In the new millennium of energy crisis renewable energy sources can play a vital role for sustainable development. Present contribution is an attempt to present some aspects of solar energy for cooking and other purposes.

Key Words: *Renewable energy, solar energy, Solar cooking*

The energy of the sun can be harnessed in a simple way to cook food. There is no need for large complex systems of lenses and mirrors to achieve this task. When sunshine falls on a blackened surface it is absorbed and transformed into heat. Glass has the property of letting in light but not heat. If a shallow glass covered chamber coated black inside and insulated all around is exposed to sun for a time the temperature inside soon exceeds 100 degree C. This is sufficient to cook food. Some more heat input can be achieved by having an exterior reflector. There can be more than one reflector also, even as many as four, designed to enclose the cooker slantingly on all directions to funnel in the solar radiation. A device incorporating these principles is the solar box cooker.

The solar box cooker made in India has a single reflector. The box looks like a square shaped suitcase. It has two hinged lids - an inner lid (or window) consisting of two glass panes, with a small air gap (for better insulation), and an outer lid holding a single reflector which is simply a glass mirror. There are arms to rest the lids at any desired position. The lower part of the box consists of a shallow inner box of aluminum sheet sitting inside an outer box. The space between the boxes has insulation (glass wool) and the annular space around the inner box at the top has a heat resistant rubber beading on all four sides for the glass window to rest when the cooker is in use and provide a good, leak-proof seating. There are four cooking pots in the inner box. All the pots are coated black outside with matt finish paint. The cooker has four castor wheels for easy movement. The outer case of the cooker is made of aluminum or fiberglass reinforced plastic (FRP) which is a light and tough material. The solar box cooker weighs about 10 kg.

Such box cookers are available in India for Rs 1500 – Rs.2500 depending on the finish.

The solar cooker takes 2-3 hours to cook food. The cooker has to be moved occasionally, say, at hourly intervals, to face the sun as it moves across the sky. It can cook food only during the day when the sun is shining – not when it is cloudy or raining. Passing clouds do not matter. If there is a clear shadow behind the cooker the sunshine can be considered good enough to cook. It is good practice to wheel out the cooker as soon as the sun is up on the horizon to preheat the cooker. If there is good sun for an hour at start, even intermittent clouding thereafter, will not matter except delaying the cooking time somewhat. On a clear day one can even do two rounds of cooking – say between 9 am and 12 noon and again between 12 noon and 3 pm.

The great advantage of solar cooking is its convenience. You do not have to be on your legs in constant attendance. This is because the food never gets overcooked or burnt. You can "load-and-forget" with the solar cooker. The housewife can attend to other chores while the solar cooker is doing its job.

In India a typical load in the cooker might be rice in double its volume of water in one pot (it can take 200 gms of rice), 'dal' (lentil) in a similar volume of water in another pot, cut vegetables (or whatever) with a small amount of water in the two other pots. Instead of moving the cooker once in an hour you can even keep the cooker fixed in the 'average' position – both in relation to the east-west direction and the azimuth – of the sun during the cooking time. After 2-3 hours when you revisit the cooker you will find all the items cooked. All that remains is for you to take them out and do the "tadka" or tempering with herbs or spices, on the regular oven, to convert them into complete dishes. You have then made a meal at zero cost in terms of fuel and in terms of the environment.

One can cook not only food, but also roast nuts, dry vegetables and fruits (taking care to keep the glass lid slightly open, to the extent necessary, to control the heat input), pasteurize water and even bake bread or cake on a clear day at noon. One can make jams and can fruits. One can use the cooker to get rid of insect infestations from cereals and condiments. One can make sun-dried culinary items in very short time in a solar cooker. I have used the cooker even to do repair jobs like restoring soggy biscuits and banana and other chips into oven crisp ones during the rainy season. The solar cooker is a truly versatile and multipurpose genius of a device. It is more than a cooker. A solar cooker kept out in the sun is like an oven kept permanently switched on. You can place anything in it anytime and take it out when done.

What is important for solar cooking is not how hot the sun is but how clear the sunshine is. In most places in India one can cook for 70-80 % of the days in a year. One can thus solar cook in all seasons. You can cook on the Himalayas on a clear day. In fact, our jawans (Soldiers) in Kargil are using the solar cooker. The solar cookers were put to good use in the aftermath of the Gujarat earthquake, thanks to the initiative of Professor Sharan in Indian Institute of Management, Ahmedabad.

There is no durable cooking device available anywhere in the world which is as cost effective and convenient as the solar cooker. Yet solar cooking has not caught on. Why? I suspect it is because most people do not know about it. People might find it strange or odd to cook in the open and may not really be aware that solar cooking is a perfectly feasible proposition. Or they may be under the impression that it is a hassle requiring one to be out in the open all the time. But the fact is that unless you are introduced to it you will not realize its true and full potential and its ease of use.

It is but true that the solar cooker has certain drawbacks which makes people say it is not an 'efficient' energy source. It is slow the cook, it cannot cook on some days when the sunshine is obscured. (This is true of photovoltaic devices also, except that the battery in the PV system can take the lag for a time.) But these drawbacks are really not very serious. An effort should be made to convince people that these drawbacks are worth living with. One gets used to it in course of time. Our world is not perfect in all respects and we have to make sensible compromises. At any rate those that cannot adjust to it could be left out and those that can should be persisted with and an effort should be made to reach them. This requires a sustained effort lasting over several years which has been lacking so far. A take it or leave it approach will not do. There has to be a build up of the solar cooker using all available means including the modern media tools.

The solar cooker is a lifetime asset. Handled with care it can last 15 years or more. There is no moving part in it to go wrong. The only maintenance required is an occasional coat of black paint on the inside of the cooker and on the outer surfaces of the cooking pots.

The solar cooker can be used both in the rural and urban sector. In the rural sector it saves village woman from having to trudge for miles in search of scraps of firewood and spending her lifetime in smoke-filled kitchens. In the urban sector it saves energy on kerosene and LPG and makes cooking easy. The cost of petro-based fuels are going up all the time by the gradual withdrawal of the subsidies.

The solar cooker is the most self sufficient and decentralized cooking instrument imaginable. If you have a place in your home where you can access sunshine you can acquire a solar cooker today and start using it immediately. It makes you energy independent.

Spread over the lifetime of a cooker of, say 15 years, the cost of solar cooking works out to less than 50 paise as against Rs. 3-5 by any other means. But the cost of solar cooking is loaded upfront. One has to fork out the full life cost of the device in advance. This is a deterrent to investing in a solar cooker and would call for a subsidy element – especially to those below the poverty line – or an installment payment or microcredit system.

It defies logic, but it is true, that solar cookers are not being subsidized by the Indian government (they were till 1994. Some states like Gujarat and Karnataka continued the subsidy after 1994) but commercial fuels like kerosene and LPG which are imported at great cost and add to the pollution are subsidized. Even other renewable energy systems are subsidized.

There is another class of cookers called 'concentrating cookers' or 'direct-focusing cookers' which are concave mirrors (parabolic in shape) which reflect solar energy to a focal point where a cooking pot can be placed. They can cater to large scale cooking. They are available in several models (Rs. 5000, Rs.55000, Rs.25,00,000 and Rs. 55,00,000!). These can do a faster job of cooking. But they are costlier and inconvenient in many ways – they have to be constantly moved to catch the sun, they cannot cook more than one item at a time, they are large, unwieldy and have to be fixed at a place, they are prone to scratches on the reflecting surface and can be blown away by high winds if not properly secured. They are not as cheap, compact and convenient as the box cooker – at any rate they are not affordable to those that are in dire need of alternative energy sources, namely the poor who depend on fuelwood. But these high-cost cooking devices are subsidized by the Indian government!

Another type of solar cooker is also now being made in India, the Sunstove, designed by Richard Warcham of U.S.A. It has been popularized in South Africa. It is an insulated box whose sloping sides themselves are reflecting – thus doing away with the outside reflector – and has a plexiglass window. It has two large sized pots. It is lighter and cheaper – costing around Rs.1000. It has just commenced production in Kolkata, with assistance from Rotary International. I feel it has very good prospects.

I have been practising solar cooking in Trivandrum in India for over 12 years on a sustained basis – an unlikely place for solar cooking because of its higher than average rainfall. I have taken to the solar cooker as one takes to a pet dog. If you are not immodest in your demands you will find solar cooking hugely satisfying and great fun.

There are over two dozen manufacturers of solar cookers in India but many are languishing for want of orders. Government, the energy gurus and even the NGOs in India seem to be distracted by other elitist RE technologies.

One can see a lot of promotional activity, world over, for photo electricity. So much so that one would be led to think that solar energy cannot be harnessed usefully except in this manner. Photo-electricity is undoubtedly a most elegant technology ideally suited to bring electricity to people living in remote places unconnected to the grid. But to offer it as the cure-all for poverty is a mistake. The Indian government offers subsidised solar PV even to those who are connected to the grid. This is a waste of government resources. Photo electricity cannot provide the much higher energies required for cooking. Photo-electricity does not automatically usher in the age of electricity for the poor. At its high cost it can meet only the minimal energy need of lighting. But these PV enthusiasts slur over the much larger cooking-energy needs of the poor.

There are numerous web sites on renewable energy world over, including those on household energy but none of these seriously broach the topic of solar cooking. They seem to singing the praise of the photovoltaic resource with great gusto. I suspect the publicity that PV gets is in part due to the powerful lobby of the multinationals

who are dominating the manufacture of PV devices and their influence on governments. There is no such lobby to work for the solar cookers.

There is lot of interest in biomass as a provider of household energy. This is understandable because biomass devices are the existing cooking devices of the poor and it makes sense to set about improving their efficiency. But biomass also depends on firewood which has to be avoided to the extent possible. Biomass systems are messy and not clean. They do not make for energy independence. They are not cheap either in the long run. However imperfect a solution, solar cooking needs to be promoted seriously. But it requires patient and sustained promotional activity which is sadly lacking.

Many individuals and organizations are working in several developing countries promoting cardboard panel cookers such as the 'Cook It'. They are a good beginning because they are cheap and the people are too poor to afford anything better. But by their very nature they are not durable. I do feel that if solar cooking is to catch on durable solar cookers such as the ones being made in India are required.