

PROMOTIONAL ACTIVITIES OF SOLAR COOKING IN COSTA RICA AND OTHER LATIN AMERICAN COUNTRIES- ITS NECESSARY BUT WITH PROPER ACTIONS.

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ABSTRACT:

Author during last 37 years in addition to publish and use at home various models of solar cookers, including hybrid solar-electric ovens, has given many technical and popular lectures and organized about 40 seminars, practical workshops in Costa Rica and other Latin American countries to promote solar energy/cookers for domestic cooking and educational institutions for warming lunch.

In Costa Rica, with a population of 1 million families where 90-95% of electricity is generated from Renewable sources and 99 % of population is connected with electric grid, some individual persons (mainly from urban areas) and 2 restaurants use solar ovens for cooking. About 20-25 schools/ colleges use larger solar ovens for warming lunch for students to save electricity and shorten the queue for heating lunch.

During this dissemination process author has observed that dissemination is very necessary, but if not done properly may lose the existing users. In this presentation some of the lessons are shared- like, making friendly cooker, telling the truth for its performance, not exaggerating its claims, explaining proper use, maintenance, use of proper pots and also non cooking uses.

Keywords: Solar oven, Micro Wave Oven, Cooking pots, Sun trajectory, Dissemination.

INTRODUCTION:

In spite of availability of around 200 models of solar cookers/ovens, dissemination by various organizations and even given subsidies in some countries including India, unfortunately not more than 3 million solar cookers/ovens are made, distributed and sold worldwide. Many valid reasons for low acceptance of solar ovens as compared to TV and Mobile Phones (about 7.2 billion phones worldwide) are reported in the literature (6)..

During last 37 years, author firstly as university professor and presently as retired promoter use at home, has designed and published various models of solar cookers, including hybrid solar-electric ovens (110 VAC and 12 VDC) and Solar Electric Microwave Oven (1-4, 10 and 13). In addition has given about 250 lectures and organized 40 seminars, practical workshops in Costa Rica and 15 other Latin American countries to promote solar cooking for domestic and educational institutions for warming lunch (11).

During this process author has observed that dissemination is necessary, but if not done properly may lose the existing users and even discourage new users. Due to sudden climate change, getting uncooked food even for 3-5 days in a month, creates more frustration than happiness felt with solar cooking for a month. Thus author personally use at his house both conventional (Photo 1 and 2) and hybrid (solar-electric) oven designed personally and published in 1987 (Photo 3). Offering subsidies is the last option where it is really justified. In Costa Rica, with a population of 1 million families, where 90-95% of electricity is generated from Renewable sources and 99 % of population is connected with electric grid some individual persons (about 400, mainly from urban areas), 2 restaurants use solar ovens for cooking. About 20-25 schools/ colleges/ students use larger solar ovens (up to 50 lunch boxes in a single oven) for warming lunch to save electricity, shorten the queue for heating lunch and also to get national Ecological award (Photos 4-7). Some of the lessons learned will be shared.

GENERAL ASPECTS:

When we say solar cookers are not accepted, we are talking persons of mainly rural areas (non electrified regions) who have more limitations to get the fuels due to cost or travelling long distances. On the other hand there are many persons who have already got conventional ranges- electric or gas and they can afford to pay fuel price, but may like to replace part of fuel either to reduce fuel bill and/or think for the environment. Author personally comes in that category and most of the persons who call/consult author also come in this category. Also. Costa Rica has set the goal about 10 years ago to be CARBON NEUTRAL by 2021. Using Solar Cookers for saving conventional fuels will help user in personal benefit and also in achieving national goal (Think Globally Act Locally).

Author made first solar oven at home in Feb. 1979 (summer) mainly for heating lunch (Photo 1) due to electric rationing imposed during the day. Then designed and published many models and even use at home (for cooking and heating meal) and at university (for heating meal, Photo 5) and **help those who are interested and call** for the detailed information.

For the author the great advantage with solar oven, is cooking without attention, which no other cooking device can provide. Its due to low temperature /slow cooking.

PROBLEM:

In Costa Rica, although in the government schools, the free lunch is provided to the students of primary, but in the private schools and all secondary schools - students have to buy the hot lunch (or fast food like hamburgers) from the canteen or bring their lunch from house and then heat in microwave ovens. Normally 4-8 ovens are kept for students, depending on the number of students. For warming students have to make long queue which reduces their some time for the recreation.

In 1996, with some funding from UNESCO, two solar ovens were made for two schools with capacity of about 20-25 lunch boxes. Then some more schools/ colleges started asking for this type of solar ovens for heating lunch, but they had to cover material and labor cost.

This presentation will deal mainly with these persons/ institutes, for warming food, although some points may be valid for domestic solar cooking.

When possible user- send me an e mail, asking for possible installation of solar ovens for heating lunch, I offer them firstly motivation lecture (free of cost, except transport)- to explain what is solar oven, what it can do, what it cannot, advantages, limitation cost and possible energy (and \$) saving etc. Also when I go for lecture I see the place for possible installation of ovens and related aspects.

1. BEFORE INSTALLATION AND ADVANTAGES:

- a. As the latitude of Costa Rica is 11°N , Sun is towards south for 7 months of a year and for 5 months its towards North. Thus one should check that there is no tree or wall on nearby on both sides of the oven to be kept. In addition near the oven place, there should not be any play ground, soccer ground or basket ball etc.
- b. Normally the ovens will be put in the big open area - there is a possibility of high wind velocity and thus some type of back support should be available, so that oven should not fall.
- c. The time to heat meal depends on solar radiation, wind velocity and number (weight) of cooking pots and adjustment of oven.
- d. The Solar oven is to save the fuel and cannot be used for the whole year. Depending on the place, the oven can be used for 8-10 months in a year for heating food. On very cloudy or rainy days students can use the microwave ovens, installed already.
- e. They can heat their lunch while studying in the class, thus having more time for the recreation.
- f. In relation to advantages, for most of the users, money saving is more important than CO_2 reduction or Global Warming. Just to give an idea, the sale price of one metallic solar oven (with the metallic base/table) with a capacity of heating of about 50 lunch boxes is about \$450/-. If these are to be heated with Microwave oven (1500 W, 5 min per pot) the daily energy saving will be 6.25 kWh or 1500 kWh per year (using ovens only for 240 days in a year), or saving of \$250/- per year for the institute in electric bill. Thus only with this use, the initial investment can be recovered in two years.
- g. In addition to cooking, solar oven can be used for many other purposes which need less temperature or solar radiation, like heating water for tea/coffee, pasteurizing water, drying some agricultural products grown in the college, teaching science and realization of science projects by the students etc. (7-9, 12) .

Once the solar oven(s) are installed, I offer the second lecture (40-50 min.) again free of cost informing how to use oven properly.

II. CONSTRUCTION OF SOLAR OVEN:

As ovens are meant for young students, it should be very friendly to use.

- a. In order to keep food in the oven, the door should be (preferably) in front or back, thus avoiding the lifting of heavy glasses. In case the glasses are to be lifted, then there should be some support to stop falling..

- b. Table should have wheels to adjust oven towards sun (east- west movement)
- c. Angle of reflector should be easy to change (north- south adjustment).
- d. Instead of absorbing plate, tray should be preferred, so that the spilling of food liquid should stay in tray and should not go into the insulation (under the absorbing plate).
- e. Use of oven thermometer inside the oven is highly recommended, firstly to reduce the risk of burning of students hand/arm and secondly to have an idea of performance (hotness) of the oven.

III. AFTER THE OVEN IS INSTALLED: PROPER USE, PRECUATIONS AND MAINTENANCE:

- a. The normal dust and ash (due to volcano emission etc.) falls on both upper glass and at reflector (Photo 8). It reduces the transmissivity of solar radiation and hence reduces the temperature inside the oven. Thus it is very important that someone should clean the glass as well reflector with water, whenever required.
- b. Due to liquid spilling the absorbing plate may get spoiled after few months. Do not worry, instead of replacing, one can take out the absorbing plate/tray, clean, paint and reuse
- c. To adjust the direction of oven, user can turn the oven E-W so that it is towards Sun (can see shade behind the oven). If it is done it is better but do not worry much.
- d. To see the proper angle of reflector, observe that the brightness from reflector should remain at the glass. If it is done it is better but do not worry much.
- e. Depending on solar radiation, the air temperature inside the oven can be very high, its very important that user should be very careful while taking out their hot lunch box. Even the author has burnt his arm (fortunately not very serious).
- f. While taking out hot lunch box (in case it is of metallic), do not keep it on the oven glass. It may break. Also the glass can break if the oven falls, mainly due to wind or falling of some stone or ball etc. If glass gets some crack, one can just use the transparent silicon to fill the crack so that water should not enter between two glasses or inside the oven (more serious). In case glass break then it should be replaced.
- g. POTS- important aspect. To heat the meal in Solar Oven, it is recommended the use of metallic pot painted with some dark color. However this cannot be kept in the microwave ovens. Although students can bring their lunch in glass pots, which can be used in both Solar and microwave ovens, practically all the students bring lunch in plastic pots, because of cheap, light and more convenience. It takes about 4-5 min to heat one lunch box.

As we want the students to heat the lunch in the solar oven, it is not recommended to use common plastic pots because maximum air temperature inside solar oven can reach up to 120-

130 °C. Thus author thought of finding some special plastic pots which could resist 120-130 °C in the solar oven as well as could be used in micro wave oven. Although author could see this type of pot first time at Trieste/ Italy, 12 years ago, but presently these are available in some local shops. Also it has been observed that most of the students do not use appropriate pots for using even in micro wave oven. Through lectures I tell them the proper types of plastic pots for safety reasons;

- h. Do not close the Solar Oven with reflector so that metallic tray can receive solar radiation and store some heat in absorbing plate. Its recommended that food should be kept when the temperature in the oven is above 60-70 °C.
- i. The time to heat meal depends on solar radiation, wind velocity and number (weight) of cooking pots and adjustment of oven. Depending on the climate, even lunch boxes can be kept in two layers.

In addition to Costa Rica, Author has also promoted the use of Solar Ovens in many countries including this Latin American region, through lectures (Argentina, Bolivia, Brasil, Chile, Colombia, Cuba, Ecuador and Mexico) and also through Workshops (Dominican Republic, Guatemala, Honduras, Nicaragua, Peru and USA). References mentioned at the end can give some idea of the work done by author.

CONCLUSIONS:

In order that more persons and institutions even in urban areas can use solar energy for cooking/heating meals, the proper dissemination and not exaggerating claims are required.

Only with heating lunch at educational institutes the initial investment can be recovered in two years. In addition, If more institutions use Solar Ovens, indirectly they are contributing for the planet health and will help Costa Rica in achieving the goal of Carbon Neutral by 2021.

This lunch heating activity for students is finished by 12:30, still lot of solar energy is available until 5 pm. Other uses could be heating of water for evening coffee for academic and administrative staff, drying of agricultural products and realization of science projects by the students etc.

With all these steps and excellent promotional work done mainly by Solar Cookers International, some more conventional cook will be converted into solar chef either for saving conventional fuels or to have healthy planet.

ACKNOWLEDGEMENT: Author is thankful to Solar Cookers International, CA (USA) for organizing this VI World conference with local Indian partners and providing partial financial support which enable me to assist the Conference and share the information.

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Photo 1. First Solar Food Warmer.



Photo 2. Authors First Solar Oven (1980)



Photo 3. Hybrid- Solar Electric Oven (1987)



Photo 4. Workshop On Solar Cooking.

Universidad Nacional, Heredia Costa Rica

Calientan sus alimentos **Estudiantes** aprovechan energía solar



Photo 5: Heating lunch by students at authors university (2005).



Photo 6: One of the College having 2 Solar Ovens for 100 lunch boxes. (2014)

Lectores interesados en su proyecto viernes, 13 de febrero de 2009, 01:59 pm

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Estimado Shyam S. Nandwani,
Su nota tuvo mucho éxito.
La puede ver aquí:
http://news.bbc.co.uk/1/hi/spanish/science/newsid_7854000/7854246.stm
Hemos recibido muchas felicitaciones por su proyecto y muchos de nuestros lectores están interesados en saber más y ponerse en contacto con usted.
A continuación le enviamos los contactos de estas personas y dejamos a su discreción comunicarse con ellos y enviarles información.
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Sent: 13 February 2009 01:09
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Name: jairo agudelo
City: pereira
Country: colombia
Email: jairoa171@gmail.com
En Colombia donde lo podría conseguir o verlo trabajar

Photo 7. Appreciation from BBC Radio (London), 2009



Photo 8: Volcanic Ash on Solar Oven (Aug. 2016)

Article submitted for presentation at VIth SCI World Conference on Solar Cooking, to be held at Muni Seva Ashram, Gujrat, India, during January 16-18, 2017.

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