

Solar cookers in schools - worldwide

Proposals for the worldwide dissemination
of solar cooking via the school system
for a peaceful future

Contribution to:
10th solar conference and 30 years INTERSOL Salzburg,
June 2022

Imma und Dieter Seifert, Neuötting

<http://solarcooking.org/seifert>

Example of the dissemination of a sustainable technology

More than 200 million solar cookers are needed to overcome the firewood crisis.

If a solar cooker is made every second, it takes 7 years.

That is why schools are important for dissemination.

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Each student should build their own solar cooker

Courses in schools in developing countries can help people suffering from the firewood crisis.

Opportunities through kits for building the cookers.

New ways need to be found to fund the programs.

Opportunities through CO₂ certificates.



Solar-Project-week at Antoniushaus Markt

Suggestion: School Solar Cooker

From prefabricated kit (reflector and frame)

Frame made of aluminum (plates with stamped parts)

Trapezoidal reflector sheets made of high-gloss aluminum; not overlapped on the support ring; attached to rings with aluminum wire

Reflector diameter $D = 1\text{ m}$
(possibly 0.8 m)

Focal length $f = D/5$

Net power 300 W (195 W)

Several cookers per family possible



Example Escolar 8 ($D = 0,8\text{ m}$)

Special features of the school solar cooker

to facilitate the production in the school workshop

Manufacture from complete kit with tools (file, wrench) and instructions

The aluminum material is easy to work with (file the burrs) and is light in weight

Components are easy to bend with a template and assemble according to the instructions

Plastic-coated aluminum wire is used to attach the reflector trapezoids, which are only screwed together at the apex



Deburring the stamped parts in the workshop

Manufacturing concept for the school solar cooker

Equip schools with kits containing all the components and tools needed to make school solar cookers.

Production of the school solar cooker in handicrafts lessons by the pupils under the guidance of the teacher.

Provide documentation for each student.

Spreading concept



Workshop by M. Vílchez
at school in Barcelona

Production and testing of
the school solar cooker in
the workshop

Learning about the various
applications

Handover into the property
of the household (also
several stoves per
household)

Experiences

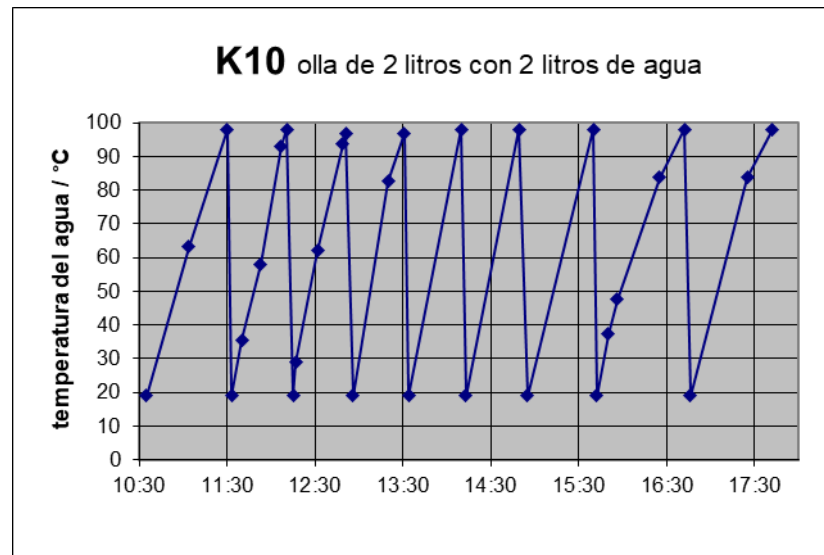
The positive experiences encourage further dissemination of solar cooking via the school system

The most positive experiences are:

- Produce a complete, functional device
- Learn skills
- Experience cooperation and mutual help
- Understand and test functions
- Recognize and calculate relationships
- Develop own ideas
(especially in thermo-technology)

Power of parabolic cooker with $D = 1\text{ m}$

Test Cocina Solar Parabólica			localidad	D-84524 Neuötting	latit. 48,2° n., long. 12,7° e.	
1 de Oct. 2002		test realizado por	Dr.-Ing. Dieter Seifert			
comienzo: 10:30			temp.ambient: 11 °C (9:30), 18 °C (12:30), 20 °C (15:00)			
horario: MESZ			Medición temp. agua: Digital Thermometer -40°C..120°C			
desde las 10 pleno sol sin viento			comienzo hervir approx. 95 °C			

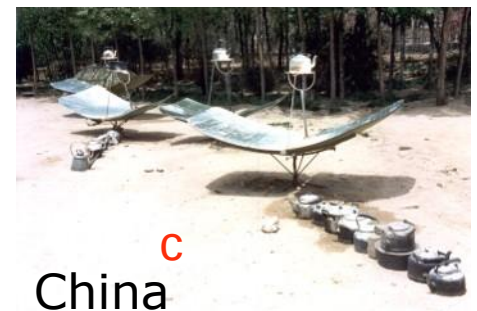
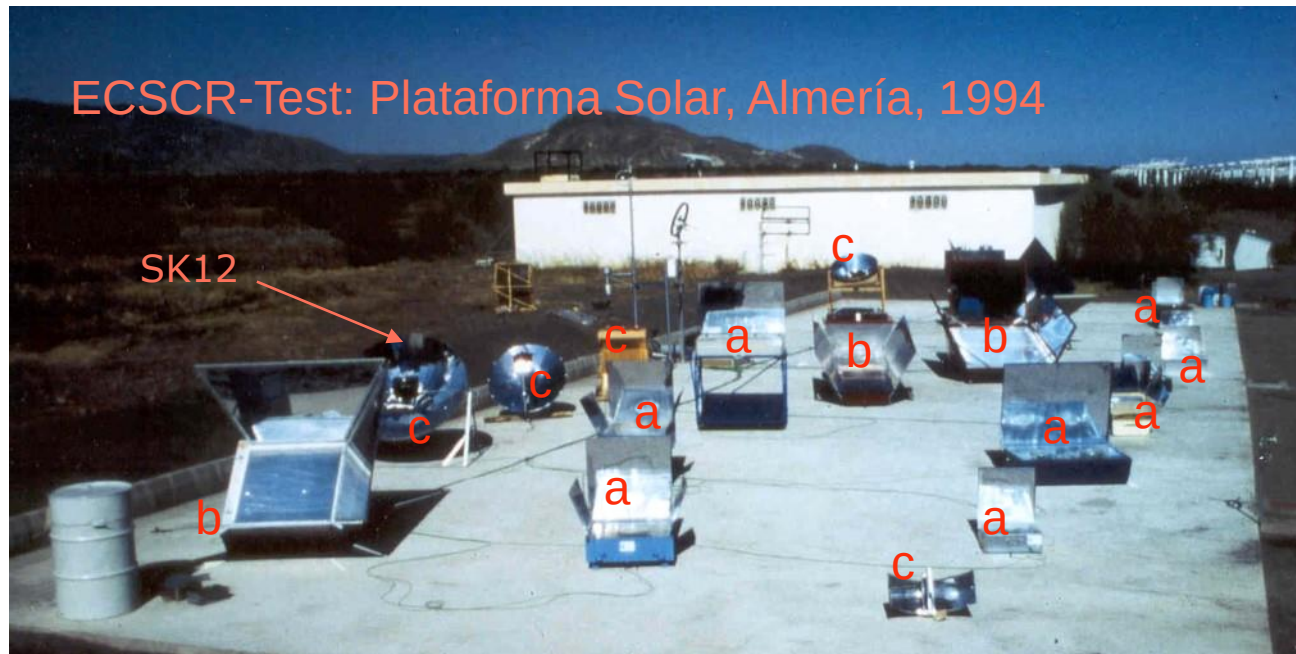


Resumen	K5	K6	K8	K10	K14
cantidad de agua hervida	3 litros	7 litros	10 litros (extr.)	18 litros	30 litros
potencia *)	60 Watt	117 Watt	188 Watt	315 Watt	614 Watt
*) valor medio tomado del test con el tiempo de cocción más corto					

Solar cooker construction methods

out of 168 designs worldwide, 25 were selected
for the ECSCR comparative test

- a) collector, direct heat transfer (box)
- b) collector, indirect heat transfer
- c) concentrator, direct heat transfer
- d) concentrator, indirect heat transfer



Experiential pedagogy with the solar cooker

The theory and practice of solar cooking offer a variety of opportunities in experiential education.

All subjects can be involved.

Useful solar cookers are created,
which the students take home.

In the household, the stoves can be used for a variety of purposes, including boiling water.

Solar cooker as instrument for experimental pedagogy (1)

Raising awareness through solar cooker projects

Learning through experience:
"Experience" solar energy
gain interdisciplinary experience

Recognizing (tangible) tangible solutions

Deepening of knowledge about global developments
firewood crisis, desertification, climatechange, poverty,
disease, rural exodus, conflicts

Strengthening the sense of responsibility
own environmentally conscious behavior

Recognizing possible solutions

Solar cooker as instrument for experimental pedagogy (2)

Gaining competence to act
through solar cooker projects

Develop initiative and activity

experience their own ability

learn skills

develop solutions

Realize cooperation locally
and globally



Source: Birgit Seifert: diploma thesis FH Landshut, "Cooking with the sun"

https://www.ams-forschungsnetzwerk.at/downloadpub/parabol_umwelt_Seifert_Endfassung.pdf

Worldwide cooperation as peace work in overcoming hunger in the world

Peace-making shared experiences help to overcome the poverty trap

School solar cooker programs in connection with school meals



Demonstration of solar cooking at a school of Baroda/India

Consequences of the firewood crisis for CO₂ emissions

The annual deficit of 1 billion cubic meters of firewood causes emissions of around 800 million tons of CO₂

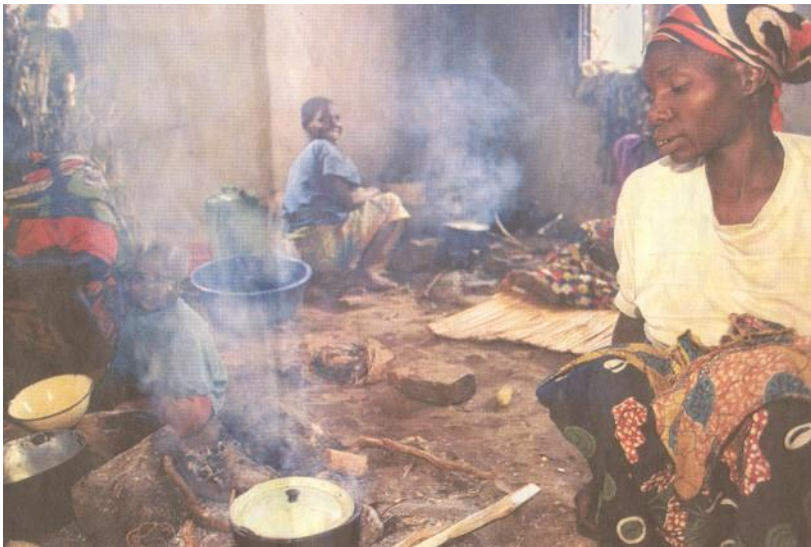
This roughly
corresponds to
Germany's
annual CO₂
emissions



Photo courtesy
M. Höhnes, Lesotho

Solar cookers can make a decisive contribution to sustainable development and poverty reduction

- Relieves of collecting firewood;
- Reduces exposure to smoke in the kitchen;
- Avoids fuel costs;
- Generates income by preserving food;
- Allows large amounts of water to be boiled.



„Smog in every hut – Open fires are among the deadliest health hazards worldwide “ DIE ZEIT, 9.11.2003

Press release from the Federal Environment Agency
from November 20th, 2018:

"High costs due to failure to protect the environment"

"One ton of CO₂ causes damage of 180 euros"

Federal Environment Agency presents updated cost rates

<https://www.umweltbundesamt.de/presse/pressemitteilungen/hohe-kosten-durch-unterlassenen-umweltschutz>

Financing the spread of solar cookers through cooperation on climate protection

Solar cookers prevent, that trees are burned and harmful gases are released into the atmosphere.

The savings in greenhouse gas emissions from solar cooking can be credited to the funding organization.

Cooperation between „North and South“ for climate protection

Through this cooperation, schools in developing countries can get the solar cooker kits



School kitchen of Zaroli-Monastery,
Gujarat, (2004)

Large solar cooker projects are possible.

They are a wonderful chance for peaceful cooperation on the way to sustainability.



Solar cooker project at
ICNEER of Dr. Shirin
and Deepak Gadhia
Valsad (2004)

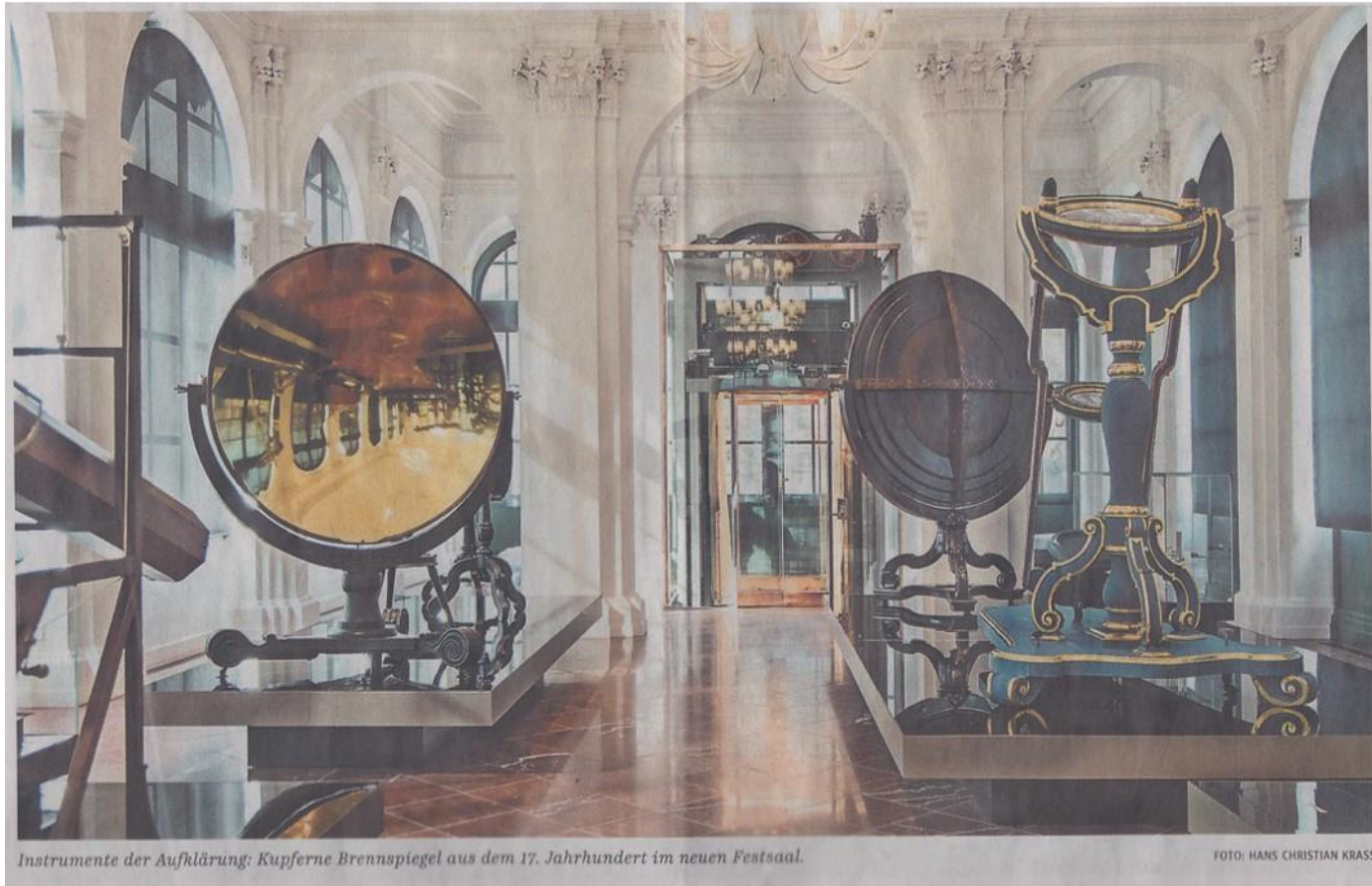
Early start



On the history of the parabolic solar cooker:

Ehrenfried Walter von Tschirnhaus (1651-1707): melting experiments

Andreas Gärtner (1684-1724): cooked in 1714 with a parabolic mirror
(wooden mold coated with gold leaf)



Instrumente der Aufklärung: Kupferne Brennspiegel aus dem 17. Jahrhundert im neuen Festsaal.

FOTO: HANS CHRISTIAN KRASS

Mathematisch-Physikalischer-Salon, Dresdner Zwinger

Source: Süddeutsche Zeitung, 18.4.2013, S. 11