

Efficiency of solar cooking oven for high altitudes

Background

Solar cooking has been presented as an alternative in various countries has a means to provide a cheap and safe way for cooking. Major advantages of such products are time saving (no need for wood collection), cheap (availability of solar energy), sustainable (reduce need for fossil fuel such as gas), poverty reduction (more time and money dedicated to education, social benefits, healthcare...).

In countries such as Switzerland, cooking is usually powered by electricity or city gas. However, solar cooking can be interesting in remote places such as high altitude areas. Some mountain huts are not connected to the grid and must get energy from other sources such as photovoltaic panels, small hydro power... For cooking, wood and/or gas is sometimes imported by helicopter. Solar cooking could be an alternative to reduce the consumption of imported fuel. However, there is little information on the efficiency of solar cooking in high altitude at European latitudes.



Figure: Typical solar cooking oven

Objectives

We propose here to make a dynamic simulation and thermal modelling of the solar oven which could then be used to calculate the impact of the changing solar irradiation and temperature from low plane areas to high altitude mountainous regions. In parallel some field tests can be performed.

The following tasks should be accomplished

- Develop a numerical model for the oven and apply the model in different climatic conditions
- Evaluate which parameters influence the most the performance of the oven
- Develop a metric which can be used by local population to determine the number of cooking days
- Propose ways of improving the number of cooking days (insulation, glazing performance...)
- Validate the model with monitoring of : solar irradiation, outside temperature, temperature reached in the oven...

Profile looking for

We are looking for a highly motivated Master student having a background in environmental engineering / physics or mathematics and willing to work on a practical sustainability problem. This project will require some modelling capacity (either using existing tools or developing analytical solution for the oven) and programming skills.

The candidate will thrive in an exciting international research environment at the LESO-PB, where researchers work on various topics related to building physics and solar energy from the urban to the nano scale.

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