

THE KERKENES ECO-CENTER PROJECT

REPORT FOR THE 2011 PROGRAM

and

REQUEST FOR A CONTRIBUTION
TOWARDS THE 2012 PROGRAM OF ACTIVITIES



Figure 1. Ladies from Şahmurathı village posing by the new solar cooker with a motorised sun-tracking mechanism. (11kecg0109)

Submitted by
The Kerkenes Eco-Center Project Team
Middle East Technical University, Ankara

in collaboration with
ŞAHDER
The Kerkenes and Şahmurathı Village Association
Sorgun, Yozgat

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<http://kerkenes.metu.edu.tr>

The Kerkenes web page opens up three homepages, K-Eco, the most recent one, is dedicated to the Kerkenes Eco-Center and Environmental Studies.



<http://www.kerkenes.metu.edu.tr/keco/index.html>

The Kerkenes Eco-Center Project web page reports on activities and annual programs.



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Information about SAHDER, the *Kerkenes and Şahmuratlı Village Association for Public Relations, Prosperity, Help and Support* can be found at the Şahmuratlı Village Web Page.

LOCATION

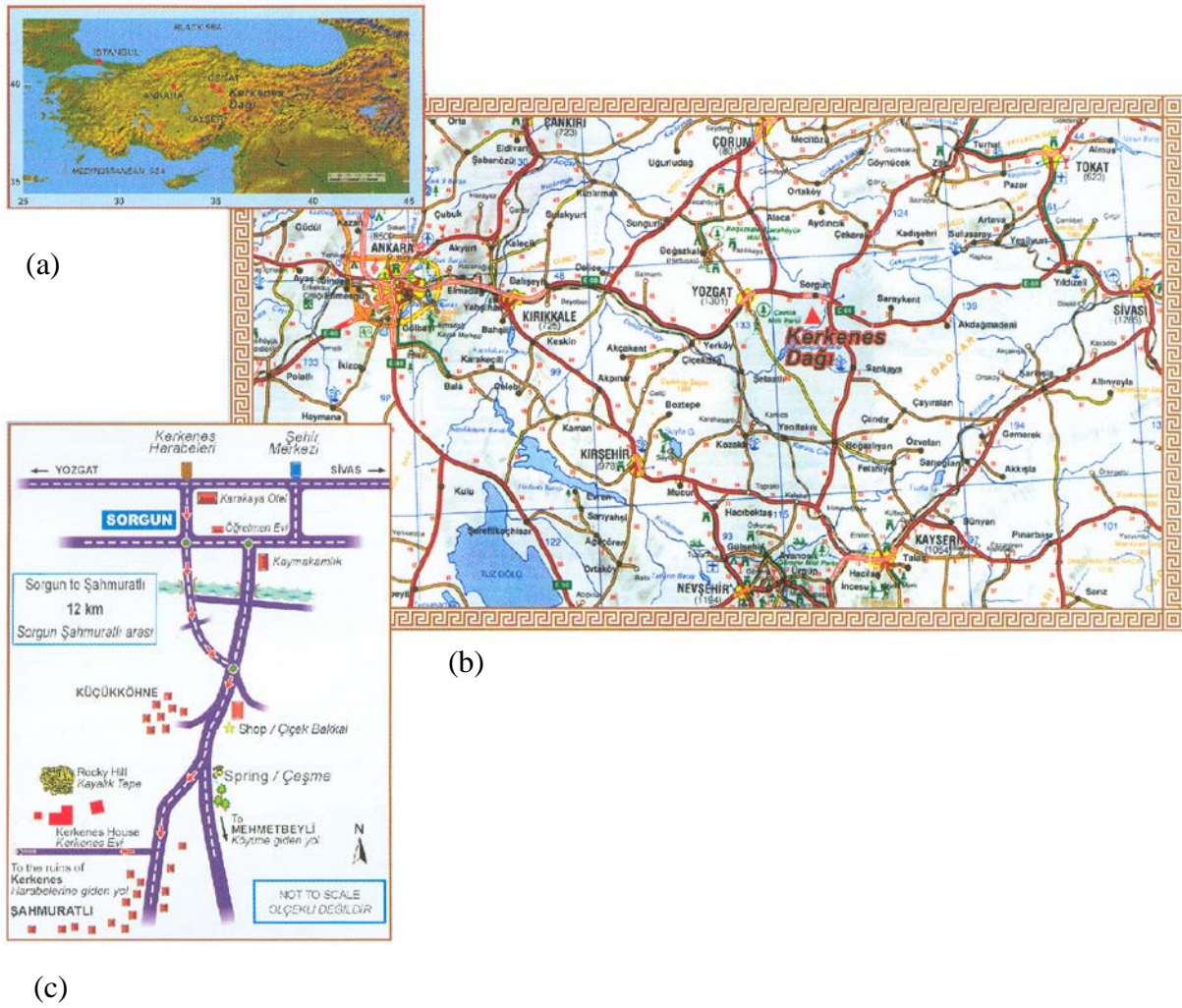


Figure 2. (a) Map of Turkey showing the location of Kerkenes on the northern edge of the Cappadocian Plain.
(b) Road map of Central Anatolia showing location of Kerkenes Dağ, the nearby town of Sorgun and provincial capital of Yozgat.
(c) Directions to the village of Şahmuratlı.

INTRODUCTION

In 1993 the Kerkenes Project was inaugurated to study the Iron Age capital that had once stood on the Kerkenes Mountain, which overshadows the village of Şahmuratlı, Sorgun, Yozgat (Fig. 3). From the outset, the Project Directors were conscious that this international research project would not only have an impact on the village and the local area, but also that it had potential for development at regional and inter-regional level. A central concern was, and continues to be, that any impact, social, cultural or economic, should be for the benefit of the village and the region.



Figure 3. Şahmuratlı village photographed in January 2011 with the Kale in the background. (11dpcg0122)

The Kerkenes Eco-Center Project was initiated in 2002 with the help of the Australian Embassy Direct Aid Program. By 2003 the concept of establishing an Eco-Centre devoted to research into and promotion of renewable energy and sustainable village life was developing and initial efforts were supported by the Erdoğan M. Akdağ Foundation, the American Embassy, Anglo-Turkish Society, the British Embassy, the Canada Fund and some corporate sponsors. Help in kind is also forthcoming from the Yozgat Governorate, the Directorate of Rural Services, and the Sorgun District Governorate and Municipality. As well as following up to completion the construction of the first strawbale building and the Erdoğan Akdağ Center for Research and Education, the Kerkenes Eco-Center Team in collaboration with ŞAHDER conducted a very successful program for the promotion of solar energy, a drip irrigation scheme for organic gardens and pursued other ongoing programs, including solid waste separation for composting and recycling, reuse of grey-water and promotion of appropriate materials and design for energy efficient buildings.

The aim is to halt, and even reverse, migration from rural areas to urban centres. While advocating an environmentally friendly approach to the development and improvement of rural settlements. ŞAHDER (The Kerkenes and Şahmuratlı Village Association) was established in 2004 to promote the welfare of the village. Significant ground has been covered and income has been generated through the promotion of products during the seasonal kermes and donations from visitors who have enjoyed their visit and what they were offered.

The purpose of the Kerkenes Eco-Center is to promote sustainability through environmental studies. It pursues the following objectives:

- To advocate the use of renewable sources of energy;
- To act as a stimulus and a catalyst for environment-friendly building with appropriate materials and energy efficient designs;
- To act as a dynamic experimental base for testing designs, materials and activities suitable for viable and sustainable village life.
- To encourage village development and income generating activities that might halt and even reverse migration from rural areas to the cities.

Village life in Turkey is a victim of large scale migration to the city, leaving those who cannot follow to suffer from a dying economy and unsustainable way of life. ŞAHDER, the Şahmuratlı Village Association, has been set up to combat the decline and bring opportunities to the village. It aims to raise living standards, provide opportunities within the village economy and hope of a better future to those who are to perpetuate village life essential to an ecological balance in our modern economy. A broad range of activities related to improvement of rural life, energy saving and use of renewable energy are conducted every year.

The project has the active support of local authorities and receives significant help in kind from the Yozgat Governorate, Sorgun District and Municipality. In 2011 it would not have been possible to repair the roof of the Solar House without the generous support of local authorities and that of AKG Gazbeton who provided the AAC blocks. Once more an innovative approach was followed in which the mud roof was completely redone. Rotting timbers were removed, the timber structure rebuilt and AAC blocks used to replace the mud cover. The new roof and external rendering of the Solar Building were completed in September and ready to host distinguished guests who attended the Kerkenes Festival on Saturday October 1 (Fig. 4).

While ongoing research and monitoring by METU faculty and students progresses, adults and children from the village participate so that all those involved benefit and learn from each other.



Figure 4. Village ladies thanked the Governor of Yozgat for his help in getting the roof of the solar building repaired and offered him and his guests the içli gözleme, the traditional village bread with fillings. (11kecg1230)

THE 2011 ACTIVITIES

The Kerkenes Festival on the Saturday 1st of October was the highlight of the Kerkenes Eco-Center 2011 program. The event held to promote all aspects of the project, was attended by many local dignitaries, Turkish and international university staff and students and, most importantly, local people (Figs 5 to 7).



Figure 5. Dignitaries, distinguished guests, visitors and team members at the Cappadocia Gate during the Kerkenes Festival. (11dpcg3414)



Figure 6. Australian Ambassador Biggs and the Governor of Yozgat breaking open the testi kebab. (11kecg1204)



Figure 7. Ali Kılınçarslan and Tahsin Baştürk were in charge of the display of solar-cooked and dried products. (11kend0209)

The sun tracking solar cooker turned by a solar powered motor was used during the summer months to cook meals for the Kerkenes team as well as for groups of visitors (Fig. 8). Solar drying and cooking skills have been acquired by several village ladies who train others. Visitors take home packets of dried products, light and easy to carry. Most of the garden products are grown in the village (Fig. 9). In June we were pleased to host the AICC committee members. As the Solar Building was under repair the ladies worked under the small shelter in the garden (Fig. 10).



Figure 8. Adjusting the motorized solar cooker. (11kecg0111)



Figure 9. A village garden with drip irrigation. (11kecg1020)



Figure 10. The AICC committee members taste the içli gözleme prepared by the village ladies working. As the Solar Building was under repair the ladies worked under the small shelter in the garden. (11kecg0907)

To improve the performance of the vertical solar drier designed by Güner Mutaf and his team in 2010, the solar panels were replaced by glass tubes used in standard solar water heaters and available commercially (Figs 11 and 12).



Figure 11. Güner and Korkut Mutaf with the help of Sergey Emeliyanov mounted the motorised solar dryer at the Kerkenes Eco-Center. (11kecg1101)



Figure 12. The drying trays are placed on the sliding shelves. The fan is at the bottom of the drying cabinet. (11kecg1106)

PERFORMANCE AND DESIGN DEVELOPMENT OF VERTICAL SOLAR DRIER By Güner Mutaf

The Vertical Solar Drier

In 2011, a new dryer model was introduced to the people living in Şahmuratlı village and we have used twenty vacuum tubes commercially available for water heating, instead of the solar heating panels. The vacuum tubes are used to heat the air that will circulate inside the drying oven (Fig. 13). In this new design development an electric fan was used to force the internal air circulation. The fan placed on one side of the drying cabinet, near the bottom, is controlled by a set of thermostatic switches to maintain the correct amount of air with correct temperature.

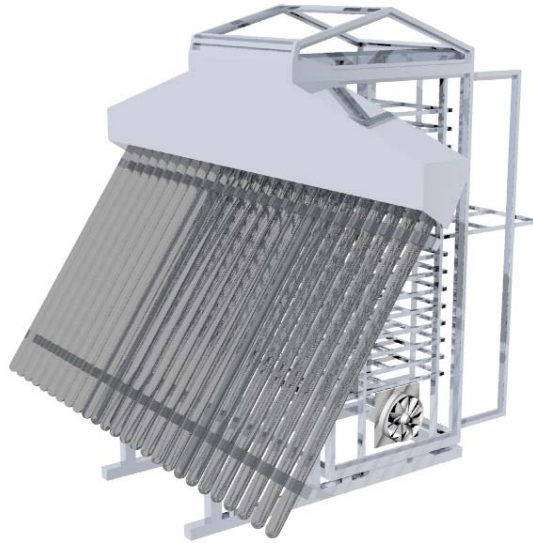


Figure 13. The proposed design improvements for the vertical solar drier.

Digital temperature control units to control the air temperatures were placed both inside the oven and at the intake chamber. When the temperature of the incoming air exceeded 40°C (that is at the beginning of the process, in the morning), the fan starts to operate and forces the incoming air to pass through the drying shelves of vegetables or fruit (Fig. 14).



(a)



(b)



(c)

Figure 14. (a) Solar drier cabinet with sleeves on which drying trays are placed.
(b) Digital Temperature Control Unit.
(c) Motor control device.

The temperature control device sends the first signal to the motor control device (Figs 14b and c) as the temperature, monitored by the first thermocouple, reaches the set temperature of 40°C to initiate the process and with this first signal motor starts turning with its slowest possible rpm. (at the moment it is set to 10% of its maximum speed). But as the inside air temperature reaches to its desired temperature, (30°C for leafy vegetables and 60°C for more massive fruits e.g. apple or pears), this time monitored by the second thermocouple placed inside the oven, a second signal is sent to the motor control unit which causes the motor to speed up. Motor speeds up to a level that is enough to cool the entering air temperature to its desired level. This can be adjusted by the operator.

Metal tubes were used to feed the vacuum glass tubes with fresh air (Fig. 15a). Fresh air, heated while passing through the tubes upwards, sucked by the fan and its heat monitored by the second thermo-couple, enter the oven from the top. Three bimetal thermometers were also used for double-checking the temperature of the entering air at the sides and in the middle of the duct (Fig. 15b). The fan used for circulating the air operates with 220 Volts and 250 Watts, its maximum speed is 3500 rpm. However the fan needs to operate at only 10% of its maximum speed thus consuming about 500 Watts only.



(a)

(b)

*Figure 15. (a) Metal tubes are fitted inside the vacuum glass tubes.
(b) Hot air enter the drying cabinet from the top where three bimetal thermometers are placed to allow checking of the temperature.*

PROPOSALS FOR 2012

The aim is for the Kerkenes Eco-Center and Şahmuratlı Village to be a showcase for environmentally friendly, energy sensitive and self-sufficient development, promoting the use of renewable energy for a low-carbon economy and a sustainable future. It is however necessary to secure additional funding so as to pursue given goals and overcome various bureaucratic hurdles that will make the income generating activities economically viable in the medium and long term.

The proposal will follow the overall goals of the Kerkenes Eco-Center Project and general objectives for rural development and improvement of living standards in the Village of Şahmuratlı. These are:

1. Promotion of renewable energy, energy efficient designs and income-generating activities.
2. Promotion of permaculture and organic gardens through resource management such as drip irrigation and composting.
- 3.

Long term goals of the project focus on environmental issues. The Kerkenes Eco-Center Project promotes the use of solar energy for domestic needs as well as income generating activities and energy efficient designs for buildings. The project thus contributes in a significant example of one way to a sustainable future. It is inspired by the well known dictum of René Dubos, an advisor to the United Nations Conference on the Human Environment in 1972: Think Globally Act Locally

Both genders benefit from this project. Special efforts are directed towards involving the village women and youth in the planned workshops. Women should also benefit from the income generating activities and play an active role in the village association.

The Project, in promoting organic farming and energy efficient permaculture, is demonstrating that opportunities can be provided for the population of rural areas. Such environmentally sensitive, socially responsible and economically feasible rural development opportunities may halt, and even reverse, migration from rural areas to urban centres.

The 2012 Program of Activities

Workshops are scheduled to start in May when mushrooms, onions and some vegetable and fruit can be bought from the weekly market in Sorgun. Towards the end of the summer it is anticipated that local products, including those from the village organic gardens, will be purchased by ŞAHDER to be dried and cooked on the solar cookers to be conserved in air-tight jars, stored and marketed throughout the autumn and winter. The peak time for solar drying and cooking will be in August and September but activities are expected to continue in October in the solar building.

Proposal for the Parabolic Reflector, Vacuum Tube and Oven by Güner Mutaf

A previous experimental solar cooker consisting of a trough stainless steel parabolic reflector and a vacuum tube, was shown to heat up to nearly 350°C (Fig. 16). The proposed solar oven will consist of a commercial electric oven with insulation combined with the parabolic trough reflector and the attached vacuum glass tube system (Figs 17 to 20). A small fan will suck the hot air from the glass tube and blow it into the oven chamber while a metal pipe back-feeds the vacuum glass tube with air after its circulation inside the oven.



Figure 16. Heat generated inside a glass vacuum tube by the trough parabolic reflector reached almost 350°C



Figure 17. Typical commercial oven to be adapted for solar oven.

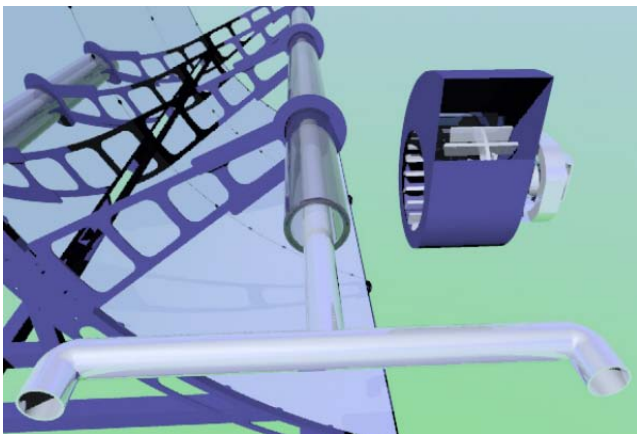


Figure 18. Detail of parts needed to attach reflector and vacuum glass tube.

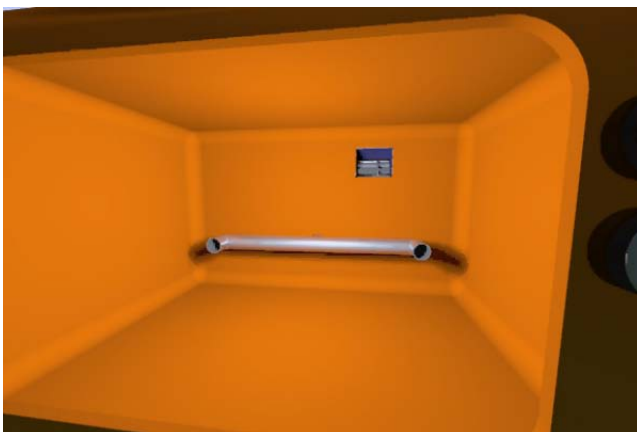


Figure 19. Interior of oven with the pipes used to circulate the air.