

Notes on Fireless Cooking - Cooking With Retained Heat

In her book "Fireless Cookery", published by Madrona Publishers, Seattle (1981), Heidi Kirschner reports experiences and recommendations on cooking with retained heat. The book is unfortunately out of print. Here notes from the book and from personal experience with this advantageous technology are compiled. Pictures (last page) not otherwise specified are by Imma and Dieter Seifert.

The **principle** of fireless cooking is very simple: The food is pre-cooked on a stove or with a solar cooker and then the pot, well sealed with a lid, is placed in an insulating environment for finishing the cooking and for keeping it warm. Thus the heat storage is done in the food and its temperature can be maintained for several hours above 80 °C, so that even meals which require a long cooking time can be cooked. The insulating container (**insulated box; hay box, hay basket, wonderbag, wonderbox**) is equipped with an insulation that surrounds the pot and ensures low heat loss. This technique has a long tradition. For more than hundred years hay boxes are known.

The technique of fireless cooking is also suitable for dissemination of appropriate technology in developing countries, because of the insulating box can be completely manufactured in these countries with locally available resources. The website of Practical Action (practicalaction.org) contains more information about Appropriate Technology, including fireless cooking.

1. Safety Precautions

To avoid burns, the hot pot is to touch with potholders. One danger is the fact that the lid and the pot handle become very hot in the insulated box, so be sure to touch them with potholders.

A good stability of the pot in the insulating container is necessary. This condition is well satisfied of baskets and other stable containers. On the other hand, a bag is less stable.

Heidi Kirschner writes under "Safety Precautions": "When cooking meat (including poultry) or fish you should always be extra careful. If it is frozen product, you should make sure that they are completely thawed before cooking. The United States Department of Health has found that in the preparation of these foods a safety temperature of 63 °C must be maintained in order not to take the risk of an ordinary household food poisoning. When cooking in the cooking box, the temperature drops very slowly, and I have checked numerous times (using different foods and pot sizes) that the food remained piping hot up to four hours - often much longer - and that the temperature was 63 °C or more. If you have a thermometer, you should convince yourself. If you want to let a pot once more inside the box or if you suspect that food is cooled, then just let it boil again and simmer for 5 minutes, so that you can be absolutely sure that nothing may be lost. Dishes that were longer than 24 hours forgotten in the cooking box, you should throw away." (translated from the German edition "Die gute alte Kochkiste", Verlag Zweitausendeins, (1984))

The risk of food poisoning exists therefore especially if dishes were poured from the pot and the rest is kept warm, but when it is already cooled below 63 °C. Therefore the remainder has to be boiled again.

2. Design

The smaller the pot and the pot content, the better it must be insulated. A water volume of 10 liters in a 12 liter pot can be hold at temperatures above 80 °C with simple blankets in a basket for many hours. A 2-liter

pot needs better insulation, preferably with pillows and the transfer to the insulated container must be particularly fast to avoid heat loss. For small amounts (up to about 1 liter) thermos flasks with highly insulating effect (by vacuum and radiation reflection) is probably the most appropriate solution.

Provisional arrangements have the disadvantage that they usually lose their effect after a short time or have an unpleasant aspect. It should also be ensured that the handling is convenient. **The insulation material should not be used loosely**, but e.g. be used as a filling for pillows. This also has the advantage that the insulating pillows after use can be easily taken out and dried. **Moisture reduces the insulating effect**. The pillows or at least the pillow coatings should be washable.

The insulation should avoid any air gaps, as heat would be dissipated through the air convection. Therefore, the cushions are closely packed together and possibly held together with a cloth or blanket. For the lateral insulation of the pot a long cushion is advantageous.

3. Insulation Material

A variety of insulating material is available. There are the usual cushion fillings: wool, cotton, hay, straw, corn husks, cork, but also synthetic fibers or polystyrene foam beads. For workarounds shredded paper would be suitable. Earlier "hay boxes" usually used not only hay, but also sawdust or chipped wood as insulation material. It was covered with a cloth providing a suitable hollow for the pot. Insulations which cannot adapt to the pot form (e.g. rigid foam insulation), have the disadvantage that they cannot be used for different pots.

4. Coating of the Insulating Material

As a pillowcase cotton fabric is especially suitable because it can well withstand the temperature of 100 °C. Plastic film of polyethylene etc. is not suitable because it would stick at the pot.

5. Container

Several containers are suitable: a chest, a basket, but also a bag. A stiff cardboard, possible with film coating, if properly cared can be quite durable. Bags are in use, often with polystyrene foam beads as insulating material. The insulating material is included between the outer and the inner shell of the bag. Tightly woven baskets of straw are stable and have additional insulating effect.

A special insulating material is expanded polypropylene, as in use for commercial pizza-transport and as it is realized in the "Wonderbox" of the Save80-cooking system. This efficient insulating material is so strong and durable that no separate container is required.

It may not be quite understandable that a basket can be used as container for the pillows or blankets, because it is not leak proof. But it is essential that the insulation is kept in shape and the pot is fixed reliable in the interior and is kept warm by the insulating material. The insulation should be as dry as possible and should be dried well after use. Thus pillows or blankets should not be attached to the basket, so that they can be taken out for drying.

6. Dealing with Soot-Blackened Pots

If the pot is blackened with soot from cooking on the stove, then you should ensure that it doesn't pollute the insulation. The pot must be quickly inserted into the insulating environment, so that a previous cleaning of the pot is not possible. Therefore, an extra bag is recommended which covers the pot. Provisionally instead of

the bag sheets of newspaper may be used, but it can be expected that the carbon black trickles out. Therefore, a large paper bag would be preferable.

7. Pots and Lids

The lid should close the pot as tight as possible, to avoid that escaping steam humidifies the insulation, thereby reducing the insulating effect.

From Heidi Kirschner is recommended that the pot is always filled up to two thirds or to about 5 cm below the rim. This is especially true for food, but with water the pot be filled up so far that the water will not spill out when the pot is handled.

8. Installation Location

To insert the hot pot, the container should be right next to the furnace in order to avoid unnecessary cooling of the pot, which is fast at high temperature. Then the insulated container can be transferred carefully (to ensure that it does not tilt or bump) to another place.

9. Applications

The book by Heidi Kirschner describes a variety of dishes, but the abundance of applications is not exhausted. It is recommended that an interactive cookery book is provided in the internet and the dissemination of experience is organized.

In most applications, the principle is always to replace the "simmering" on the stove by cooking in the insulated container. It also avoids the subsequent warm-keeping, so that food or water needs not to be heated again. The simmering on the stove after boiling is reduced to a short time. In the book by Heidi Kirschner a period of 3 to 15 minutes (depending on the dish) for the remaining simmering is mentioned in the recipes. Usually a pot with about 3.5 liter capacity is assumed. If large quantities are cooked in correspondingly larger pots the duration of the simmering on the stove is less. Keeping warm is particularly advantageous if it avoids to light a fire again, because that can be quite laborious.

In some countries, beans are very cheap, but they are not cooked, because the cost of fuel is high and the hours of cooking cause headaches. But even large beans can be soft boiled in the isolated container (after short precooking) without energy consumption and without supervision. The beans should be soaked at night, then precooked with about 5 liters of water and then finished in about 4 hours in the fireless cooker without consumption of fuel and without inhaling of exhaust.

In her book Heidi Kirschner suggests that food which only require short cooking time or which is cooked with little water, are not suitable for fireless cooking. For pasta which tends to stick, the cooking with retained heat may not be suitable.

10. Combined with the Solar Cooker

Cooking with retained heat refutes the main argument against solar cooking in developing countries: "People come in the evening of the field work and need to cook when the sun is down". On the contrary, the cooked and hot held food must be cooked not only on the often primitive and unhealthy and environmentally harmful fire, there is no fuel required and the food is immediately ready on returning home from the field. Of course it

is necessary that a cook has prepared the meal, as it has been customary in all countries in former times, as especially the grandmothers took over this task, also caring of the infants.

If you use solar box cookers, the box can also be applied in principle for keeping warm, as the reflector is folded onto the glass. However the box is blocked for further solar cooking and the heat-insulating effect is generally lower than in a special insulated container.

11. Benefits of the Fireless Cooking Technique

Cooking with retained heat relieves from long cooking on the stove, because simmering is almost completely eliminated. There is no supervision necessary because in the food in the container cannot burn or boil over. Later arriving participants find a hot meal. Restart of fire is avoided. Fuel consumption and emissions are prevented.

Even with the supply of larger groups the technique of cooking with retained heat is useful. An example: At a meeting of SOS Children's Village mothers in Caldonazzo, Imma was invited to demonstrate the parabolic solar cooker; she had cooked a large pot of goulash for lunch. However, the meal was delayed until midnight, but the pot in the hay basket was still hot, much to the amazement and enthusiasm of the participants.

With the heat retaining technique water can be kept hot for a long time; especially if you have a large pot of boiling water (e.g. 8 liter), for example, from the solar cooker. You can keep the water hot overnight. The hot water can also shorten the cooking time, because one already starts at a high temperature.

Cooking with retained heat is still far from being exhausted and it is a wide field for appropriate solutions. This technique can be combined with all conventional cooking techniques and saves about half of the energy previously used for cooking.

The Excel spreadsheet in the appendix shows the **great potential in developing countries to avoid deforestation**, particularly in relation to the use of charcoal, which causes deforestation with terrible consequences.

The smoke in the kitchen ("killer in the kitchen") is the fourth main cause of death worldwide. Cooking with retained heat produces no fumes, thus avoiding completely the smoke exposure, with the traditional three-stone fires or other stoves without chimney occur during hours of simmering.

12. Avoiding Deforestation in Developing Countries

The Excel-table contains the results of calculations of the potential savings through improved cookstoves by cooking with retained heat and with solar cookers. By avoiding charcoal from traditional kilns also through the switch to biomass from short rotation plantations, deforestation can be avoided completely.

To avoid deforestation due to firewood crisis is a threat to the whole civilization, the technique of cooking with retained heat should be spread also in the industrialized countries, as Heidi Kirschner has enthusiastically recommended in her book.



Hay basket for transport of hot dishes (Internet)



Hay basket in combination with parabolic solar cooker



Chest with pillows and blanket



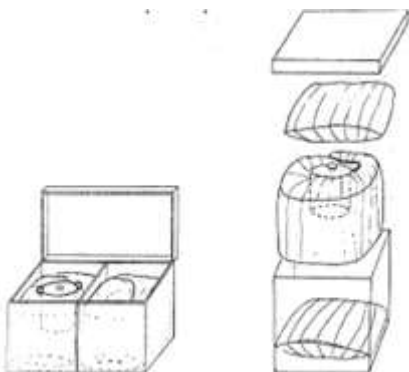
Straw basket
(Source: Jagadeeswara Reddy, NEDCAP, India)



Thermos flasks in combination to parabolic solar cooker
(K. Schulte: Project Solar Cookers for Nepal - Banti Bhandar, Rotary Sweden)



Fireplace with tripod in Nepal
(K. Schulte, Sweden)



Heidi Kirschner: Box with pillows



Heidi Kirschner: Insulating Bag