Cooking Stoves in Afghanistan Badakshan

By Sjoerd Nienhuys, Energy Advisor

A visit to the northern border area of Afghanistan Badakshan in the Himalayas was made to assess both traditional and new houses on technical aspects for possible house improvements, particularly in terms of energy efficiency, thermal insulation and cooking equipment.

In this remote high mountain region, the old traditionally built houses of the poorest people still have an open hole in the roof, allowing smoke from the central cooking fire to escape (top picture). The roof and walls are inevitably blackened with soot. As soon as the fire has died down, cold air, snow and rain once more seep into the room.

Traditional large round flatbreads (*naan*) are baked in a two-foot deep clay oven, consuming enormous quantities of firewood and cow dung. The same oven is used for cooking by placing a large wok over the top. By installing a skylight over the roof hole (picture below), the heat generated from the cooking pit in the central room is retained, keeping the floor and room warm. During the long winters in such high altitude areas (2000 - 4000 m), family members usually live in the same room, preferably in the smallest, to economise firewood.

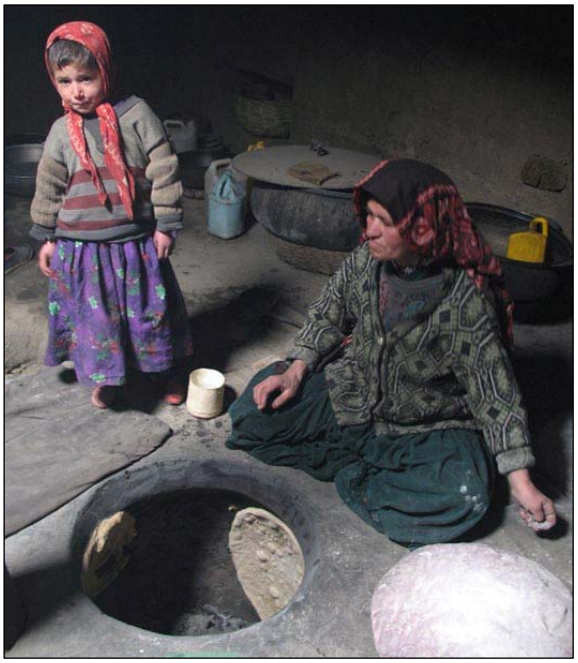
Once the meal has been cooked and the bread baked, the heated fire pit and remaining ashes and embers provide sufficient heat to warm kettles of water and everyone's legs as well. The family spends many hours in this position to savour the remaining heat (picture right).

The massive amount of firewood required to heat the fire pits to baking temperature contributes significantly to the alarming rate of deforestation, vegetation loss and desertification already going on since the war began several years ago. High population growth, combined with overgrazing by sheep and goats, further aggravates the situation. These issues have been recognised by a number of international development organisations.

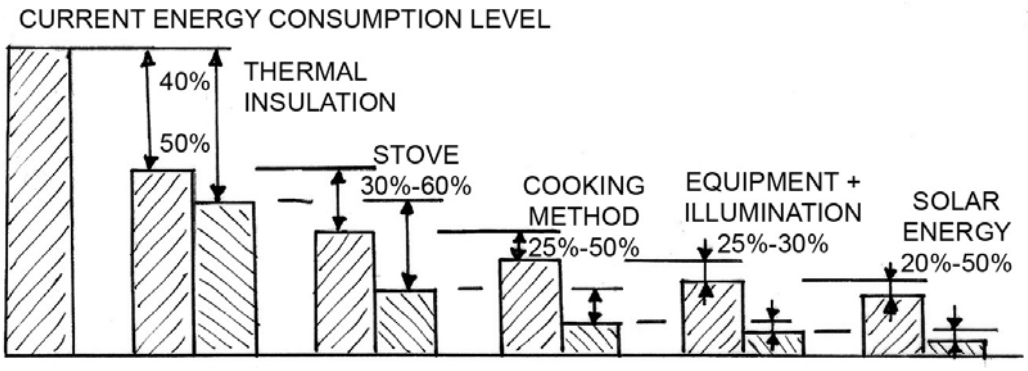
COMPLETE DEVEGETATION OF RIVER ZONE BETWEEN AFGHANISTAN AND TAJIKISTAN

The general concept of energy conservation through thermal insulation is understood by a number of these organisations. Unfortunately, due to the demands of the beneficiaries, many organisations focus mainly on cooking equipment (whereby large firewood savings can be realised) rather than primarily on thermal insulation, starting with closing the roof hole. Saving of firewood through improved cooking stoves is necessary and, for families purchasing firewood, will provide income savings. However, in the higher altitudes of the Himalayas, if an efficient cooking stove is used in non-insulated houses, people will require additional room heating. In such a case, firewood savings will be less.

Firewood saving, similar to other energy saving methods, needs to be achieved through three related measurements – The Energy Triangle: (1) Reducing energy needs; (2) Using renewable energy; and (3) Using the energy as efficiently as possible. For most poor people "energy" is the same as "biomass".



Firewood is used simultaneously for cooking and room heating purposes. In the winter, the fire burns for many hours and cooking time is not based on time efficiency; hence, stews and similar slow-cooking dishes are common. When a house is well insulated, the room will quickly warm up and retain the heat, thereby eliminating the need for keeping the fire burning for long hours. Cooking periods can then be shorter, thus traditional dishes need to be adjusted for fast preparation (less than an hour).



ESTIMATED SAVINGS POSSIBLE ON ENERGY CONSUMPTION IN AFGHANISTAN MOUNTAIN AREAS

The correlation between improved cooking stoves (ICS) and thermal insulation needs to be emphasized. An ICS such as the Rocket model emits little heat into the room and a chimney or hood is required to evacuate the smoke. People will not use such a stove for cooking during the winter because it does not provide sufficient room heating and consequently go back to using their traditional cooking equipment. With room insulation, the ICS can be used all year round, but cooking methods must be adjusted. One option is the use of pressure cookers.

For the situation in Afghanistan mountain areas, the following energy saving sequence applies:

(1) Thermal insulation of houses – 50% less space heating required.
(2) Improved cooking stoves – 40% less firewood used (of the remaining amount).
(3) Changing cooking methods – 30% less firewood used.
(4) Use of solar energy (direct sunshine) for room heating, water heating and cooking, 20% less.

The current cost of firewood and cow dung has the highest impact on low-income people, requiring them to walk further and further up into the mountains scavenging for “free” firewood. Others need to buy the bundles of firewood or sacks of dung, spending sometimes 80% of their annual income for this biomass. Many assert to having no money to make the smallest investment, not even if it would be financially recuperated in one season from the firewood savings. Community guaranteed micro-credit systems for the low-income bracket are required.

There are many thermal insulation methods and new materials have come on the market reducing the thickness and installation cost. Attention needs to be given to the issues related to ventilation and humidity control. Post-fitting of roofs and walls with thermal insulation must assure it does not affect their strength or earthquake resistance. Local expertise needs to be developed in these matters. One of the biggest benefits of thermal insulation is increased comfort in the house and eventually better health for the occupants.

The traditional method of baking bread in floor cooking pits needs to be abandoned, being replaced with far more firewood efficient methods, such as a metal or chimney stove. Interestingly, some of the solutions do already exist in the region. The metal stove pictured right, found in a house in neighbouring Tajikistan, bakes three pizza-size breads simultaneously. Because of the internal oven design, it is necessary to turn the breads several times; otherwise, they burn on one side. Improving this metal oven design is an option, but the bread will need to be 30 cm in diameter instead of 45 cm.

In another house in Tajikistan (picture right), the house owner had a chimney bread oven, even more firewood efficient than the metal box oven above. Here the waste heat from the very large chimney is used, being conducted through a double-walled box. The bread is maximum 30 cm in diameter and thicker than the traditional *naan* flatbread. The house owner confirmed that she could only use this type of oven with her insulated house.

A benefit of this design was that the oven, when not in use, still produced additional room heating as compared to the stove and chimney without the oven box. It acts as an additional radiator.

Several of the richer families had built the fire pit in a shed outside because they did not want smoke inside the house. This not only has the disadvantage of using enormous amount of firewood, but the radiating heat is not being utilised to warm the house in the winter. Sadly enough, these families were using between 10 and 14 tonnes of firewood per season, while a third of the biomass needed to be bought because their farms were not large enough. Yet, if thermal insulation or an ICS would save money and improve their comfort, they would consider the options.

When discussing alternative bread-making options, some people were resistant to the idea of abandoning the firewood-wasting floor ovens: "It is our traditional bread". They argued that the fire- roasted bread had another taste. Resistance to change is common, but in larger towns, the large flatbreads already have competition from much smaller round breads. Several restaurants serve 20 cm diameter round breads and many say these are even tastier than the dry *naan*. For people preferring the traditional *naan*, village-based production in a central fire pit of improved design will substantially reduce overall biomass consumption; this, however, requires social organisation.

The conclusions of this short story are several.

- In cold mountain areas, to have an overall firewood saving, thermal insulation of the building takes precedence over improving space heating stoves or cooking stoves.
- Solutions of improved cooking stoves and methods often exist in the region, but are not widely known and not easily replicated by local craftsmen; information gathering and dissemination of the good solutions is necessary.
- Rich people are inclined to change their behaviour when it improves their comfort and economics. Poor people depend mainly on firewood scavenging and cannot invest even a small amount for an improvement that would be recoverable in one season due to lack of access to credit.
- Resistance to change is caused by lack of information and local demonstration.