ICIMOD

FOR MOUNTAINS AND PEOPLE

Sustainable Energy for the Himalayan Rangelands

INFORMATION SHEET #9/09

No other region in Asia will perhaps suffer as much from a changing climate and looming energy crisis as the cold high altitude mountain areas of the Hindu Kush-Himalayas, where living conditions are harsh and many people vulnerable and marginalised. Within the mountains, the rangelands pose a particular problem, as they are located above the timberline where conventional sustainable energy solutions are ineffective. Energy is crucial in rangeland areas: herders cannot survive the winter without fuel. Traditionally, twigs from scrub and bushes and animal dung have been the main sources of energy, but these biomass resources are shrinking, and collecting fuel now takes herders, especially women, enormous time and effort. Women also face a variety of health hazards from cooking in a smoky environment, and are often forced to keep their children out of school to assist with daily survival activities, perpetuating intergenerational poverty. Global warming makes the rangeland environment more vulnerable, threatening energy and ecological security.

To adapt to climate change and other impacts, herder communities need to have new energy sources, to make better use of existing biomass sources, and to reinvigorate their own resilience enhancing practices. A pilot study on energy in the Hindu Kush-Himalayan rangelands showed the vast potential for saving fuel and greenhouse gas emissions, reducing indoor air pollution, and freeing up time spent in collecting fuel, especially by women, for productive activities. Properly designed renewable energy options are both a mitigative and an adaptive response to climate change. ICIMOD is working to find sustainable energy solutions for the rangelands that pass the test of availability, affordability, and acceptability. This requires innovative solutions designed to fit the specific rangeland context that are sustainable, replicable, and can be scaled up across the Hindu Kush-Himalayan rangelands. Policymakers need to understand better the critical role of sustainable energy in building the resilience of herders and regulating global climate patterns.

Sustainable energy for the rangelands

In 2007, ICIMOD implemented a pilot project to look at sensible solutions to the energy crisis in the rangelands. Sustainable energy service solutions in remote rangeland areas need to address the three broad criteria of sustainability – availability, acceptability, and affordability – and deal with both supply and demand side issues. The concepts are summarised in Figure 1. The pilot project was designed to establish a knowledge base on the household energy situation at the project sites and to test available technologies in the field for local acceptability and feasibility. (Affordability and availability issues are being addressed in the second phase.) The results and experiences were shared in national stakeholder workshops; the more important findings are shared here.

Energy realities for herders

The baseline survey clearly showed the realities of livelihood and energy vulnerability at the project sites. Herders are amongst the poorest people in the region, with an estimated annual per capita income at the sites ranging from USD 172 (Pakistan) to USD 491 (China). Livelihoods focused on livestock with little diversification. The majority of sample households experienced food shortages for at least some part of the year; more than half of the households in Nepal and 40% in Pakistan out-migrated seasonally in response to economic hardship. Almost all energy (95%) was obtained from traditional solid fuels at all project sites. Women spent on average from three hours (Bhutan and China) to seven hours (Nepal and Pakistan) per trip to collect fuel. The factors affecting energy demand were complex and location specific. The per capita annual energy use varied from 15 GJ (Nepal) to 43 GJ (Bhutan); it increased with household income, but at a decreasing rate; and decreased with increase in household size up to a threshold.

Energy saving technologies

Energy saving technologies included improved metallic stoves, solar cookers, solar lamps, bio-briquettes, and a milk churner machine. Simple meteorological data recording instruments were also installed to assess renewable energy potential.

Improved metallic stoves

Traditionally, rangeland families use open fires for both cooking and heating, but they are very inefficient as well as smoky. Improved cooking stoves convert fuel into energy efficiently and most of this energy is actually used to heat the food. However, this improvement does mean that less heat is available for space heating. The improved metallic stove is one way to enable simultaneous cooking and space heating when required, but to be sufficient it is important to insulate the living space better and use the heating energy more efficiently. Three types of improved metallic stove were tested to address diverse local needs. They showed an average daily fuel saving of 5 to 13 kg or 25 to 60 per cent (except in China where people were already using a an improved stove), and an average saving of 47 hours per month in time spent collecting fuel and cooking.

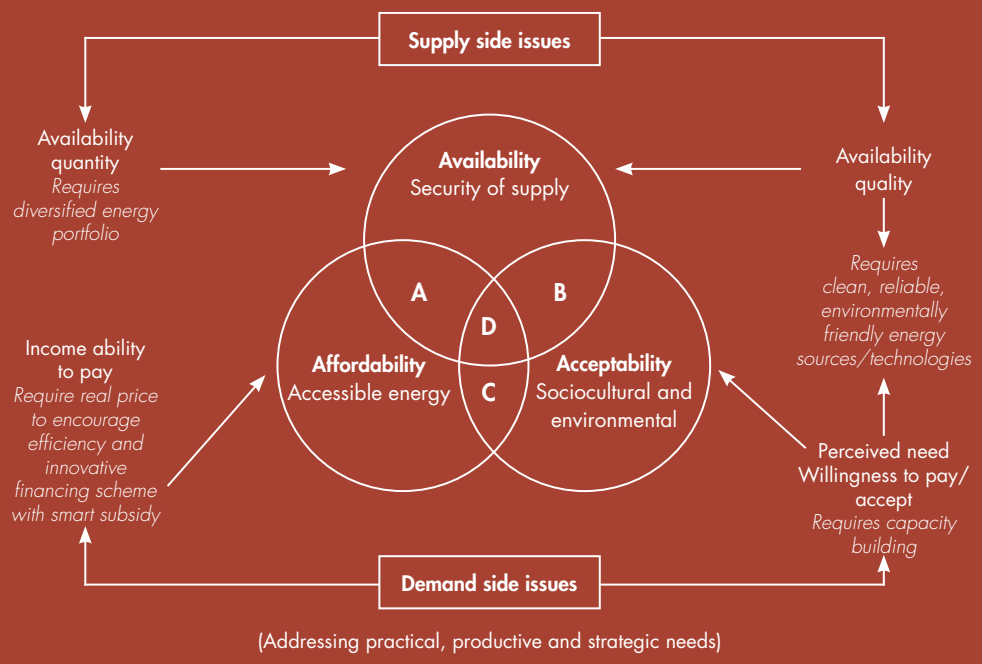
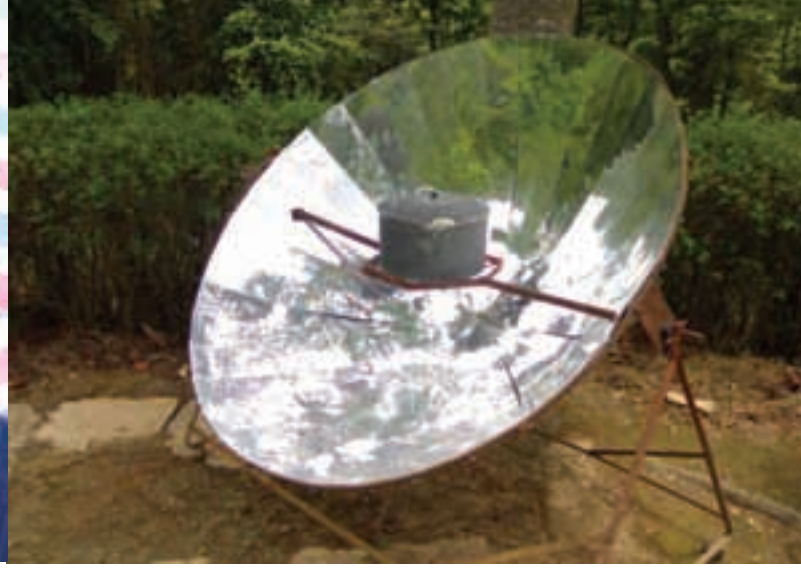


Figure 1: Framework for addressing sustainable energy services



Solar cooker

Two types of solar cooker were tested: parabolic and wooden box. The parabolic cooker is an umbrella-like structure which reflects and focuses the sun's rays onto a pot or kettle. Food normally takes about half an hour to cook with good sunshine. Thin metal pots with a dull black outside and tight lids cook faster. Herders mostly used the cooker for boiling water, milk, and tea. It was popular at all sites saving 6 to 12 kg fuel and 13 to 20 minutes cooking time daily. The wooden box solar cooker is an insulated box with a transparent top and mirror reflection rather like a greenhouse. The box can hold four seven-litre pots. Food takes two to three hours to cook and remains hot for another two hours. The box was much less popular than the parabolic cooker except in Bhutan, where herders saved around 10 kg of fuel daily. Solar cookers require households to change their cooking approach. Solar cookers are best promoted as a complementary rather than replacement technology for traditional cooking.

Solar lamp

A small low cost portable solar lamp with a detachable solar recharging panel was offered. The set had two lamps, each with four WLED, and a total power rating of 5 watts. Energy is stored in a 6 volt standard lead acid battery and the lamp also has a socket for a small radio. The fully-charged lamp gives 15 hours of light, enough for five days at 3 hours per day, is extremely durable, and produces a bright clean light sufficient for study and work. The solar lamp was very popular and was highly suitable for the semi-nomadic rangeland communities. People were sure that the annual savings on kerosene and dry cell batteries would be enough to buy these smoke free mobile lamps. A larger fixed solar lamp with 33 WLEDs and power rating of 10 watts was also tested and was preferred to the solar lighting panels currently used in Bhutan, China, and Nepal because of its low weight and cost.

Vast potential for saving energy

The average annual baseline solid fuel use per household ranged from 6.4 tons (Nepal) to 17 tons (Bhutan), and the annual GHG emission rate per household from 10 (Nepal) to 35 (China) tons CO_2 equivalent. Overall the piloted technologies were acceptable and show significant potential for saving fuel, reducing indoor air pollution and reducing greenhouse gas (GHG) emissions, reducing drudgery, and freeing up the time of herders, especially women, for productive activities.

Lessons learned

1. There is no one-size-fits-all solution to the energy problems in the rangelands as technologies are not seasonally or gender neutral. The menu of technologies still needs to be broadened, and a tailor made approach developed for different areas taking into account the gender needs of the herders (practical, productive, and strategic) and the specific local context.
2. Properly designed renewable energy options are both a mitigative and adaptive response to climate change; they build adaptive capacity without increasing GHG emissions – a win-win opportunity.
3. It is important to increase heating efficiency in domestic housing (eg through improved insulation) to overcome the trade-off between increased cooking efficiency and loss of space heating from a single stove.
4. Energy provision is not merely technology provision; it is about empowering local herders through building capability, creating economic opportunities, and enhancing their organisational strength to have a voice in shaping their energy choices – a lengthy process, which requires a long-term programmatic approach.

The Way Forward: From field testing to demonstration and commercialisation

There have already been promising impacts at policy level. Governments and others in the pilot countries have responded to this demonstration of the potential for energy saving in rangeland areas. The Royal Government of Bhutan has incorporated a renewable energy programme for rangelands in its Tenth Five Year Plan (2008-2013). In Pakistan, the Government of Chitral has provided seed money to promote pilot activities. A private entrepreneur in Pakistan and China has invested in an enterprise to fabricate the technologies, and in China a new portable solar biodigestor is being designed and tested in the private sector as an ideal solution to address the cooking and lighting energy needs of herders.

ICIMOD is now working to scale up use of the tested technologies and techniques at sites in five countries (Bhutan, China, India, Nepal, and Pakistan) in preparation for rolling out the programme in the remaining areas of the Hindu Kush-Himalayas through commercialisation and market development. Sustainable dissemination and commercialisation of these technologies in remote rangeland areas poses formidable challenges. The project seeks to confront these through strategic policy, institutional, and technological innovation to fit the specific context. Innovative financing and delivery systems will need to be created through new partnerships in order to establish a convincing good practice demonstration model that is sustainable, replicable, and scalable across the region. In support of this, we will conduct local case studies to identify and design suitable production options and innovative financing and delivery options; broaden partnerships and support capacity building needs at different levels to create an enabling environment for making the desired energy services locally available and affordable; and develop good practice documentation for wider dissemination so that policymakers and planners can take these experiences, adapt them to their local context, replicate them, and scale them up throughout the Himalayan rangelands.

With the current state of technologies, infrastructure, and policy environment, herder communities will continue to rely on traditional solid fuels for many years to come. As such, policies for sustainable energy options need to focus on a) improving the efficiency with which solid fuels are used, b) promoting more sustainable ways to supply these biomass resources, and c) facilitating the transition to modern fuels by making them physically available, economically affordable, and socially and environmentally acceptable. This energy transition will require new strategic policy and development options. There are no easy solutions. It is both a challenge and an opportunity.

The DESER project: Development of Sustainable Energy for Rangelands

Aim: to help find sensible solutions to the energy crisis in the rangelands

Overall goal: to enhance sustainable livelihoods of people whilst maintaining the environment

Sites and partners: Soi Yaksa and Nubri – Department of Livestock, Bhutan; Hongyuan County – Sichuan Academy of Grassland Science, PR China; Upper Mustang – National Trust for Nature Conservation, Nepal; Chitral – Agha Khan Rural Support Programme, Pakistan. Leh and Ladakh in Himachal Pradesh of India are included in Phase II.

Supported by the Austrian Development Agency

Author Bikash Sharma

For further information contact

Bikash Sharma: bsharma@icimod.org

Photos: all Bhutan and China, *Bikash Sharma*; except pg 3 Nepal, *Samden Lama Sherpa*

International Centre for Integrated Mountain Development
GPO Box 3226, Kathmandu, Khumaltar, Lalitpur, Nepal
Tel +977-1-5003222 **email** info@icimod.org www.icimod.org

Prepared by ICIMOD Publications Unit, November 2009