Installation of Improved Metal Cooking Stoves in the Khumbu Region

Field Visit Report

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PROJECT:
Research and Dissemination of High Altitude Metal Cooking Stoves in conjunction with the World Wildlife Fund for Nature Conservation, Nepal Programme (WWF-NP), Solukhumbu area project.

PURPOSE:
Installation of high altitude metal cooking stoves and operational training to the users in twelve villages of the Solukhumbu District.

ITINERARY:

16 November 2004	Travel from Kathmandu to Lukla.
16-25 November 2004	Villages: Lukla, Ghat, Phakding, Monju, Namche Bazaar, Khumjung, Tengboche/Debuche, Pangboche, Dingboche, Thame, Thamo and Langden of Solukhumbu District.
26 November 2004	Return from Solukhumbu District (Lukla) to Kathmandu.

1. BACKGROUND

The majority of people in Nepal live in rural areas (88%). From the total energy requirements of the country, the rural areas account for 80%, mainly used for cooking. Almost all rural energy consumption (98%) is from traditional biomass resources, such as fuel wood, agricultural residues and animal dung. Accessibility to the electric grid by rural people is very limited, while LPG gas and kerosene oil in the high altitude and remote areas is relatively costly due to the high cost of transport. Therefore, people living in remote areas depend heavily on forest resources to meet their demand for cooking energy.

In high altitude areas fuel wood is needed for cooking and space heating; the amount increasing with the altitude and colder temperatures. This results in continuous forest degradation, nutrient depletion from soils (by burning agro waste and cow dung), low agricultural outputs and soil erosion. Together, these aspects result in a further reduction of accessibility to fuel wood.

Especially in high altitude areas, WWF-NP seeks methods to reduce the overall demand of firewood and stimulates activities such as the development of better, more efficient cooking stoves. Other energy conserving measurements include: thermal insulation of buildings, passive solar energy for houses and the development of greenhouses and biogas reactors for high altitudes. The Netherlands Development Organisation (SNV-Nepal), in conjunction with the Alternative Energy Promotion Centre (AEPC), is supporting the current programme of WWF-NP with STARIC-N in the development and dissemination of efficient cooking stoves for high altitudes.

Two types of cooking stoves are currently being considered:

- An all-metal stove with two cooking holes and the possibility of a water heater.
- An elevated mud stove (lower cost, less heat radiation), also with a water heater.

Both stoves have chimneys. The present report is dealing with the all-metal cooking stove.

The first model of the all-metal cooking stove has a two-hole top with a sunken pot design and is based on the “rocket” or elbow principle, improving the efficiency in two ways: by improved convection (sunken pot) and improved combustion through aeration from below (elbow). In

addition, the lightweight stainless steel burning chamber is insulated, creating a hotter flame and better gas combustion, also increasing the efficiency.

This design is currently being field tested to assess its acceptability by the villagers. The additional water heating facility will be developed after acceptance of the basic stove design. Variations of the stove (three holes) can be developed at a later stage.

2. IMPLEMENTING AGENCY

The Sustainable Technology Adaptive Research and Implementation Centre (STARIC-N) has been selected as the implementing agency of this stove research and application project. WWF-NP has contracted STARIC-N to undertake the research and introduction of the new stoves in the designated areas of the Dolpa and Solukhumbu Districts.

The project aims to improve the general living conditions of remote village people by introducing an improved cooking stove that reduces firewood dependency and subsequently saves time in two aspects – less time spent in collecting firewood and faster cooking. People living in the selected high altitude areas prefer to use metallic cooking stoves that radiate some heat for space heating.

Because of the relative high cost of other metallic cooking stoves introduced in these areas in the past, the current stove designs weight less and, consequently, are less costly to manufacture and transport. The manufacturing costs of former family stoves in Nepalgunj or Kathmandu was (in 2003) 40 kg @ NRs 45/kg = NRs 1,800. The transport cost usually doubles the ex-factory cost of the stove with the airfreight costing NRs 57/kg = NRs 2,280. In addition, local transport to the village destination would bring the cost of the stove to a minimum of NRs 5,000 (excluding the chimney).[1]

In order to facilitate transport and reduce possible damage during transport, the new stove has been designed as a disassembled unit which can be easily fitted together on site. WWF-NP staff and a local entrepreneur were contacted to assist in the installation, brief the users and provide in the future follow-up services; this will include contracting and sales.

The two staff from STARIC-N made a field visit to Solukhumbu during the second half of November to install a series of twelve demonstration metal stoves and educate the villagers regarding their use. STARIC-N had produced a draft users' manual (in Nepali) so that the users could refer to it when necessary and explain the same to visiting neighbours who are interested in buying the same model.

Installation Contract Agreements

The stoves were installed on the basis of a demonstration contract or agreement. The terms of the agreement require the owners to keep records of firewood consumption, cooking time and the number of meals cooked. In addition the users of the demonstration stoves should entertain visitors interested in the stove design and its functioning, and allow modifications to the stove if the programme staff so determines. At the end of the demonstration period, the villager having the demonstration stove has the option of buying the stove at the manufacturing cost (i.e., without transport cost) or returning the stove (and chimney) to the local service agent for resale to another villager. The local agent (service centre) can take orders for delivery and installation of the

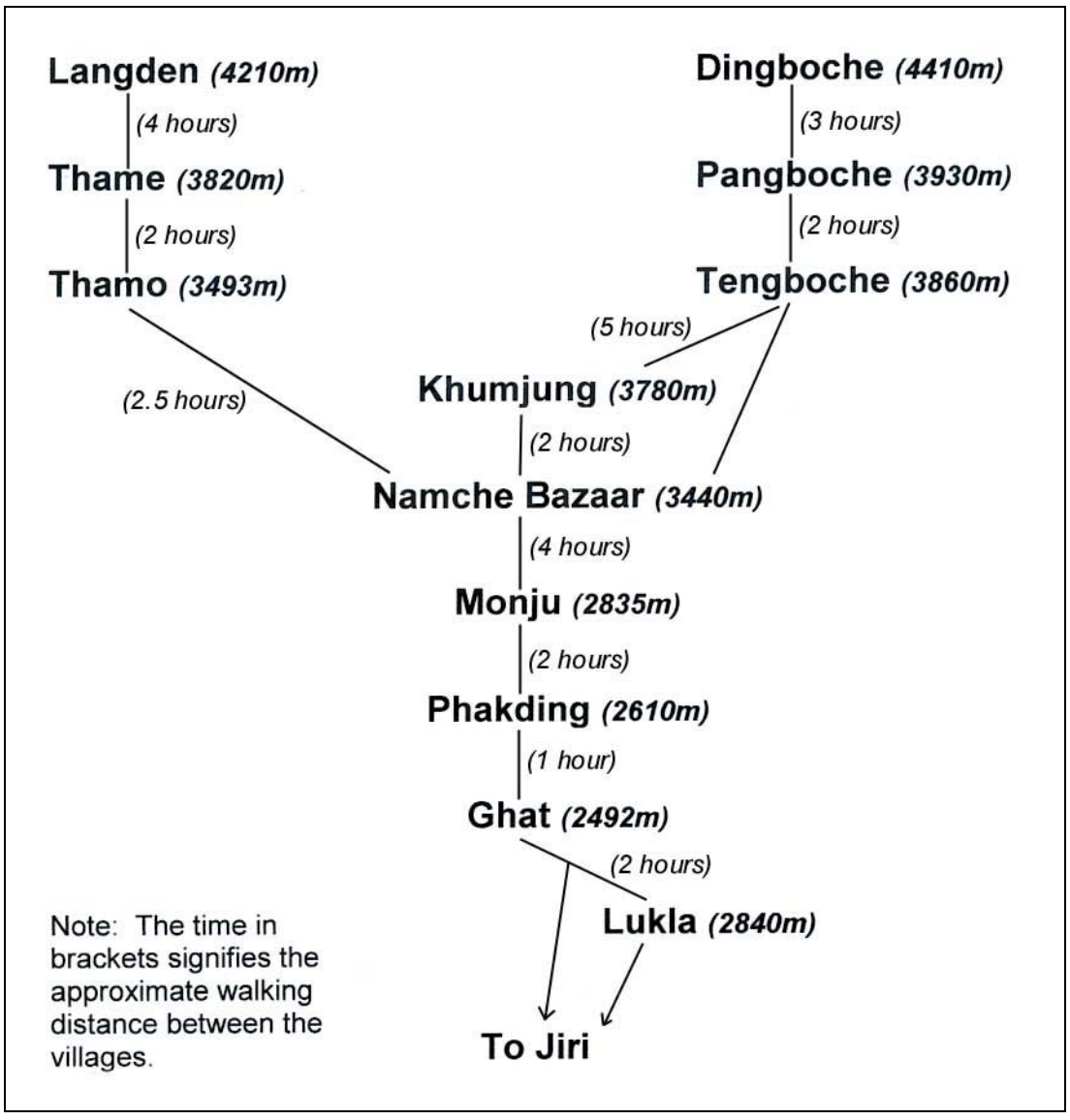
[1] Since 2003 metal and energy prices have increased sharply. In 2004 one USD = NRs 75. The above-mentioned stove would now cost over NRs 6,000. Nepalgunj is the supply city for the Dolpa region.

stoves supplied from Kathmandu. The person buying the new approved type of stove (and chimney) will have to pay the full cost.

Saving and Loan Schemes

The development of local Saving and Loan Schemes is necessary so that the stove becomes better accessible to low-income villagers. Once the water heating attachment becomes available, this will substantially increase the total purchase cost. The persons managing the Saving and Loan Schemes (women groups) may possibly require two types of training, one to improve their administrative capacities in running a Saving and Loan operation and the other on how to assist the villagers in making the best stove selection according to their needs and affordability.

3. AREA MAP



The 12 demonstration stoves were placed in the following villages:

Day	Village	Altitude	Type of Accommodation	Remarks
2	Lukla	2840m	Private House	Chimney in hood
3	Ghat	2492m	Teahouse	"
3	Phakding	2610m		"
4	Monju	2835m	Private House	"
5	Namche Bazaar	3440m		"
6	Khumjung	3780m	Teahouse	"
7	Tengboche/Debouche	3860m		"
7	Dingboche	4410m		
7	Pangboche	3930m		
9	Thamo	3493m	Teahouse	Chimney in hood
9	Thame	3820m		
9	Langden	4210m		

4. TRAVEL LOG

During the months of September and October 2004, the model stove was field tested in the village of Godavari, a 30-minute drive from Kathmandu. The first model was manufactured on the basis of the design parameters in the report of Sjoerd Nienhuys (SREA)[2] and modified several times to accommodate manufacturing conditions, increase firewood efficiency and improve its use. The inner combustion chamber is planned in stainless steel or chrome steel, but for the testing period common 0.5 mm thin sheet steel was used. During the field testing period, the inner combustion chamber will be replaced by the definite and far more durable stainless steel unit.

The new stove design consists of flat sheets and an elbow unit which can be assembled into a stove on site. The transport volume of the stove is thus minimized (vehicle, plane, porter, yak/zopje) and the stove is less prone to damage during transportation. The demonstration stoves are delivered with three lengths of chimney pipe. The current model stove weights about 20 kg. This is about half the weight of the other improved metal cooking stove manufactured for the Humla region (Karnali), being over 40 kg.

The manufacturing cost for twelve stoves was NRs. 36,000 and the overall cost including the chimney elements was NRs. 43,800. This comes to about NRs 150/kg. For series production in large quantities, the cost may come down to about NRs 75/kg. Packing cost and transport to the airport in Kathmandu was NRs. 1,650. Airfreight cost was NRs. 1,000 per stove or NRs 12,000 for twelve. Therefore, the demonstration stove costs on average NRs. 4,700.

Some minor modifications will keep the stove, including the chimney, under 20 kg. It is estimated that the series stove will cost NRs 1,500, plus NRs 1,000 for transport.

[2] Report: *Cooking Stove Improvements - Proposal for High Altitude Areas - Dolpa and Solukhumbu Regions (February 2004)* by Sjoerd Nienhuys, Senior Renewable Energy Advisor (SREA), SNV-Nepal.

Checking the different stove parts after unloading from the small cargo plane in Lukla.

16 November – Day One

We reached Lukla Airport at 2:00 PM and were met by the field staffs of WWF-NP, SCAFP (Sagarmatha Community Agricultural Forestry Programme) and Mr. Lakpa Sherpa. The cargo plane carrying the 12 stoves and chimneys reached at about the same time. The whole afternoon was spent unpacking, separating and checking the different stove parts.

The above-indicated procedure needs to be improved in efficiency, avoiding the need for repacking at the airport grounds. Although the airport authorities were very accommodating, it must be possible to have pre-packed units ready for immediately transport from the airport to the service centre without the need for repacking at the airport.

The service centre in Lukla should therefore have sufficient space to receive a planeload of stoves. Usually the cargo planes to these remote areas take stand-by loads up to their loading capacity. This also means that the pre-packed sets need to be clearly labelled with their packing weight and destination. All pieces in a bag should be tied together with string.

Two options are possible.

1. The individual stove components are packaged separately in Kathmandu and shipped in bulk to the service centre. At the service centre, the components for an individual stove are then assembled and packaged for transport to the customer. For this option to be possible, all the components must be precisely manufactured so that there won't be a problem with the pieces fitting together.
2. All materials are pre-packed in Kathmandu factory per stove order from the field, and labelled and addressed accordingly to the service centre. The service centre needs verify the content of each pack before sending it to its final destination.

Both methods may be realised with the chimneys in separate packages, as these are voluminous.

Stove recipient packing the stove for transport to his village at the airport in Lukla.

17 November – Day Two

The whole day was devoted to assembling the various parts of the stove. The packing was torn in various places and the staff checked to see if all pieces had arrived. This took a total of about 10 hours of labour.

The question here is if this should be done at the service centre or at the house/hotel in the village. Although a porter can carry the weight of two (40 kg) or three stoves (60 kg), they cannot carry the big volume of three assembled stoves. So assembling these at the starting point (service centre) is unsuitable.

A commercial person must be paid for the time he/she is involved. This means that the villager needs to collect the stove from the service centre and assemble it at the destination on the basis of an assembly manual. Making the detailed manual is part of the project.

Prior to our arrival, the field staff of WWF-NP had selected the people from different villages in the Khumbu region who would receive a demonstration stove. These selected clients were at Lukla to collect the stoves. All the stoves were distributed on that same day. Each was given a timetable as to when we would be arriving in their respective houses in the coming week.

On the same day we also managed to install a stove at a private house in Lukla, owned by a lady near the airport. She had been selected by the WWF-NP community mobilizer. In this case the

assembled new stove was placed on top of the existing fireplace. A large metal rack in the fireplace, used as a pot stand, had first to be removed.

The new stove placed on the open fireplace.
Prior to the installation, the lady had a metal rack on which the pots and a kettle were placed.
High above the fireplace is a large open hood. The chimney pipe goes into the hood.