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REGIONAL WOOD ENERGY DEVELOPMENT PROGRAMME IN ASIA
GCP/RAS/154/NET

REGIONAL WORKSHOP ON STOVES USED FOR SPACE HEATING AND COOKING AT DIFFERENT ALTITUDES AND/BY ETHNIC GROUPS

Pokhara, Nepal
12-16 February 1996

in Collaboration with
International Centre for Integrated Mountain Development (ICIMOD)

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
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FOREWORD

Space heating is an important function of household stoves in many parts of Asia, particularly at higher altitudes, but is often overlooked by policy makers and stove programme designers. In some areas, the same stove serves for both cooking and space heating; in others, there may be a special stove for space heating alone. The different practices depend, among other factors, on the customs and traditions which prevail in different ethnic groups. So far, little information is available on space heating stoves, and few development activities have been undertaken in this field. This is a serious omission, as it is estimated that half a billion people in South and Southeast Asia alone use stoves for space heating, whether as an absolute daily necessity in the coldest climates, or for comfort during cooler seasons or nights.

At the same time, there are some obvious problems associated with space heating stoves. For instance, space heating requires relatively large amounts of fuel, usually wood or other biomass, and health aspects are particularly significant in poorly ventilated houses, common at higher altitudes.

Over the years, it has become common experience that addressing domestic energy problems successfully is a complicated and difficult matter. Addressing the problems associated with space heating stoves is no exception. It is vital to understand the users' needs in planning interventions, as existing domestic practices are almost always linked to prevailing customs and traditions, values, norms and social structures, particularly regarding gender roles – we should not forget that the overwhelming majority of domestic stove users in Asia are women. All of these, along with several other real and perceived constraints and the users' particular priorities, can be obstacles to an intervention's success. From a policy or programme perspective, there are additional concerns in the form of environmental management, institutional constraints and limited human and financial resources.

The Regional Workshop on Stoves Used for Space Heating and Cooking at Different Altitudes and/by Different Ethnic Groups was aimed at addressing these issues, by determining methodologies and formulating recommendations for the introduction of improved stoves with space heating functions. The workshop, which took place at Pokhara, Nepal on 12–16 February 1996, was jointly organized by the International Centre for Integrated Mountain Development (ICIMOD) and the FAO-Regional Wood Energy Development Programme (RWEDP). Thanks to contributions from expert resource persons and participants from 10 countries in the region, most of whom had their own experiences in the subject at hand, the workshop provided a unique forum to obtain an overview the present situation. This report summarizes the outcomes of that workshop. It is hoped that it will add to the general awareness of space heating requirements, and contribute to the development of policies, strategies and action for the wider introduction of suitable space heating devices in the region.

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Participants in the Regional Workshop on Stoves Used for Cooking and Space Heating at Different Altitudes and/by Ethnic Groups

Mahapuchera Mountain, which provided a stunning backdrop to the regional workshop

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***Above left**: Solar water heaters like this one can help conserve biomass energy. **Below left:** A discussion group in the regional workshop enjoy some direct solar heating, while **above right**: a Pokharan villager supplements the sun's power with a wood-fired space-heating stove.*

1. INTRODUCTION AND OBJECTIVES

1.1. Background

Stoves serve a range of different purposes. The most common is cooking, but in some areas, particularly where the temperature is low, stoves are also used for space heating. In other areas, separate stoves may be used for cooking and heating. Although climatic conditions are a key factor, other influences such as differences between ethnic groups and relative wealth may also play a role.

Stoves with a heating function are mostly used in domestic surroundings which are badly ventilated in order to prevent heat-loss. In many cases, this can and does have adverse impacts on the health of the users and any other residents, causing or contributing to chronic obstructive lung diseases (COLD), acute respiratory illnesses (ARI) and eye infections, along with, possibly, cancer, low birth weight and other problems. The use of chimneys can help in reducing many of these problems, but it is not a panacea, and the resulting heat-loss may lead to increased fuel consumption.

Unfortunately, very little information is available on stoves used for heating, and apparently little development activity in this field has so far been undertaken, noteworthy exceptions being the GTZ-sponsored FECT and DESP programme in Peshawar, Pakistan and activities in China (CAAERP) and Bhutan (Helvetas). However, even these activities have been carried out in isolation and little if any information has been published about the problems encountered, solutions attempted, results achieved etc.

In view of the facts that a) there was an identified need for improvements in space-heating devices such as stoves and b) it seemed probable that relevant information existed in at least a few countries, it was considered opportune to organize a regional workshop on the subject of heating stoves. This would provide a forum for the pooling of information, exchange of experience and discussion of the achievements of stove practitioners in the region. At the same time, the issues involved could be addressed and strategies defined as to how to overcome common problems and how to disseminate and apply improved stoves and/or suitable stove designs.

The result was the Regional Workshop on Stoves Used for Space Heating and Cooking at Different Altitudes and/by Ethnic Groups, held at Pokhara, Nepal on 12–16 February 1996, and organized jointly by the International Centre for Integrated Mountain Development (ICIMOD) and the FAO-Regional Wood Energy Development Programme (RWEDP).

1.2. Objectives

The prime objective of the workshop was to determine methodologies and formulate specific recommendations for the introduction of improved stoves used for cooking and heating or for space heating alone.

In addition, the participants were to try to address the following questions:

- What can be learnt from past experience in terms of technical, economic and social problems encountered and solutions attempted?
- What good opportunities exist for the transfer and/or adaptation of a stove design which has been found suitable for a particular region and/or application to other areas or applications in the same or other countries?
- What should be done to transfer a particular technology or method to other areas and countries, and who should be involved?
- Is there a need for further R & D or exchange of information and/or expertise?
- How have heating stoves been disseminated?
- Is there a need for a market approach?
- What are the options for pursuing cooperation between the various actors involved with heating stoves (GOs, NGOs, commerce, manufacturers etc.)?
- What kind of action plans can be developed for follow-up in the near future and how can they best be implemented?

1.3. Expected Outputs

(i) State-of-the-art reviews on the technical, economic and social aspects of stoves used for space heating and cooking in the context of mountain populations.

(ii) Better awareness of the space-heating requirement that forms an integral part of domestic energy use among mountain peoples.

(iii) Formulation of a policy framework for the adoption and popularization of suitable space-heating and cooking devices for mountain populations.

(iv) Identification of strategies for technology transfer within and among the countries of the region.

(v) Formulation of action plans for follow-up activities and programme implementation.

1.4. Workshop Programme and Participants

The workshop was attended by 31 professionals, researchers, developers, manufacturers and representatives of governmental and non-governmental organizations from Bangladesh, Bhutan, China, India, Nepal, Pakistan, Philippines, Sri Lanka and Vietnam, along with GTZ, ICIMOD and RWEDP professionals. Manufacturers of space-heating devices provided brief demonstrations of their products.

Following an inaugural ceremony, 22 papers were presented and discussed in three thematic areas: i) the stove programme; ii) the stove and its economics; and iii) use of the stove. Annex 1 provides brief abstracts of these papers. After the technical sessions, participants were divided into three working groups to discuss: a) a framework for policy formulation; b) strategies for technology transfer; and c) action plans for follow-up activities and programme implementation. The working groups' findings were presented and the regional workshop's conclusions and recommendations drafted for adoption in a final plenary session. The conclusion of the workshop was followed by a two-day field trip to the mountain village of Ghandruk, to obtain a better understanding of the energy technology options presently employed, and to provide the participants with an opportunity to appreciate the extreme hardships encountered by mountain people in their daily lives.

The programme of the workshop is reproduced in Annex 2 and the list of participants in Annex 3 of this report.

2. PROCEEDINGS OF THE WORKSHOP

2.1. Inaugural Session

The workshop was inaugurated by the Kaski District Chairman, Mr. Mahadev Gurung, with the lighting of the traditional *panes* lamp. In his address, Mr. Gurung declared that the 'mountain people' were looking forward to more efficient energy resources and technologies to cook their food, warm their houses and light their rooms at an affordable price. He also wished the participants a pleasant stay in this Himalayan town. He said he hoped the three days of discussion would yield useful conclusions regarding technology transfer, and that the workshop would be able to formulate action plans particularly suited to the conditions found in mountain areas.

Also during the inaugural programme, Mr. Egbert Pelinck, Director General of ICIMOD, delivered a welcome address, and Dr. W S Hulscher, Chief Technical Adviser of the FAO-RWEDP, also spoke. These addresses are reproduced as Annexes 4 and 5 respectively. Dr. Rijal, Energy Specialist of the ICIMOD and the workshop's coordinator, pointed out the unique and unprecedented opportunity the workshop provided to discuss issues relating to space heating technologies employing biomass fuels.

In a short address, Mr. Auke Koopmans, Biomass Conservation Specialist of the RWEDP, highlighted the importance of space heating needs for mountain communities, and proposed a vote of thanks, closing the inaugural session.

2.2. Technical Session I: The Stove Programme

The morning session of the first day was chaired by Dr. M R Pandey and coordinated by Dr. T S Papola; the afternoon session by Prof. N K Bansal and Mr. S Akhtar respectively. The session began with the introduction of the participants and resource persons. Nine papers were presented and discussed. Major issues identified during the deliberations are highlighted in the following paragraphs.

2.2.1 Present Context

In mountain areas, biomass is the main source of energy for cooking and space heating, and this is expected to remain the case, at least in the short term. This is because a) it is locally available and supply is generally reliable; b) it is often the cheapest fuel available; c) its use is often part of local traditions; d) existing stoves are adapted to these fuels; and e) there are often no alternatives available in mountain areas. It should also be noted that biomass energy supplies may be affected by external rules and regulations, such as those relating to forest user groups (community forestry, etc.).

In mountain areas, 70–80 per cent of primary energy is used directly for cooking and only 20–25 per cent directly for space heating. However, when we look at the actual service provided by the energy, an estimated 60 per cent is used for space heating and only 40 per cent for cooking. To date, Nepal's national improved cookstove programme has not considered space heating functions, because the problems of mountain people have not been understood. However, efforts have been made to introduce improved stoves with the dual functions of cooking and heating through some international programmes. In a joint programme between

Germany and Pakistan, dual-function stoves capable of 25 per cent fuelwood savings were introduced, but their dissemination was difficult, because a) the stove was complex and manufacturable only by skilled workers; b) cleaning was difficult; c) use was limited to particular utensils only; and d) the population in mountain areas is sparse and scattered over a wide area.

As necessity is the mother of invention and adoption, national improved cookstove programmes have shown great diversity. For example, in Bhutan, a Swiss-made stove for space heating has been commercialized, but there is still a problem with cookstoves. In Sri Lanka, the pottery liner stove has been a success, but the same stove failed to take hold in Nepal. This indicates that any design has to suit the socio-cultural and socio-economic character of a community if it is to be adopted.

It is necessary to find out the actual conditions prevailing in mountain communities with regard to fuel supply (e.g. seasonality, quality of energy), raw material supply, labour, ownership, decision-making processes and local manufacturing capabilities before an appropriate stove programme can be designed. In addition, during the development and implementation of technology, planners must be aware of the specific role that biomass energy plays in the lives of mountain people. Finally, safety and health are, of course, prime considerations in the development and promotion of stoves for cooking and space heating.

2.2.2 Coordination and Integration

Improved cookstove (ICS) programmes are being promoted in mountain areas through a number of different agencies: GOs, R & D institutions, NGOs, the private sector etc. There is a need for multi-sectoral support/involvement, which includes the private (commercial) sector, and for better coordination between the different agencies, since lack of coordination has been identified as a factor in the programmes' limited success to date. To achieve this, the role of each agency must be appropriately defined. Communication between all agencies, particularly exchange of information and expertise, is vitally important to the success of the programmes. Promotion of government-NGO partnership is likewise needed, and the role of organizations such as ARECOP in strengthening cooperation between international organizations and institutions, NGO participation and the flow of information may be of vital importance.

Overall, the programme must be need and demand-driven, rather than supply-driven as has been the case with many programmes promoted by GOs and donor agencies. Experience with improved cookstove programmes in the mountains has shown that stoves need further development, particularly for space heating, and that an integrated approach which considers technology, dissemination and financing must be evolved. Stove programmes must be integrated with related sectoral programmes, such as population rehabilitation after natural/activity-induced disasters, health programmes and energy and rural development programmes. There is also a need for an integrated multi-sectoral approach, one that is coordinated with, for instance, housing improvement, health and/or sanitation. Building design and siting (including passive solar heating and insulation) should be considered.

2.2.3 Affordability versus Subsidy

Several questions must be asked relating to provision of subsidy in stove programmes: for example, does the provision or the removal of subsidy cause a limited rate of adoption of improved stoves? Is subsidy either necessary or desirable? Where withdrawal of subsidy is followed by decline in the rate of adoption – that is, subsidy appears to be the driving force behind adoption – it may mean that specific demands and needs are not being adequately met by the new models and/or that the price is too high for the target group. In addition, subsidy often diminishes or even removes user choice, reinforces the expectation of free goods and is not sustainable. Stove programmes should concentrate on financial reality along with meeting expectations – i.e. the cost-benefit balance.

2.2.4 Putting People First

Stove programmes are often technology-driven, and fail to take into account alternative means of reaching the prime objectives, such as improving house construction and maintenance, providing training for stove users, and better stove maintenance. The users of the stoves – who are usually women – and their views and workloads should also be considered and acted upon. Such information should be incorporated in the programme design phase. Likewise, stove promoters must know the actual situations with regard to stove use, stove function, fuel use and supply, construction materials, decision-making processes, local manufacturing capabilities, kitchen and living space functions etc. This data should be analysed to reach a coherent picture of needs. At all times, users should be consulted and their views incorporated. User training should also be kept in mind. Stove programme development should be approached step by step, with the direct involvement of the target group (taking into account probable opposing priorities between male and female community members), and wherever possible with the introduction of the concept of recovery of costs.

2.2.5 Improving the Database

The database on biomass energy (and possibly data collection methods) needs to be improved, particularly with regard to specific tasks such as space heating and the energy used for it. Existing information, for instance that given for Pakistan and India, seems to underestimate the amount of energy used for heating, due possibly to faulty methods of data collection. At the same time, biomass energy does not have a high profile, and this often results in its neglect by policy makers due to and causing lack of information and awareness.

The need for data on primary energy sources, process technology, conversion technology devices and energy services was emphasized for planning implementation programmes and for matching energy needs, technology and resources, which is vital to the success of the programmes.

2.3. Technical Session II: The Stove Itself and Its Economics

The morning session of the second day was chaired by Mrs. C Aristanti and coordinated by Dr. A A Junejo. The session started with a presentation by Mr. Koopmans of summaries of the previous day's discussions in order to maintain continuity and not repeat the issues raised

earlier. Seven papers were presented during the second technical session. The following are highlights of the discussions.

2.3.1 Stove Designs

Various types of metal stove are used in the mountainous areas of the region, either produced locally or by commercial manufacturers. Most of these units are two or three pot-hole types. Some additionally offer water heating. Stoves used in the mountains often have combined functions, e.g. cooking and space heating, with the latter frequently being of lesser importance in terms of time, but not necessarily in terms of the amount of energy used. Habit, affordability, complexity of the device and access to maintenance and repair services need to be carefully examined before a device is developed. Stoves should be easy to use and maintain. It was noted that stoves which could take only one size and type of pot and were complex in operation were not accepted by the target communities. Complicated designs and features (e.g. adjustment of dampers) often results in failure to use the stove properly. There may be a need for standardization with regard to testing methods and certification systems for stoves.

2.3.2 Specialization versus Versatility

As has been noted, the stoves currently in use often have multiple and combined functions, e.g. cooking, space heating, lighting, drying, or as a focal point for social gatherings. Improved versions being introduced are often less versatile, and this affects acceptability. Improved stoves must be versatile in function, as well as with regard to fuel, pot size and use (e.g. cooking on high heat, simmering, baking or special food preparations). Space heating stove development is a recent phenomenon and has not been studied in depth before now. The question of whether it is feasible, practical and efficient to develop stoves meant for space heating only must be addressed.

2.3.3 Promote Local Materials and Skills

Stove development must take into account common patterns, types and construction materials of potential users' houses. It must also, clearly, take into account factors like community, ethnic group and altitude. Materials used in stove construction are generally of local provenance, such as clay, stone and brick, and for stoves with a space heating function, these may be less effective. A good deal of indigenous knowledge is available, and this should be tapped in designing stoves.

2.4. Technical Session III: Use of the Stove

The third technical session started in the afternoon of the second day of the workshop, chaired by Mr. G R Shrestha and coordinated by Mr. A Koopmans. Six papers were presented and discussed. The third session continued to the morning session of the third day, chaired by Mr. G U Sarhandi and coordinated by Dr. K Banskota. A case study on ‘Study and Documentation of Stoves for Cooking and Space Heating’ was presented by Mr. K M Sulpya and Prof. B Bhadra. The following are the issues raised during the ensuing discussions.

2.4.1 Minimize Health Hazards

Mountain people, in particular women and children, often spend long hours near stoves situated in confined spaces. The negative aspects of smoke and respirable suspended particles – the effects of which become apparent in the long term – should be taken into account and acted upon, which may call for the use of chimneys at all times. There is a need to study the effects of stove interventions not only in terms of energy and time conservation but also from the health angle. The results should be used to provide evidence to policy makers in order to bring about positive change.

Stoves should be designed in such a way that they are safe to use in terms of burns, respiratory diseases, eye problems etc. They should preferably have a chimney (and its use as a heat exchange surface should be considered), though ensuring combustion efficiency may be a useful alternative where chimneys are less desirable, such as in places where importance is attached to smoke as a wood preservative, or are dangerous, such as in houses with thatched roofs or low kitchen ceilings. Protective add-ons for stoves should be provided where safety from burns cannot be incorporated in the stove design, particularly for hot surfaces on heating stoves.

2.5. Group Discussions

Following the presentation of papers and subsequent discussions, the participants split into three discussion groups with specific topics, and the results of the discussions were presented in the plenary session.

2.5.1 Group 1: Framework for Policy Formulation

The group discussion on a framework for policy formulation was coordinated by Prof. B Bhadra.

A conceptual framework for policy formulation on stoves, drawn up by the group, is presented in Figure 1 (see page 9).

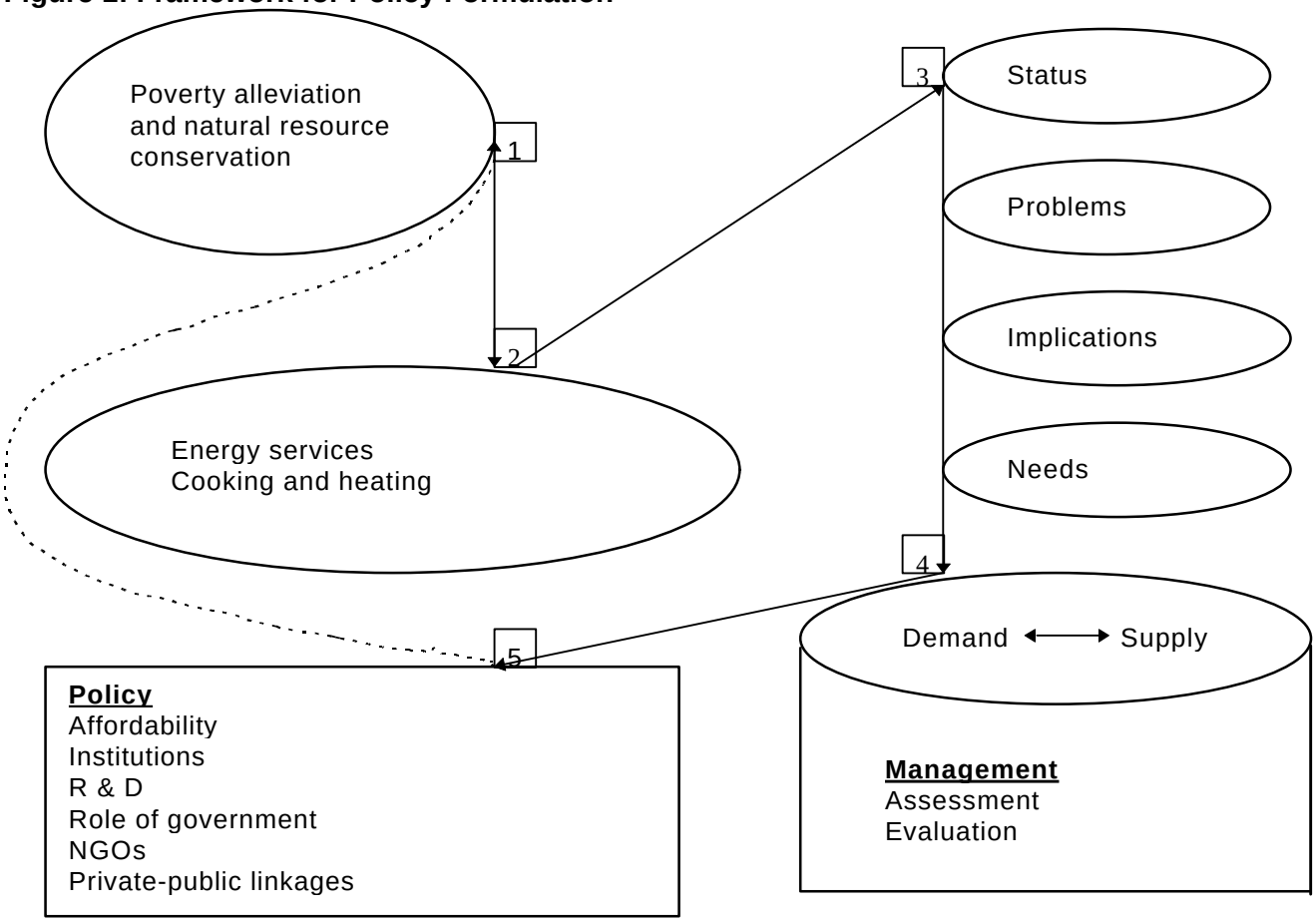
The final goal, which can be at national, local or district level, is defined as alleviation of poverty and conservation of natural resources. It necessitates the provision of both cooking and heating energy services for mountain populations.

This in turn requires an understanding of the status and implications of, need for, and problems associated with improved stove technologies which provide an interface between energy demand and supply. This entails the proper assessment and evaluation of energy services and supply potentials, as well as an understanding of the acceptability of technology in terms of economic, social and cultural considerations. The policy variables which will have a bearing on stove programmes are thus the issues of affordability, institutional capability (role of government, NGOs and private-public linkages) and research and development efforts.

Macro versus Micro Policy Focus

In the context of rural energy needs, environmental problems emanate from poverty. Energy policy should aim at fulfilling basic needs and improving productive capacity. The approach should be oriented to promote indigenous technology and inputs, utilize local institutions, and develop and identify technologies which are affordable for poor people. The technology should not be subsidy driven, but if a subsidy scheme is unavoidable, it should be sustainable from a resource utilization perspective, and phased out as soon as possible. A good example of a stove which has found success without subsidy is the space heating stove introduced in the Mustang area of Nepal.

Figure 1: Framework for Policy Formulation



Indigenization of the Stove Programme

Indigenization of stove programmes is viable if the status, problems, needs and implications are properly understood. In this regard, evaluation of stove technologies is essential. The issue of affordability needs to be examined not only from the perspective of reduction of domestic drudgery for women, but also from that of disposable incomes in the local population. The

provision of subsidy must also be examined from the perspective of the social cost of fuelwood, and this cost must be internalized in the evaluation of stove programmes.

Institutional Aspects

The choice of appropriate institutions is essential in technology dissemination to mountain populations. Community-based organizations with decentralized modes of production may look viable, but research and development activities are always centralized in nature and appropriate linking mechanisms are needed in order to obtain effective feedback. Besides this, technical, economic, social and cultural acceptability is crucial, and assessment of stove programmes should take these factors into consideration. There is a pressing need to strengthen community-based institutions for the dissemination of small-scale technologies, such as stove technologies.

Promote Innovative Approaches

Technology research and development should primarily concentrate on cost reduction. Private and local enterprises should be promoted for innovative research activities. Production and supply of suitable technology is hampered by both weak research and development and the lack of access to institutional credit and marketing linkages in rural mountain areas. The issue of utilization of local material and labour and promotion of local enterprises should be examined against the mass-scale production of technology and its dissemination in mountain areas, so as to capture the benefits of economy of scale.

It was noted that the cost of fuelwood collection does not reflect the social cost of resources, and thus reduces people's motivation to innovate and develop entrepreneurial activities.

Health Aspects

Indoor air pollution due to biomass energy conversion has recently become a major issue. Intervention studies to better understand the health risks associated with inefficient utilization of biomass for space heating and cooking should be initiated. Also, education of the users is important and should form an integral part of stove programme development.

An Integrated Approach

Specific energy planning for mountain areas must be carried out under an integrated approach, so as to provide energy to support basic human needs and also to support economic growth by reducing energy constraints. This approach entails the development of a decentralized planning process, with integration of production and energy sectors, stressing the utilization of renewable energy resources. However, matching of energy resources with energy demand may be achieved with efficient energy technology as an interface between supply and demand. In this process, the role of the private sector must be identified, and that of the government gradually minimized. In the short term, close interaction between these institutions will be essential as each of them possesses skills which may well be complementary, but care must be taken that they do not compete among themselves for delivery of necessary services.

Data Shortages

The lack of available data also places a severe constraint on planning and the adoption of appropriate policies. There is thus a need for improvements in data to reach a better understanding of the primary and secondary energy needs of mountain populations, the types of stoves and choice of fuels available to them, the relationship between heating and cooking needs and the quality of energy services, as well as a socio-economic understanding of the mountain population.

Programme Monitoring and Evaluation

Stove programmes should be monitored and evaluated on a continuous basis, in order not only to evaluate the impact of the programmes but also to aid the development of innovative designs which suit local requirements and available fuel types. The variables that can be considered important from the perspective of policy and needs measurement are: i) time saving for women (i.e. the users); ii) health benefits (reduced respiratory disease incidence, low weight at birth, child pneumonia; savings in fuelwood/trees/forest); and iv) impact on income and employment.

2.5.2 Group 2: Strategies for Technology Transfer

The group discussion was coordinated by Prof. N K Bansal and the findings were as follows:

Even though technologies which save energy diminish adverse environmental impacts and reduce purchase and maintenance costs to consumers are available, other problems exist. A major one is matching energy resources and the energy services required with an appropriate energy technology which can serve as an interface between supply and demand. It is therefore desirable to increase the range of affordable technological alternatives which are available, and this makes technology transfer essential. Efficient energy technologies may not be widely adopted unless mechanisms for their transfer are improved, impediments to their adoption are removed and the issue of affordability is properly addressed.

Programme Focus

Strategies for a heating stove programme must necessarily be different from those for a cookstove programme, because of seasonal and local variation in heating requirements. A heating stove programme should be formulated independently under the general umbrella of the improved stove programme. The success of the cookstove programme has been limited by its being implemented with only a small amount of data on local needs, cooking habits, types of food and fuels. The heating stove programme should overcome this drawback, and should be integrated with other programmes with similar objectives, such as afforestation or rural development programmes.

A Needs-oriented Approach

Local needs for space heating with respect to region, dwelling, occupation etc. should be identified. Designs should be simple and easily acceptable, and, where possible, locally available materials should be used in their construction. Popular participation through CBOs should be ensured. Any accessories or components needed for maintenance should be

available locally (even if they have to be brought in from elsewhere). Back-up services must be established. This means that programmes also generate employment in the community. The technologies and the programmes themselves should be aimed specifically at the target groups. Alternative heat energy sources, including passive designs, should be integrated into the programme. Research on the availability of local materials should be carried out to facilitate the development of appropriate technology.

Institutional Aspects

The programme should be institutionalized, and regional forums made responsible for technology transfer. Transfer of stove designs between countries would be desirable in order to save time and money, as long as they suit local needs. Coordinating mechanisms must be established between various national and international agencies for documentation of existing information, data base and dissemination. International agencies should play a role in this programme, to facilitate technology transfer.

Research and Development

Any necessary design modifications should be undertaken with the help of R & D institutions, though credit should also be given to the originator. New designs may need to be developed to suit local requirements, with R & D an integral part of such development. Portable as well as fixed designs must be developed according to local needs. Specific standard testing methodologies for space heating performance are needed at both regional and institutional levels. Recommendations for dissemination should be made for the most appropriate design or designs only. User participation in the design process must be ensured. Wherever possible, versatility should be a priority in design.

Human Resource Development and Gender Equity

Training programmes at different levels for different designs or uses should be provided in a decentralized fashion. Skilled manpower, with the emphasis on women, for fabrication, installation, and maintenance should be developed through training. Awareness programmes should be developed for policy makers, users and other stockholders.

2.5.3 Group 3: Action Plans for Follow-up Activities and Programme Implementation

This group discussion was coordinated by Mr. Usinger. The principal findings were as follows:
The group recognized the lack of programme dissemination and promotion strategies. If stoves were designed taking full account of the heating and cooking needs of the target communities and the need for saving fuel, this would in turn provide financial benefits to the users besides the health benefits associated with the reduction of indoor pollution. At present, cooking and space heating functions are not seen in the context of the home economics of development. Though firewood is getting scarce and the time spent for its collection has increased substantially, reduction of drudgery for women does not enter into the economic calculus of mountain community households, as those women do not have a say in economic decisions for their households.

Policy Issues

The users' viewpoint on space heating is not represented in the existing improved stoves programme. Too much attention is given to the technical and economic aspects of the programme, while the cultural and social suitability of technologies is being neglected. The decentralized nature of the programme demands local initiatives not donor-driven approaches. There is a lack of institutional coordination and collaboration.

Technology

Indigenous local technologies and knowledge tend to be low on the research agenda, and imported technologies are given undue attention, as laboratory results often indicate that the latter are more efficient. However, these results are unreliable, as they fail to take into account the multiple use aspects of resources and technologies. At the same time, there are almost no credit facilities or training programmes provided for local entrepreneurs and manufacturers in mountain communities. In mountain regions, there are almost no local materials available which are appropriate for space heating stoves, and importing materials increases production costs. However, locally available building materials may well be suitable for reducing heat loss from the building envelope.

Action Plans for Programme Implementation

Localized action plans for space heating stoves should be encouraged. The guiding principle for the introduction of a new technology should be that it must be at least as efficient, healthy and safe as the traditional technology it replaces, and should be, if possible, more economical. Affordable and suitable technologies should be developed and promoted. It should be borne in mind that technical acceptability alone does not guarantee that stoves will be acceptable to mountain people – the devices should also be socially, culturally and economically acceptable. The best way to achieve this is to gear efforts towards improving and upgrading locally available technologies. There is a need for multidisciplinary teams, of technicians, sociologists, health experts and engineers, in research and development.

Coordination and Cooperation

Coordination and cooperation should be encouraged between research and development institutions, implementing agencies and stove users. Integration of multidisciplinary issues and a sectoral approach is essential for stove programme development and implementation.

Programme Components

It is desirable to establish national standards on the cooking and heating efficiency of stoves, allowable emission levels and exposure time in front of stoves, minimum safety standards, and certification procedures. Guidelines for identifying materials for stove production which are appropriate both economically and ecologically are also needed. The development of guidelines for stove programmes should take into account not only technical details but also information on incorporating socio-economic conditions, culture and indigenous knowledge in programme development.

Existing networks at various levels should place greater emphasis on the application of information, database and expert exchange in stove development. Organized training at regional, national and local levels should incorporate both technical and non-technical aspects of stove technology, with special attention given to gender. Manuals should be prepared on the basic principles of development for cooking and space heating stoves. A compendium of cooking and space heating stoves should be prepared.

2.6. Closing Session: Conclusions and Recommendations

This session was chaired by Dr. W Hulscher and coordinated by Dr. K Rijal. The findings of the group discussions were presented by the coordinators of each group. After further discussion, the following conclusions and recommendations were arrived at.

2.6.1 Conclusions

A. The Role of Biomass Fuel for Space Heating

1. Biomass energy is an important source of energy in mountain areas where space heating is required. Some of the reasons for the importance of biomass energy are:

    - It is normally widespread and locally available, though it is often available in a decentralized way;
    - It is often the cheapest available source of energy and its price is normally not controlled;
    - Its use is traditional;
    - Stoves adapted to biomass fuels are widely available and are often locally made at low or no cost;
    - Biomass fuel supplies are normally reliable.

However, at the same time, these fuels are often used in inefficient equipment, resulting in low conversion efficiency. In addition, they are often used in an irrational manner.

2. Although a considerable amount of information is available, there is still a need to improve the database on biomass energy (and possibly data collection methods). This is not only valid in general but in particular with regard to specific tasks such as space heating.

3. At the same time, biomass energy is often viewed at the policy-making level as unfashionable and harmful to the environment. This results in neglect or even suppression by policy makers, which is exacerbated by lack of information on its use, lack of awareness of its importance, etc.

4. Policy making with regard to biomass energy is often done at the macro level, and different emphases are frequently found at the micro level.

5. Other rules and regulations, for example from forest user groups, may have an impact on biomass energy supplies.

6. Due to a general lack of infrastructure and the energy supply situation, options for energy substitution are often not available in mountain areas.

B. On Stoves and Their Use

1. Stoves used for space heating purposes often have multiple and combined functions, e.g. cooking, space heating, lighting, crop and fuel drying and as a focus for social gatherings. Improved stoves designed with only one specific function in mind are generally less versatile than those they replace, and this can result in low acceptability and adoption rates. Stoves should fit in with the expectations of the users – for example, the potential benefits should outweigh the cost of changing stove types.

2. Stoves need to be versatile not only in function but also with regard to fuel, pot size and mode of use (cooking on high heat, simmering, baking, special food preparations, etc.)

3. Although one function of a stove may be less important in terms of time, such a function may have a large influence on energy consumption.

4. Stoves which need frequent adjustment (of dampers etc.) and are of complicated design (making them difficult to maintain) may be abandoned even though they may be functional.

   Many of the local materials used for stove construction, such as clay, stone and brick, are in general less effective for stoves with a space heating function.

6. Non-chimneyed stoves often increase indoor pollution levels.

7. People, in particular women and children, often spend long hours near the stove, which is often located in a confined and insufficiently ventilated space.

8. Improved stove dissemination should fit in with financial rather than economic reality.

C. Stove Programmes and Stove Actors

1. Stove programmes, including those intended for space heating, are often technology and supply-driven.

2. Stove programmes and/or promoters often only look at the stove without taking other options into consideration (improving house construction and maintenance, educating the stove user, better maintenance of traditional stoves etc.).

3. Subsidies used to promote improved stoves often reduce or remove user choice and increase the notion of free goods. This can have a detrimental effect on commercial stove producers as they cannot compete in the free market.

4. The design and promotion of stoves, including space heating stoves, are often based on perceptions and/or incomplete information rather than hard facts.

5. Stove programmes are often implemented on a "stand-alone" basis, with little coordination and integration with other related sectors such as sanitation, housing, home economics and the private sector.

6. In order to identify and disseminate the best stove for a given situation, information should be collected with regard to all related issues, such as present stove use, stove function, fuel use, fuel supply systems, construction materials used and available, local manufacturing capabilities, kitchen and living conditions (including function) and decision-making processes (including the influence of gender).

2.7. Recommendations

A. The Role of Biomass Fuel in Space Heating

1. The use of biomass should not be discouraged as it is locally available, can be environmentally friendly if properly used and its supply can bring employment and provide income.

B. On the Stoves and Their Use

1. It is recommended that stoves (in general, as well as for space heating) be fitted with a chimney in order to reduce indoor pollution.

2. Where chimneys cannot be used, other solutions should be considered, such as chimney hoods. This is particularly important in areas where people make use of smoke for preservation (of food, building materials, etc.), as an insect repellent or for other functions. At all times, efforts should be made to ensure complete combustion of the fuel used.

3. Heat transfer from the stove to the surrounding space should be maximized. Chimneys can be used as heat exchangers and this feature should be considered during installation.

4. Stoves should be designed in such a way that they are safe to use (for everyone involved, including small children) or protective add-ons should be provided, particularly for hot surfaces in heating stoves, in order to reduce the danger of burns.

5. The effect of the use of improved stoves versus traditional stoves should be studied not only in terms of energy and time conservation but also from the point of view of health. The results of such studies should be brought to the attention of policy makers, who should be urged to act upon them.

6. The long term negative aspects of smoke and respirable suspended particles should be taken into account and acted upon in stove promotion programmes.

7. Efforts should be made to document existing stoves used for space heating and to disseminate such information in the form of compendia, manuals, etc.

C. Stove Programmes and Stove Actors

1. Efforts should be made to collect and analyze information with regard to all related topics, such as prevailing stove use, stove function, fuel use, fuel supply systems, construction materials used and available, local manufacturing capabilities, kitchen and living conditions and decision-making processes. Based on the analysis, a needs assessment should be made before stove design begins.

2. At all times, the users of the stoves, in most cases women, should be consulted and their feedback should be considered in any decisions made about stoves, including space heating stoves.

3. Space heating stove programmes should preferably be integrated with other community programmes, such as sanitation, housing and health. A step-by-step approach may have to be used to ensure direct involvement of the target groups, whereby opposing priorities (female/male) should be taken into account.

4. Efforts should be made to standardize space heating stove testing methods and a space heating stove certification system should be established.

5. Full use of available expertise in the field of stoves in general, and space heating stoves in particular, should be made. Women actors, other individuals and private sector should be identified and their expertise incorporated .

6. Stove programmes should try to become self-sufficient, for example the private sector should be involved as soon as possible. During the interim, supply-driven/demand-driven efforts should be made to promote stoves with increasing cost recovery.

7. Besides activities with regard to space heating stove improvements, other options should be studied and considered. These could include the use of passive solar heating, the use of insulating materials and improving building maintenance in order to reduce heat leakage.

8. Use should be made of the available indigenous knowledge and skills.

Clockwise from top left: Model of a wood-fired bukhari (heating stove) from Bhutan; Delegates examine a Chinese coal briquette cooking and space-heating stove with attached hot-water radiator; A stove made by the National Science and Engimeering company, complete and dismantled.

Above: Another view of the Chinese cooking and heating stove produced and sold commercially by the National Structure and Engineering Company, Nepal; Below right: One of the many types of metal cooking and heating stove sold commercially in Nepal.

3. EVALUATION OF THE WORKSHOP

Evaluation was an integral part of the workshop. A questionnaire was used to obtain feedback from 27 participants on the workshop's organization and management, areas that need further improvement in the future, and so on.

The questionnaire also tried to gauge the participants' views on whether the workshop achieved its stated objectives. All participants completed the evaluation questionnaire. However, a few participants did not answer all questions.

3.1. Findings

A. Pre-workshop Information

(I) In responding to questions about the information distributed to participants before the workshop, 89 per cent of the respondents indicated that they had received sufficient information about the contents and goals of the workshop. A few respondents did, however, suggest that the final programme for the workshop, as well as the list of participants, should also be provided to them in advance to help them make better preparations.

(ii) In response to a question about administrative and travel arrangements, 78 per cent of the respondents were satisfied. Some participants did suggest that the complete mailing and street addresses, as well as telephone numbers for hotels and the workshop venue, should be given beforehand.

(iii) Seventy per cent of the participants did not have any suggestions about the handling and delivery of pre-workshop information or about improvement in logistical and administrative arrangements. Approximately 15 per cent felt that they should be informed well in advance (some even suggested three months) about the travel, boarding and lodging arrangements.

B. Workshop Facilities

Participants were asked to comment on a scale of one to ten on the quality of the workshop venue and administrative support. Their responses are summarized in Charts 1 and 2.

C. Workshop Structure and Flow

Participants were asked whether workshop activities were appropriate and useful or inappropriate and not useful. The responses are shown in Table 1.

D. Workshop Objective and Outputs

The participants were asked to assess on a scale of one to 10 whether the workshop had met its overall objective of helping to determine methodologies and formulate specific recommendations concerning the introduction of improved stoves. The response was very positive, as indicated in Chart 3.

A breakdown of how far the workshop was judged to have achieved each of its six anticipated outputs is given in Table 2.

Table 1 Participants' Opinions on the Usefulness of Workshop Activities

Activities	**Not useful**	**Fairly useful**	**Very useful**	**No response**
Display of stoves	4%	67%	26%	3%
Presentations from participants	4%	52%	33%	11%
Group discussion 1	4%	37%	48%	11%
Group discussion 2	--	52%	37%	11%
Group discussion 3	--	48%	44%	8%
Group presentation 1	--	30%	70%	--
Group presentation 2	--	41%	59%	--
Group presentation 3	--	52%	37%	11%

Number of respondents: 27

Table 2 Participants' Assessment of How Far the Expected Outputs Were Achieved

Expected outputs	**Not achieved**	**Partially achieved**	**Achieved**	**No response**
1. State-of-the-art review of the technical, economic and social aspects of stoves used for space heating and cooking by mountain populations	4%	44%	48%	4%
2. Better understanding and realization of space heating requirements forming an integral part of domestic energy services for diverse ethnic mountain peoples living at different altitudes	-	48%	52%	-
3. Better understanding of the health aspects of space heating/cooking devices and the practices of mountain populations	-	26%	74%	-
4. Formulation of a policy framework for the adoption and popularization of suitable space heating and cooking devices for mountain populations	4%	48%	44%	8%
5. Identification of strategies for technology transfer within and among the countries of the region	-	37%	56%	7%
6. Formulation of action plans for follow-up activities and programme implementation	4%	44%	48%	4%

No of respondents: 27

E. Participants' Expectations

The participants were asked to what degree the workshop had met their overall expectations. The feedback is shown in Chart 4.

3.2. Strong/Weak Points and Suggestions for Improvement

The participants were divided into three groups, and each of the groups was requested to discuss and agree on at least three strong or weak points, and to suggest what could be done to improve the weak points. The findings of individual groups are given in the following passages.

Group 1

Strong Points
1. Representation was good: there were representatives from GOs, NGOs and even the private sector.
2. There was complete and timely distribution of papers.

Weak Points
1. There was too little time for discussion due to the number of papers presented.
2. Too much emphasis was placed on technical aspects, and very little on socio-economic aspects.

Suggestions
1. Specific issues/topics should be identified beforehand to avoid confusion and repetition.

Group 2

Strong Points
1. Health aspects were covered.
2. Experiences from different countries were discussed, meaning there was good exchange of ideas.
3. The state of the art was understood.

Weak Points
1. Information on health impacts from exposure to cold were not made clear.
2. Poor information given on space-heating stoves.
3. Information on techno-economics was lacking.

Suggestions
1. Data should be collected to cover the weak points.
2. An action plan should be formulated.

Chart 1: Quality of the Workshop Venue

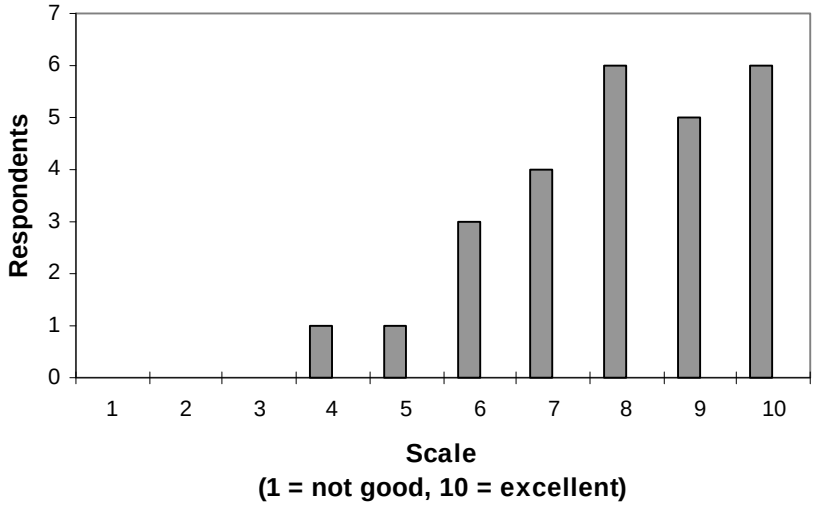


Chart 2: Administrative Support

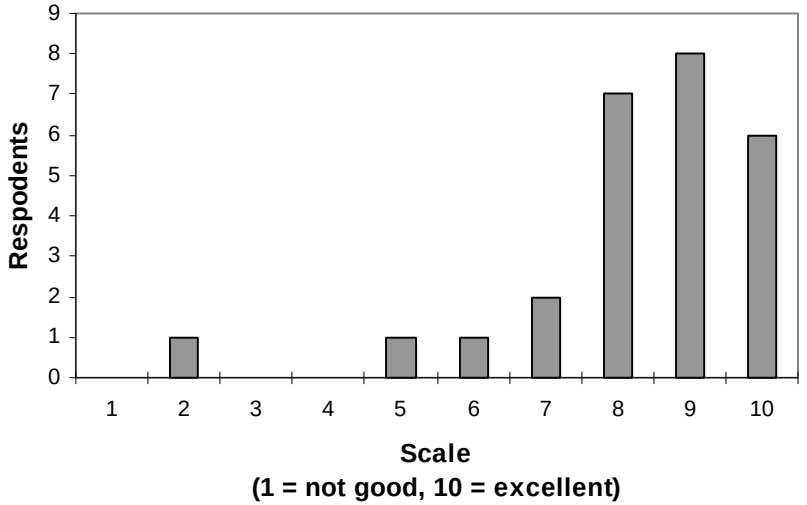


Chart 3: Fulfilment of Workshop's Objectives

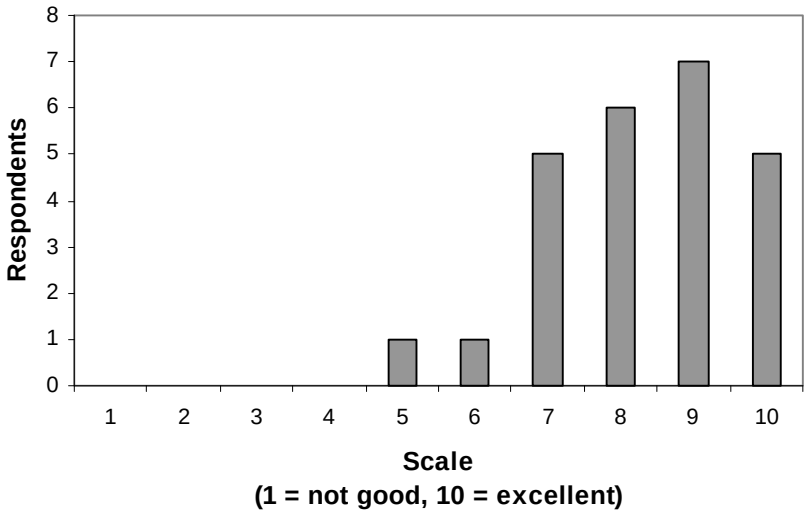
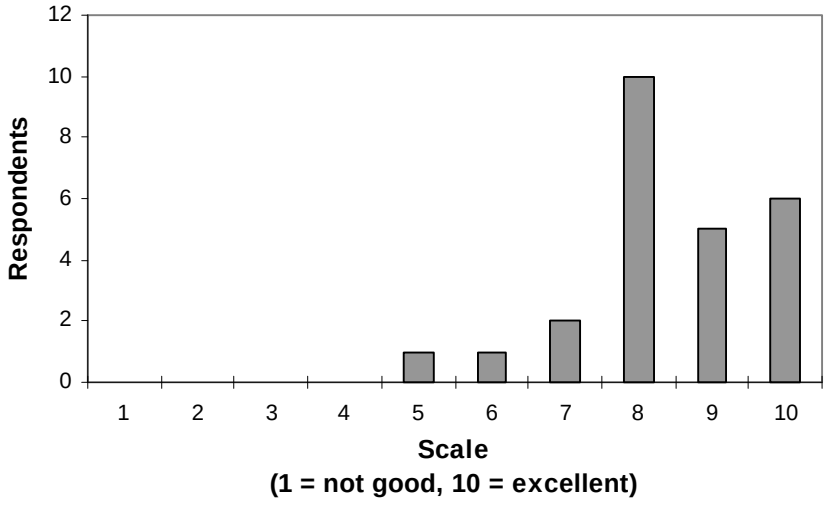


Chart 4: Fulfilment of Participants' Expectations



Group 3

Strong Points
1. There was strong emphasis on health issues.
2. There was good coverage of space-heating stove technology and expertise.
3. There was very good contributions from participants and resource persons.

Weak Points
1. Coverage of indigenous stoves was inadequate.
2. Socio-economic factors/aspects were not well covered in the papers, although they came out during the discussions.
3. Female representation and participation were inadequate.

Suggestions
1. There should be more study of indigenous stoves (e.g. Mustang).
2. Socio-economic, gender and institutional issues need to be examined in greater depth.
3. Studies should be promoted, experiences documented and networking strengthened.

3.3. Conclusions

The workshop was on the whole successful, since all the workshop participants agreed on the importance of and need for cooking and space-heating stove technologies.

An integrated effort from experts from different disciplines was needed to develop, disseminate and encourage the adoption of technologies related to stoves.

Less presentation of papers would allow more time for interaction and exchange of ideas. Thus, allocation of adequate time for discussion on specific issues related to the problems addressed may help to generate desirable outputs.

It is important to study the socio-economic aspects involved in the process of adoption of stove technologies.

An opinion was expressed that a field trip before the formal sessions would have helped to focus discussions on observed, practical field problems.

ANNEX 1: ABSTRACTS OF THE PAPERS PRESENTED AT THE REGIONAL WORKSHOP

Asia Regional Cookstoves Programme (ARECOP): Background and Possibilities

Mrs. Christina Aristanti

The paper discusses the need for a network for the development of improved cookstove programmes in different Asian countries, followed by ARECOP's experience in networking. Ms Aristanti chiefly highlights the present activities and vision of ARECOP. The major components of ARECOP's vision are promotion of activities that integrate multiple needs in an holistic approach, utilization of indigenous knowledge systems, carrying out gender impact analyses, examining the issue of financial sustainability, emphasizing monitoring and evaluation, and the intention to popularize programmes to improve the working conditions within the kitchen, adopting a flexible approach to promote improved cookstoves. The paper also highlights the goals, objectives and activities of ARECOP, along with its national and regional-level initiatives. The paper also examines the possibility of ARECOP collaborating with institutions interested in biomass-based space heating technologies.

Stoves Used for Space Heating at Different Altitudes and/by Ethnic Groups in Pakistan

Mr. Ghulam Umar Sarhandi

Pakistan, with an area of 790,000 km^2, is broadly divided in two regions: North and South. The southern part is mostly plains, where the temperature difference between summer and winter is 10^0C. The North, accounting for 40 per cent of the total land area, has cold weather; where temperature drops below freezing point in winter. The Pakistan Council for Appropriate Technology (PCAT) initially focused its stove programme on the manufacture of improved cookstoves, but with the passage of time demand grew for stoves which might also keep people's houses warm during the winter season. The programme then turned its attention towards addressing this demand and three designs, two of them cooking-cum-space heating and one specifically space heating, have been introduced in the North. The paper discusses organizational experience of PCAT on space heating stoves and provides diagrams and characteristic features.

Cooking and Space Heating Stoves for the Tea Plantation of Sri Lanka

Mr. Lukada Gedara Lamasena

This paper examines the development of improved stove programmes in Sri Lanka and discusses the dissemination strategies adopted by an NGO named Integrated Development Association (IDEA) to promote and popularize improved biomass stoves. It also deals with salient features of ANAGI improved cookstoves, besides discussing the traditional cooking and space heating stoves used by the tea plantation community. IDEA is exploring the possibility of developing a multi-purpose stove suitable for those communities that need it for activities like cooking, space heating and water boiling.

A Multi-purpose Stove for Cooking, Heating, Baking, Drying, etc.

Dr. Surendra Khuntia

This paper explains the technical aspects of the SK-Multi-purpose Bukhari space heating stove developed by the Regional Research Laboratory at Bhubaneswar, India. It also provides the results of the performance evaluation of multi-purpose activities such as cooking, *chapati* preparation, space heating and drying. It claims that 80 per cent of heat energy of the fuel is being utilized for cooking and space heating. The paper also examines the techno-economic feasibility of the stove and concludes that this device can serve as a viable option for multiple household energy applications in mountain areas.

Studies on Stoves Serving Cooking and Space Heating Functions in the Highlands of Vietnam

Ms. Vu Thuy Hang

This paper examines the need for space heating in the highland and mountainous areas of Vietnam and also describes different types of traditional and improved biomass stoves. It chiefly discusses laboratory findings on two types of stove: i) fixed stoves mainly used for cooking and heating; and ii) portable stoves mainly used for heating only. The paper also argues strongly for integrating the construction of improved stoves with the structure of the house in order to maximize the potential benefits.

First Steps in the Implementation of a Heating-cum-cooking Stove Project in the Uplands of North Vietnam

Mr. Nguyen Phu Nghiep, Mr. Tran Ngoc Tue and Mr. Dinh Van Tieu

This paper tries to rationalize the need for space heating of the many ethnic peoples (such as Thai, Muong, Tay, Nung, Dzao and Hmong) living in the mountain areas of northern Vietnam, in particular during the severe cold season. It presents a model of a cooking-cum-heating stove that can be used by these ethnic groups. The authors claim that the design they have developed is made of materials easily available in local markets and can be constructed by farmers after one day of intensive training. The paper describes this model, its cost and the way to build it. In particular, it emphasizes that, under the constraints of limited resources for extension, it is vital to create a group of skilled stove builders who can then build stoves and train the local residents.

Space Heating and Cooking Stove Programmes in Northern Pakistan: A Reflection on Approaches

Mr. Tanveer Ahmad

This paper briefly examines the various stove programmes launched in northern Pakistan for cooking, baking and space heating, with specific reference to the PCAT-FECT project, and cites reasons why these programmes did not achieve their desired goals. It draws out a number of lessons regarding the development and dissemination of biomass-based technologies. Based on these lessons learned, the author concludes that emphasis is needed on developing integrated approaches whereby a number of similar and relevant technologies is developed and offered as a package, rather than focusing on a particular technology, such as stoves for cooking and/or space heating. It also emphasizes that for sustainable technological intervention in rural areas, communities should be organized, trained and involved at all stages of programme development. The author concludes that community organization and social mobilization are key elements and vehicles for all interventions, be they technologies, credit schemes or natural resource management programmes. The author also claims that NGOs like SUNGI and AKRSP have demonstrated these integrated approaches in the northern mountainous areas of Pakistan and suggests that a cooking and space heating stove dissemination programme should be integrated with their existing programme activities.

Status of Improved Stoves in the Northern Areas of Pakistan

Mr. Muhammad Saleem

This paper examines the different types of stoves for cooking, baking and heating that are used in northern areas of Pakistan. These devices are open hearth, tandoor, metal cooking-cum-heating stoves and kerosene oil, natural gas and electric stoves and heaters. The paper provides information regarding their use for heating and cooking during different seasons of the year, highlighting the concern of the communities of northern areas on saving fuel. The author suggests that the stove should be designed in such a way that it can save fuel, reduce smoke, save time and produce sufficient heat inside the house for heating. He goes on to say that in-depth research on a stove to suit local conditions has not been undertaken so far and thus recommends that special attention should be given to it by the agencies involved.

Communities' and People’s Perceptions of Improved Cookstoves in Surkhet, Nepal

Mr. G B Adhikari

This paper examines the merits and demerits of the stove programme launched by the Community Development Resource Centre (CDRC) in one of the rural areas of Nepal with the objective of reducing the health hazards and saving fuelwood. Based on their experience in improved cookstoves, the paper concludes that the present improved cookstove design cannot be installed easily in houses, most of which are small, of low height and have thatched roofs. People also complain of this design's not having the advantage of space heating, which the traditional stoves had. The paper concludes with a quote from a poor woman: 'A simple technology also does not favour the poorer people in the world.'

Possible Application of Down-draft Stoves in Space Heating

Dr. A M Hasan Rashid Khan

This paper examines the operation of traditional stoves in Bangladesh, discusses its disadvantages and suggests modifications, mainly for cooking. It provides measured values of CO concentration in down-draft stoves and suggests the utilization of flue gas in bakery ovens and for space heating purposes, since the outlet temperature of the chimney is around 400 500^{o}C. The paper concludes that stove designs are very sensitive to operation and design variables, and thus wood block sizes and fuel feeding rates play an important role in achieving clean combustion of wood.

Space Heating Comparison of Different Metal Cookstoves for High Altitude Areas

Mr. R Aggarwal and Dr. O P Sharma

The paper begins by pointing out that tribal people experience severe winters between November and March, making space heating a major requirement alongside cooking, which is met by metal cookstoves. The results of different types of metal cookstoves tested for cooking and space heating efficiencies are provided. The results of the comparisons reveal that three-pot cookstove developed by the Technical Back-up Support Unit (TBSU), Solan under the National Programme on Improved Cookstoves (NPIC) and approved by Ministry of Non-conventional Energy Sources (MNES) of the Government of India has cooking efficiency of 24.97 per cent and space heating efficiency of 42.36 per cent, which is higher than the other cookstoves used in the region.

Methods for Testing the Thermal Performance of Cooking/Heating Coal Stoves and Their Evaluation in China

Xiao Mingsong

This paper explains the need for a standardized method of evaluating the thermal performance of cookstoves, and explains the mechanism used in China. It also provides details on testing instruments, installation, testing conditions and procedure. The paper provides the methodology to calculate and evaluate the test results and gives information on the minimum level of cooking and heating efficiency essential for any stove to qualify for sale on the market.

Studies on Cooking and Space Heating Stoves in the Himalayan Range of Bhutan

Mr. Jampel Nidup

This paper argues that space heating is of prime importance in the mountainous region of Bhutan, even for mere survival. It explains the traditional cooking and space heating biomass stoves and the introduction of efficient cookstoves initiated by the Government of Bhutan. The author, being himself a manufacturer of improved stoves, explains the different models and

construction techniques of space heating devices currently marketed in Bhutan. Two main designs are popular, and the price varies from US$ 75 to US$ 300 depending on the quality of construction material used and durability.

Space Heating through Integration of Wood/Charcoal Stoves in Building Design

Prof. N K Bansal and Mr. M S Bhandari

This paper investigates the concept of integrating the kitchen cookstove in the design of the building, for the purpose of space heating, in cold conditions. The exhaust gases from the cookstove flow through a cavity wall, which acts like a chimney. The wall stores the heat and keeps the inside space at a comfortable temperature, provided that heat loss from the building is maintained at 0.5 W/m^2 K, which corresponds to five cm-thick insulation or 80 cm-thick mud wall, for a space volume of 27 m^3 and ambient temperature of between 3.6^o C and 15.5^o C.

The Improved Stove Programme in Bhutan

Mr. Jigmela

This paper provides an account of the stove programme launched in Bhutan by the National Women's Association in 1983 as a means of promoting healthy living in villages. Presently, it falls under the Public Works Division of the Ministry of Communications. The design of the stove is based on climatic conditions and ownership of livestock in any given area. The paper concludes that although the country has not made much progress in the field of space heating technology, the National Stove Project dealing with Improved Stoves has been a success in that the targets were achieved without losing the qualitative standard of the stoves. This programme has also been instrumental in creating awareness of the importance of healthy living and conservation of forest resources.

A Cooking and Space Heating Coal Stove

Mr. Zhang Jianming, Ms. Anh Hongping and Mr. Tiano Yishui

The paper gives the rationale for use of this model in areas with no central heating systems and low temperatures. Technical details of the stove model are provided, and its efficiency highlighted. This model is suitable not only for cooking but also for heating, as a water sleeve and radiators are attached to the system. It has been tested and appraised by experts according to the national standards for domestic cooking and space heating coal stoves.

Stoves Used for Space Heating and Cooking at Different Altitudes and/by Ethnic Groups

Mr. D L Shrestha

This paper provides a brief account of the energy scenario in Nepal, and shows a wood energy imbalance in terms of sustainable supply. The paper examines the trend of development and dissemination of improved stoves, besides providing information on types of stoves in use and

the way they are being used. The construction methods of different types of stove and their operation and maintenance are also dealt with. Lastly, the paper deals with the process of dissemination of space heating stoves and their costs.

Promoting Government-NGO Partnership for Development and for Dissemination of Improved Biomass Stoves in Nepal

Mr. G R Shrestha

This paper gives the current status of improved biomass stoves in the context of Nepal. It also examines the potential for extension of the improved cookstove programme, for which strong partnership between the government and NGOs is vital, along with user education, self-construction of the device and development of local technical skills and institutional capabilities, besides fostering a market-oriented approach for stove dissemination, with the involvement of women as key actors in both decentralized planning and decision making processes. The paper also discusses the role that governmental and non-governmental organizations can play in the development of the ICS programme in Nepal.

Study and Documentation of Stoves for Dissemination and Utilization of Energy-saving Heating Stoves in China

Mr. Z Ming

This paper examines the history and the present status of the improved stove programme in China, besides providing a brief account of rural energy policy enacted by the Chinese government and the organizations involved in disseminating the fuel-saving stoves. At present, 166 million farm households in China either cook their food or warm their houses. With the success of stove dissemination in rural areas, this programme is being extended to the kitchens of government organizations, schools, hospitals, restaurant and hotels. The plan for the future is that these improved stove technologies will be manufactured and marketed by the producers and that the government will gradually withdraw from the programme.

Study and Documentation of Stoves for Cooking and Space Heating at High Altitudes in Nepal

Mr. K M Sulpya and Prof. B Bhadra

This paper examines the technical, economic and socio-cultural aspects of biomass-based space-heating technologies in selected mountain areas of Nepal, besides reviewing the history of improved stove programmes. It also provides sketches of different types of devices being employed in those areas. The water boiling and average cooking tests on various types of space heating stoves were analysed, and efficiency was found to range between 8.9 per cent and 20.7 per cent. Space-heating efficacy was measured in terms of rise in room temperature which ranged between five and 10^{o}C, depending on the device. It is concluded that open fires provide more heat to raise room temperature. This paper also examines the economics of using wood as a source of energy and the possibility of substitution with other energy forms. It

discusses the social aspects of using stoves, with particular emphasis on gender equity and on people's attitudes towards the stove, besides explaining the prevailing barriers for stove programme development and the desired institutional support and linkages for the success of the programme.

Promotion and Diffusion of Energy Technology in Mountain Areas: Issues and Options

Dr. K Banskota and Dr. K Rijal

This paper begins by highlighting the failure of improved cookstoves programmes in mountain areas, and attributes it to misconceptions with regard to technology and to people's needs. It explores the energy needs of mountain communities, giving the case of Ghandruk as an example. An attempt is made to provide a framework for the promotion of biomass energy technologies in mountain areas. The main components of the framework, identified and illustrated with example cases of space heating stoves, are: i) matching energy needs, technologies and resources; ii) factors promoting technical and economic acceptability; iii) factors promoting socio-cultural acceptability; and iv) creating a conducive institutional and policy atmosphere. The paper also claims that appropriate matching of energy needs with energy resources, using technology as an interface, requires a series of steps, such as understanding socio-economic and spatial dimensions; identifying energy needs; screening technological options; matching technologies with needs and the resource base; and ensuring complementary investment.

Stove for Space Heating and Cooking in Mountainous Areas of the Northern Philippines

Mr. John F Malamug

The paper opens with an introduction to the government-established Affiliated Non-conventional Energy Centres (ANEC), under the Department of Energy's Non-conventional Energy Division NCED), which oversee implementation of the government's Rural Energy Policy and link the NCED with grassroots and extension agencies to promote and commercialize non-conventional energy systems. The paper then describes the mountainous Cordillera Administrative Region, the region's population and the typical domestic arrangements of the Cordillerans. Kitchens are always indoors, and serve as social centres for the house. Stoves are generally wood-burning open fires or three-stone fires, and in both the morning and evening they are kept burning for extended periods in order to provide heat for the gathered family members and for cooking. Two to three kilogrammes of wood is normally consumed during each of these periods. Although numerous cases of respiratory disease have been found among users of the stoves, no serious study has been made to establish a direct link between the stoves and the medical problems. The paper concludes that until more efficient stoves and more effective dissemination strategies are developed, the Cordillerans are likely to continue using the traditional stoves.

Health Effects of Domestic Smoke Pollution

Dr. M R Pandey

Indoor air pollution from biomass-burning stoves in rural areas of developing countries has been recognized as a serious problem. The suspended particles, carbon monoxide, nitrogen oxides, formaldehyde and other organic compounds found in biomass smoke, often combined with poor ventilation, have been linked with low birthweight, eye problems, respiratory disease and cancer. Respiratory disease is the biggest cause of morbidity and mortality in the developing world, according to WHO statistics. More detailed descriptions of its forms and incidence is given. Women users of biomass stoves seem to be badly affected.

ANNEX 2: PROGRAMME OF THE WORKSHOP

URBAN TRAINING CENTRE, BHIM KALI, POKHARA, 12–16 FEBRUARY 1996

11 February 1996

Registration of participants, Hotel Kantipur, Lake Side, Pokhara

12 February

Morning
Inaugural Session

- Introduction to the workshop, by Dr. K Rijal, Energy Specialist, ICIMOD
- Welcome address, by Mr. Egbert Pelinck, Director General, ICIMOD
- Address by Dr. W Hulscher, Chief Technical Adviser, FAO-RWEDP
- Inaugural address by the Chief Guest, Mr. Mahadev Gurung, District Chairman, Kaski District
- Vote of Thanks by Mr. A Koopmans, FAO-RWEDP

Display of Space Heating Devices by Manufacturers and NGOs
Technical Session I: The Stove Programme

Chairperson: Dr. M R Pandey; coordinator: Dr. T S Papola

- Introduction of the participants
- 'Asia Regional Cookstove Programme: Background and Possibilities', Mrs. Christina Aristanti
- Discussions

Afternoon

Technical Session I continued

Chairperson: Prof. (Dr.) N K Bansal; coordinator: Dr. A A Junejo

- 'Promotion and Diffusion of Energy Technology in Mountain Areas: Issues and Options', Dr. Kamal Banskota and Dr. Kamal Rijal
- 'Stoves Used for Space Heating at Different Altitudes and/by Ethnic Groups in Pakistan', Mr. Ghulam Umar Sarhandi
- 'Cooking and Space-heating Stoves for the Tea Plantations of Sri Lanka', Mr. Lukada Gedara Lamasena

- Discussions
- 'Stoves Used for Space Heating and cooking at Different Altitudes and/by Different Ethnic Groups in Nepal', Mr. D L Shrestha
- 'The Improved Stove Programme in Bhutan', Mr. Jigmela
- 'Promoting Government-NGO Partnership for Development and for Dissemination of Improved Biomass Stoves in Nepal', Mr. G R Shrestha
- Discussions

13 February

Morning
Technical Session II: The Stove Itself and Its Economics

Chairperson: Mrs. Christina Aristanti; coordinator: Dr. A A Junejo

- Review of the previous day's discussions, by Mr. A Koopmans
- 'Space Heating through Integration of Wood/Charcoal Stoves in Building Design', Prof. (Dr.) N K Bansal and Mr. M S Bhandari
- 'Studies on Stoves Serving Cooking and Space Heating Functions in the Highland of Vietnam', Ms Vu Thuy Hang
- 'The Cooking and Space Heating Coal Stove', Mr. Zhang Jianming, Ms Anh Hongping and Mr. Tiano Yishui
- Discussions
- 'Study and Documentation of Stoves for Dissemination and Utilization of Energy-saving Heating Stoves in China', Mr. Zhu Ming
- 'Methods of Testing the Thermal Performance of Cooking/Heating Coal Stoves and their Evaluation in China', Mr. Xiao Mingsong
- 'Studies on Cooking and Space-heating Stoves in the Himalayan Range of Bhutan', Mr. Jampel Nidup
- 'Space Heating Comparison of Different Metal Stoves for High Altitude Areas', Mr. R Aggrawal and Dr. O P Sharma
- 'Possible Applications of Down-draft Stoves in Space Heating', Dr. A M Hasan Rashid Khan
- Discussions

Afternoon

Technical Session III: Use of the Stove

Chairperson: Mr. G R Shrestha; coordinator: Mr. A Koopmans

- Slide presentation by Dr. S Khuntia: 'A Multi-purpose Stove for Cooking, Heating, Baking, Drying, etc.'
- 'The Status of Improved Stoves in the Northern Areas of Pakistan', Mr. Muhammad Saleem
- 'First Steps in the Implementation of a Heating-cum-cooking Stove Project in the Uplands of North Vietnam', Mr. Nguyen Phu Nghiep, Mr. Tran Ngoc Tue and Mr. Dinh Van Tieu
- 'General Problems and Principles in Improving Heating Systems', Mr. J Usinger
- Discussions
- 'Health Impacts Due to Biomass Burning', Dr. M R Pandey
- 'Space-heating and Cooking Stove Programmes in Northern Pakistan: A Reflection on Approaches', Mr. Tanveer Ahmed
- 'Stove For Space Heating and Cooking in Mountainous Areas of the Northern Philippines', Mr. John F Malamug
- 'Communities' and People's Perceptions of Improved Cookstoves in Surkhet, Nepal', Mr. G B Adhikari
- Discussions

14 February

Morning
Technical Session III continued

Chairperson: Mr. Ghulam Umar Sarhandi; coordinator: Dr. Kamal Banskota

- Review of the previous day's discussions, by Mr. A Koopmans
- 'Study and Documentation of Stoves for Cooking and Space Heating at High Altitudes in Nepal', Mr. K M Sulpya and Prof. (Dr.) Binayak Bhadra
- Discussions

Formation of Working Groups

Group I: Framework for Policy Formulation
Group II: Strategies for Technology Transfer
Group III: Action Plans for Follow-up Activities and Programme Implementation

- Working group discussions

Afternoon

- Working group discussions (continued)

Closing Session

Chairperson: Dr. W Hulscher; coordinator: Dr. Kamal Rijal

- Presentation of group findings and discussions
- Evaluation of the workshop
- Presentation of conclusions and recommendations
- Video presentation by ACAP

15–16 February

- Field Trip to Ghandruk

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ANNEX 4: WELCOME ADDRESS

Mr. Egbert Pelinck, Director General,
International Centre for Integrated Mountain Development (ICIMOD)

Respected Chief Guest Mr. Mahadev Gurung, Chairman of Kaski District
Distinguished Guests, Participants and Colleagues,

Ladies and Gentlemen,

It is my great pleasure to welcome you all here today on behalf of the FAO-RWEDP and ICIMOD. I am particularly grateful to Mr. Mahadev Gurung, District Chairman of Kaski, for being with us here this morning as our chief guest. His presence is indicative of the importance that Pokhara attaches to foreign delegates and the close relationship ICIMOD enjoys with local institutions in the Hindu Kush-Himalayan region.

I would like to express sincere appreciation to the 25 international participants, from the HKH region and beyond, who have made the effort to come to Pokhara. I am certain that you share the concerns of ICIMOD with regard to improving the living standards of the mountain people, and we are proud to facilitate this opportunity for you and your Nepalese colleagues to share your concerns and make your contributions towards enhancing the mountain focus of energy technology interventions. I am also very grateful to the participants from the private sector who have made it possible for us to see different types of space-heating stoves on display.

It is also a personal satisfaction for me that in my present capacity I can work together with the RWEDP, with which I was associated in 1992-93. And through RWEDP, I would like to thank the Government of the Netherlands for its support to the RWEDP, which makes this particular workshop possible.

Allow me to briefly highlight ICIMOD's activities in the energy sector. From its inception, ICIMOD has concentrated on the key issues of rural energy in the mountains. It took part in a series of rural energy planning studies and implemented a project that developed methods of rural energy planning and management and trained district-level officials in this field. An important mountain-specific source of energy is hydropower, and ICIMOD has carried out several assessments and training programmes that have focused on strengthening national capabilities for planning, design, construction and management of mini- and micro-hydropower schemes. ICIMOD has collaborated with 18 national institutions in the region and has established a strong regional network in this field.

ICIMOD is presently in the second year of implementation of its four-year Regional Collaborative Programme for the Sustainable Development of the Hindu Kush-Himalayas. The main objective of this programme is to contribute to poverty alleviation and environmental stability by focusing on three thematic areas: mountain farming systems, mountain natural resources and mountain enterprises and infrastructure. Within this overall programme we have identified the following activities for the Energy Sub-programme of our Mountain Enterprises and Infrastructure Division:

- Analysis of present energy-use patterns, technologies, policies and management systems;
- Development of energy scenarios for the future and identification of desirable mixes of systems based on sustainable use of available energy resources in mountain areas;
- Development of energy-planning guidelines for mountain areas;
- Evaluation/assessment related to sustainable use and development of specific energy resources available in mountain areas, focusing on wood, hydropower, biogas and solar energy.

Within the Mountain Farming Systems Division, a major sub-programme of relevance to this workshop is our Gender and Development Programme. There seems to be hardly any other topic of more direct relevance to women than energy. The human energy needed for women to collect fuelwood and the wood energy that is used for cooking food and heating the house is enormous. And still, despite 20 years of discussions, the majority of mountain women are in desperate need of drudgery-reducing technologies such as efficient wood stoves. This has become increasingly important due to the large scale migration of men from the mountains and hills to urban centres, the plains and even abroad. And within ICIMOD's third thematic division, the Mountain Natural Resources Division, various activities in community forestry and rehabilitation of degraded lands work towards a continuous flow of fuelwood for mountain inhabitants.

As all of us know, the demand for energy differs between mountain communities, with variations in the level of natural resource endowment, patterns of technology diffusion, and mountain specificity. Thus the problems faced by mountain communities, as well as the solutions available, are unique in nature and dimension. For example, while biogas is proving to be a viable option for household energy in Nepal, up to 1,500 m above sea level, it is not feasible at higher altitudes.

I personally believe that this forum will provide us with an opportunity to discuss the issues and options available to us with regard to a better understanding of the nexus between human development and technology.

At this point, allow me, however, to remind ourselves that technology is not an end in itself but a means to achieve sustainable human development. For this, we need to think and operate within a broader framework of social engineering rather than present our viewpoint from the narrow perspective of technological engineering. We need to understand the energy needs of the mountain people in the right context. The development and provision of energy should not be considered only as a means of fulfilling the basic needs of mountain communities but should also include their rights to lead better and healthier lives. This may even include the promotion of trade in fuelwood, thereby providing an opportunity for poor villagers to enter into the monetary economy, an aspiration now widely shared by the people of the Hindu Kush-Himalayas.

We at ICIMOD are always keen on learning about issues that have a bearing on the sustainable livelihoods of the mountain population. The topic chosen for deliberation in the three days ahead of us has direct bearing on the day-to-day domestic needs of the millions of people living within the HKH region, and particularly on the needs of those living at higher altitudes.

In this connection, it is particularly interesting to note that the useful energy required for space-heating activities in mountain areas exceeds 60 per cent of the total energy consumed, whereas the cooking energy requirement only amounts to around 30 to 40 per cent. Supply-oriented approaches to satisfying mountain populations' energy needs have led us to consider the energy needed for cooking as the primary requirement of rural households; as a result, most interventions up until now have been designed to increase the efficiency of pot utilization.

And, as in many other aspects, mountain people have been neglected even in the context of cooking stove design. As a result, space heating has never figured prominently in the energy calculus. It is only recently that we have begun to realize the importance of space heating and moved towards a better understanding of the technological options that are available for space heating in and around the HKH region.

This has been partly triggered by the tourism industry trying to provide foreign tourists with some comfort. However, it is not just the concern with tourists' comfort that has brought us together. Inefficient methods of space heating are taking a huge toll on our natural resources as well as on our health. Tomorrow, as mountain people experience higher incomes, the demand for space heating will increase, as has happened in so many other temperate areas. Rich experiences from other areas need to be carefully scrutinized so that we can promote efficient and culturally acceptable technologies without over-exploitation of limited natural resources. This is what sustainable development is all about.

When we think about space heating in mountain communities, it is also important to keep in mind the role that orientation towards the sun and insulation of buildings will play. I am sure that during the following three days we will be able to find a common interest around which we can all collaborate to design an effective framework for technology transfer, formulate action plans for future initiatives, and maintain partnerships for space heating. I am confident that this meeting will provide these outputs.

A two day field-trip will allow you to get acquainted with the hardships that mountain people face, the pristine beauty that tourists favour and a village economy in transition, using a mountain-specific source of energy and introducing new efficient technologies.

I would once again like to welcome you all to Pokhara and I hope that you have a memorable stay here. Thank you!

ANNEX 5: ADDRESS

Mr. W S Hulscher, Chief Technical Adviser,
FAO-Regional Wood Energy Development Programme

Respected chief guest Mr. Mahadev Gurung, chairman of Kaski District,
Distinguished guests, participants and colleagues,

Ladies and gentlemen,

I feel delighted and privileged indeed to attend the opening of this regional workshop on Stoves for Space Heating and Cooking at Different Altitudes and/by Ethnic Groups. It is my pleasure to say a few words on behalf of the FAO Regional Wood Energy Development Programme in Asia.

First of all, I would like to express my gratitude to the Government of Nepal for cooperating with the FAO and the RWEDP, and for hosting our present activity. Nepal is an active and important member of the RWEDP, and we have had numerous interactions between RWEDP and delegates from Nepal in regional expert consultations, workshops, etc. Also, two well-established organizations in Nepal have undertaken pilot studies within the framework of the RWEDP, and some of the results will be presented in this workshop. What is more, I think all of us feel well accommodated in this beautiful place, Pokhara, and enjoy being in Nepal.

Further, I would like to express my appreciation and thanks to the International Centre for Integrated Mountain Development, ICIMOD, for cooperating with us in organizing this workshop. Mr. Pelinck, as the previous chief technical advisor of the RWEDP, you know the Wood Energy Programme very well, and thanks to your efforts in the past, the present programme has a bright scope for further wood energy development in the entire Asian region. We know you are now heavily occupied as the director general of ICIMOD, I think with great success, as ICIMOD is doing very well. Whenever you have time to visit the RWEDP again in Bangkok, we will be most obliged!

The preparations for the present workshop have been taken care of in an excellent way by ICIMOD, in particular by Dr. Kamal Rijal, Energy Specialist at ICIMOD. The good cooperation between Dr. Rijal and Auke Koopmans, wood energy conservation specialist at the RWEDP, has resulted in an innovative concept and programme, appealing to many knowledgeable participants from the region. Dr. Rijal, I feel fortunate to have interacted with you on many previous occasions, at Twente University and ITC in the Netherlands some 10 years ago, and I am delighted our new responsibilities bring us together again.

It may be relevant to mention here that ICIMOD and the RWEDP are developing plans for further collaboration. Wood energy issues are prominent in mountain regions in various ways. Not only the issues of good fuel use are at stake, but also issues of wood energy resource and their sustainability, and, furthermore, important aspects of data, planning and policy-making with regard to wood energy.

I hardly need to emphasize for the present audience that wood and biomass energy serve many people, not just in rural areas, where most of the people in the region live, but also in towns and cities. In fact, in many countries in Asia, wood and biomass energy are bigger energy suppliers than coal, oil or hydropower. This is not always appreciated by decision makers, who frequently focus on large-scale investment in new energies only. However, wood and biomass fuels constitute important sub-sectors of the region's national economies. Why, then, are wood and biomass often not given the attention they deserve, or even overlooked?

I can think of a few reasons, which may apply to a greater or lesser degree to individual cases.

First, it was for a long time taken for granted that wood and biomass fuels were always available, as people could just take and use what they needed. I think that, by now, we know, or at least should know, that this is no longer true in most parts of Asia.

Second, I have observed that many people believe that wood and biomass are phasing out as fuels. It is true that, in absolute terms, the share of traditional energies in national energy balances is decreasing, mainly because use of oil, coal and gas is increasing at a fast rate in many countries. However, RWEDP has data, and other agencies also have similar data, showing that in absolute terms the consumption of wood and biomass fuels is still increasing. The reason, of course, is mainly the population growth that is taking place in most countries. Let us be very clear that wood and biomass fuels are not phasing out. On the contrary, we can state safely that wood and biomass energy will remain with us for many decades to come.

A third reason may be that, at first sight, there seems to be little glamour or reward involved in working in wood and biomass energy. Opening a new refinery, inaugurating a big new hydro-power dam and installing a new high-voltage power transmission line are usually considered more spectacular than, for instance, reporting that a number of villages have acquired new cookstoves, even when the latter substantially improve quality of life and the health of thousands of rural people.

There may be more reasons why people tend to overlook the importance of wood and biomass fuels, but, really, there is no need to elaborate on them here, in this workshop. The very presence of so many delegates from RWEDP member countries, as well as from Nepal as host country, illustrates that the experts gathered here do not support these attitudes or misconceptions. I am gratified that all of you share with the RWEDP an appreciation of the importance of wood and biomass energy.

Ladies and gentlemen, so far I have referred to wood and biomass energy in general. However, this workshop is focusing specifically on stoves for space heating and cooking at different altitudes. This is a problem area which seems so far to have been undervalued. We know of many activities and programmes which address improved cookstoves and the problems of their dissemination. Sometimes, but not always, the multiple functions of stoves are incorporated in these activities. However, it may be that the space-heating function has never been placed in the forefront, even though we should be aware that in some parts of the world this function may be paramount. Therefore, I consider the focus of the present workshop very timely and proper. I am keen to learn more from the results of your deliberations.

Ladies and gentlemen, I would like now to say a few words about the FAO-Regional Wood Energy Development Programme in Asia.

Some of you may know that the RWEDP has already been operational already for many years: namely since 1983. The RWEDP is located in Bangkok, and is generously funded by the Government of the Netherlands. In 1994, the third phase of the programme was started. This phase is a substantial programme lasting five years, in which 15 Asian countries participate. Altogether, these countries are home to more than half of the world's population, and most of them are woodfuel users. The thrust of the present phase is two-fold:

Firstly, there is consolidating the achievements of the past by disseminating the results and findings to many more people. That means training, workshops, expert consultations etc., both regionally and nationally. It is our aim to have trained more than 2,000 people in various aspects of wood energy development – namely staff from governments and NGOs, as well as private sector organizations. Many valuable results from previous studies are still not familiar to many people who could benefit from them.

The second thrust is to initiate and support strategies to engage more systematically in wood energy policies and planning. In most countries, efforts have been made by governments and NGOs to relieve pressure on wood energy. However, this has often been by small and scattered projects. In many cases, a larger framework of policy and planning was lacking. The present phase of RWEDP aims to assist the member countries firmly to incorporate wood energy into national and sub-national energy planning. This can, of course, only be successful through cooperation between energy planners and experts from forestry departments, who have the expertise and background in wood resources. Cooperation should also be established with departments concerned with agriculture, rural development, gender and other relevant matters.

When I refer to RWEDP, I refer basically to three areas of specialization. These are wood energy resources, wood energy conservation, and wood energy planning. They are all represented in the Regional Wood Energy Programme and they are all essential. You will appreciate that the specialisms are not only of a technical nature, as many socio-economic aspects are closely intertwined with wood energy development. I mentioned already the many people who earn a living in the wood energy business. There are also the numerous people who depend on cheap woodfuels, which they can hardly obtain these days.

In wood energy development, we must aim to strike a delicate balance between policies for basic needs satisfaction, environmental concerns, employment and income generation, balanced rural-urban growth and other related policy areas. Altogether, it makes wood energy development a complex and challenging subject.

The present regional workshop is fully funded by the RWEDP. Several more regional and national workshops or consultations in related subjects are to follow in due course with full or partial support from the RWEDP. Plans will be made by the RWEDP, in cooperation with the member countries, on the implementation of national workshops.

Furthermore, apart from the named workshops, the RWEDP is also preparing for a number of regional and national courses on wood energy planning and wood energy resources, and for related activities. The many invitations and communications to our focal points and to the FAO representatives in the member countries are evidence that RWEDP is a very lively and active regional programme.

Ladies and gentlemen, last but not least, I would like to express my thanks to the FAO representative in Nepal for facilitating this workshop, along with many other RWEDP-related activities.

I wish you all a very pleasant and fruitful workshop. Thank you!

ACRONYMS

ACAP	-	Annapurna Conservation Area Project
AKRSP	-	Aga Khan Rural Support Programme
ANEC	-	Affiliated Non-conventional Energy Centre
ARECOP	-	Asia Regional Cookstoves Programme
ARI	-	Acute Respiratory Illnesses
BCSIR	-	Bangladesh Council for Science and Technology Research
CAAERP	-	Chinese Academy of Agriculture Engineering Research and Planning
CBO	-	Community-based Organization
CDRC	-	Community Development Resource Centre
CEDA	-	Centre for Economic Development Administration
CRT	-	Centre for Rural Technology
COLD	-	Chronic Obstructive Lung Diseases
DCS	-	Development Consulting Services
DESP	-	Domestic Efficient Stove Programme
FAO	-	United Nations Food and Agriculture Organization
FECT	-	Fuel Efficiency Cookstove Technology
GO	-	Governmental Organization
GTZ	-	Deutsche Gesellschaft fur Techische
HKH	-	Hindu Kush-Himalaya region
ICIMOD	-	International Centre for Integrated Mountain Development
ICS	-	Improved Cook Stove
IDEA	-	Integrated Development Association
MEI	-	Mountain Enterprises and Infrastructure
MNES	-	Ministry of Non-covenventional Energy Sources
NGO	-	Non-governmental Organization
NPC	-	National Planning Commission
NPIC	-	National Programme on Improved Cookstoves
PCAT	-	Pakistan Council for Appropriate Technology
RWEDP	-	Regional Wood Energy Development Programme
R & D	-	Research and Development
TBSU	-	Technical Back-up Support Unit
TU	-	Tribhuban University
WECS	-	Water and Energy Commission Secretariat