

Critical Issues

The Main Discussion

- Session I: Sustainable Development of Mountain Areas:
Restoring the Environment and Combating Poverty
- Session II: Sustainable Mountain Farming Systems
- Session III: Rangelands and Grasslands and Control
of Desertification
- Session IV: Management of Mountain Watersheds and
Forest Resources
- Session V: Sustainable Use and Conservation of
Biodiversity
- Session VI: Natural Hazards and Disaster Management
- Session VII: Women and Mountain Development
- Session VIII: Review of Selected Mountain Development
Processes and Opportunities

Session I: Sustainable Development of Mountain Areas: Restoring the Environment and Combating Poverty

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If there is any ecosystem that is most severely threatened by the challenges of economic, environmental, and cultural survival, it must be the mountain areas. Despite the large differences in the biophysical and sociocultural environments of mountain areas, the rampant poverty and the difficulties encountered in its reduction appear to be common ailments afflicting almost all mountain societies. Whether it is in the arid mountains of West and Central Asia or the cold mountain areas of Russia, the Hindu Kush-Himalayas or the uplands of South East Asia and the Pacific, mountain people seem to be not only relatively worse off than their respective plains' inhabitants, but also, in most cases, development forces have either bypassed them or have not succeeded in making their living conditions less difficult. The exceptions are few.

Mountain farmers are having to eke out a living for their increasing numbers from small plots of sloping agricultural lands that are losing soil fertility and valuable topsoil. The burden on their womenfolk and children to manage the difficult agricultural work has increased as able-bodied male members are forced to search for incomes outside their farms and villages. The story with mountain pastoral groups is not very dissimilar as degrading pastures and ranges also reduce traditional sources of food supply. Upland people practising various types of shifting cultivation are also reducing traditionally-maintained fallow periods and are clearing more forest lands to compensate for losses in food supply. Forests throughout the warmer mountain areas have been a major safety valve so far, but these are also coming under relentless pressure from both mountain dwellers and lowlanders. Unfortunately, development forces have been highly insensitive to mountain conditions and have also contributed to these problems, often guided by priorities different from those directly benefiting mountain people and mountain environments.

Barring a few exceptions, environmental problems such as increasing loss of topsoil, deforestation, water shortages, flash floods, and degradation of large tracts of agriculture, forest, and pasture lands have increased over the years in almost all the mountain areas of Asia. While it is well known that natural hazards are common in mountain areas, population pressure, poverty, and development activities are forcing people to move into high risk zones, increasing their vulnerability to many of these naturally-occurring events.

The stagnant nature of mountain farming systems has been one of the major causes of poverty. A major challenge for reducing both poverty and pressures on the environment is therefore to transform a stagnating mountain agriculture into a dynamic one by systematically identifying and developing comparative advantages in different agro-climatic belts on a sustainable basis. There is scope for increased productivity in the agricultural sector, but there is little scope for increasing the area cultivated. Prospects for productively employing the rapidly increasing population in traditional agricultural activities are not encouraging. This is the stark background against which the importance of generating off-farm employment emerges so clearly, and even here the prospects appear to be very difficult.

At present, there is no escaping the fact that a rapidly growing population in many mountain areas is exerting pressures on available natural resources; pressures that exceed the physical carrying capacity and the scale of the economy. This is equally true for ranges, grasslands, mixed farming areas, and those under shifting cultivation. While physical carrying capacity is subject to change through technological improvements and investments in real capital, these "gains" from technology and capital formation in mountain areas have been far too limited in magnitude and extent to offset the pressures of a rapidly

growing population. The scale aspects of increasing population-related pressures are already very serious and given present trends will continue to worsen in the future.

Marginality of mountain areas is most evident from the inadequate development attention received by most mountain areas. In the national competition for development resources, mountain areas have been relatively unsuccessful. It is this factor that explains the slow development of basic infrastructure and support services. A major factor that has guided mountain development activities in the past has been the extent to which mountain resources could be exploited for use in the plains.

Limited development efforts in mountain areas have had little impact on poverty and worsened the environmental conditions in many areas because of weak institutions. If there has been a failure to mobilise local community organisations, wherever these have existed, the expansion in central development bureaucracies has also been limited and performing poorly. Stronger local-level development organisations are indispensable for successful management of development activities in view of the various constraints of access and communications. Decentralised and participatory organisational frameworks have been accepted as needed, but efforts to promote these have not been sustained.

Sustainable development approaches must provide a realistic basis for guiding action at different levels of decision-making, without being so costly that the approach becomes unaffordable. This approach will not differ from the past, if substantially more attention is not given to improving the livelihoods of the poor through low-cost, high-yielding, locally-sustainable, people-based solutions to the problems of poverty and resource degradation. Many of the serious problems concerning resource degradation, population growth, and inadequate living standards persist or worsen, not because they are impossible to solve but because they have not yet received the attention needed. The three important natural resources for villages are land, water, and forests. The continuing degradation of these resources has adversely affected food security, the economic conditions of the village, and the biodiversity of the environment. It is, therefore, very essential that village communities are supported to undertake activities for protection, conservation, and improved management of these natural resources.

Studies have shown the need for strong policies on both the demand and supply side. Demand management plays a crucial role in the short- and medium-term in reducing the pressures on resources, while supply management has an important role in the medium- and longer-term perspective. Macro-policies must emphasise both of these aspects in order to ensure that the mountain areas begin to move towards a path of sustainable development.

Discussion

The important issues raised in the context of sustainable mountain development are integration of mountains with the plains, a better understanding of the impact of development programmes on mountain areas, greater sensitivity to mountain conditions, resolving the conflicts of increasing production while maintaining sustainability, and assessing the impact of commercialisation on mountain societies and economies, particularly in terms of greater exploitation of scarce and fragile mountain resources. It was also observed that while the scale aspects of population could not be ignored, more efforts should be directed towards improving and diversifying mountain economic activities on a sustainable basis. Change in mountain areas is inevitable. However, consideration must be given to the type of change most appropriate for different mountain areas. While being sensitive to the diversity of the mountains, there are also important lessons to be learned from common problems. Development institutions need to be far more sensitive to these issues, including the need to ensure that women are not marginalised.

Session II: Sustainable Mountain Farming Systems

The majority of the mountain people continue to depend on farming for their livelihood, and it is very critical to ensure that mountain farming systems are sustainable. Numerous factors have resulted in increasing pressure on farm and environmental resources leading to declining productivity, increasing soil erosion, and loss of natural resources, making it extremely difficult for farm households to meet their growing demands. The challenge of different farming systems throughout the mountain areas is to make them economically viable and environmentally sound. Sustainable options available for different types of farming systems found in the mountain areas need to be carefully examined.

Soil Erosion and Soil Fertility Management - Dr. K. Syers, IBSRAM, Thailand

Different types of physical factors (compaction and crusting, water logging, and soil erosion), chemical factors (nutrient depletion, salinisation, acidification, and pollution), and human-induced factors (deforestation, overgrazing, and over-exploitation) play an important role in soil degradation, depending on the nature of the area. The major cause of unsustainability on steep lands is water runoff and consequent erosion. Such steep slopes occupy a very large area in Asia (35% in Thailand, 63% in the Philippines, 75% in Vietnam, and 87% in Nepal) and are classified as hilly and mountainous areas.

Experiments carried out in different areas using conservation farming practices have indicated that soil loss can be reduced and, in some cases, quite substantially, but the appropriate mix of practices and their impact varied considerably from location to location. Experiments on 20-50 per cent sloping lands in Chiang Rai, Thailand, showed very substantial soil loss reduction when using grass strip and hillside ditches, but little change with agroforestry as compared to farmers' practices. Similar experiments conducted in Chiang Mai on land with 18-40 per cent slopes showed alley cropping to be as effective as grass strips and hillside ditches. Insofar as the role of contour hedgerows in soil erosion control and soil fertility management in sloping areas is concerned, they reduced soil loss and often increased crop yields in the short-term. They also supplied mulch and nutrients and fodder for ruminants. However, there was competition for light, water, and nutrients, and it could accentuate pest and disease problems. Farmers also had difficulties in adhering to this practice on a continued basis. Other practices such as clean weeding with herbicide, legume and grass ground cover, minimum tillage, and hedgerows with clippings' mulch, were also found to reduce soil loss. One of the most important findings has been the critical role of providing additional nutrient inputs in order to make sloping land farming systems sustainable in the long run.

While many issues need to be examined through more systematic and continuing research, several points need to be emphasised regarding soil erosion and soil fertility management in sloping and mountainous areas. In many situations, soil loss can be reduced to acceptable levels and a range of technologies is available. Management of the vegetative cover (living and dead) is critical. External nutrient input is essential to balance losses in runoff, by soil erosion and by crop off take for a system to be sustainable. The potential for and benefits of hedgerows require a more careful evaluation than has been accorded in the past.

Dry Land Agriculture - Dr. M. Saxena, ICARDA, Syria

Large areas of West Asia's uplands can be classified as arid and semi-arid areas consisting of ranges and grasslands with a mix of nomadic transhumance, sedentary, and semi-sedentary agricultural and livestock activities. About 38 per cent of the total population in this region depend on these ranges and grasslands,

where the average rainfall is about 200mm per annum and agricultural activities can be executed for only about 120 days in a year. Livestock raising is the dominant activity with 70 per cent of the sheep, 50 per cent of the cattle, and the bulk of camels depending on these rangelands for natural grazing. Severe degradation of these ranges and grasslands has become a serious problem. Increasing loss of vegetation and soil resources are among the major problems arising out of overgrazing, abolition of tribal control over rangelands, and inadequate attention to the protection and sustainable use of range resources. Efforts are also underway to permanently settle nomadic groups, greatly disrupting traditional lifestyles and resource management practices.

Measures to develop these arid areas have focussed on enhancing biomass output through the use of appropriate drought and cold-tolerant species of animal legumes, bushes, and agricultural crops, including reseeded natural vegetation. Efforts have also been made to increase the levels of nitrogen and phosphate in the soil and reintroduce rotational grazing. As water is a critical constraint in these areas, more efficient local and improved methods of water harvesting have been emphasised.

The sustainable development of dryland agriculture and animal husbandry requires better integration of pasture activities with arable farming, improving soil fertility, more efficient rotational grazing systems, better utilisation of scarce water resources, improving agronomic practices, and reducing population and livestock pressures. In this context, integration of traditional practices, such as regulating herd size based on feed condition, is as essential as the management of modern changes such as improved transportation which by providing greater access to range resources has resulted in greater degradation in the absence of proper management systems.

Shifting Cultivation - Dr. K. Rerkasem, Chiang Mai University, Thailand

Shifting cultivation has been an important feature of the upland areas of East Asia covering parts of Myanmar, Thailand, Vietnam, South China, and the Philippines. Farmers practising shifting cultivation have developed complex and integrated systems to exploit available agricultural and forest resources in their respective environments. These systems, with some common characteristics, have been undergoing substantial changes. Most of the shifting cultivators consist of ethnic minorities. Along with increase in population pressure, deforestation has also been rapid. Traditionally-maintained fallow periods for restoring soil fertility in shifting cultivation has declined in all the countries. Most governments are attempting to permanently settle shifting cultivators through the introduction of paddy cultivation, cash crops, and other development activities. Stronger measures are being introduced to conserve and protect forest resources traditionally used by these people.

The effects of these changes have been both positive and negative. Increasing population pressure has intensified land use. Paddy is being cultivated wherever slopes and water conditions are favourable. The most significant change has been the improvement in infrastructure accompanied by development in multiple cropping and production of cash crops for non-local markets. The economic incentives for increasing commercialisation have been fairly large.

The sustainable development of shifting cultivation in warmer and wetter upland areas of East Asia requires a better integration of traditional activities with modern commercial cash crops. Better understanding is needed regarding why some of these farmers have stronger conservation practices than others. Insofar as specific areas of emphasis are concerned, diversification of livelihood activities, integration of traditional and new technologies, community management of natural resources, and better harnessing of water resources deserve higher priority.

Session III: Rangelands and Grasslands and Control of Desertification

Ranges, pastures, and grasslands cover a substantial area in the mountain areas of Asia and there are still a sizeable group of people dependent on these resources for their livelihood. As ranges and pastures are also on the borderline with many deserts, their degradation enhances the onset of desertification. The neglect of rangelands has been even greater than mountain agriculture. Major efforts are needed to understand the changes being encountered in these critical resources for their successful rehabilitation and controlling the expansion of deserts in these areas. An essential component of any successful strategy in this context is to understand the traditional adaptation mechanisms of the people inhabiting these areas and to build on their efforts.

Rehabilitation of Degraded Ranges and Pastures - Dr. N. Mohammed, PARC, Pakistan

Mountain areas of Asia and the Pacific region have a wide variety of rangelands representing almost all major grassland ecosystems of the world. From a rangeland management point of view, Australia, China, Mongolia, the Islamic Republic of Iran, India, Pakistan, and Afghanistan are very important. Apart from Australia and New Zealand, most of the countries in the region have traditional livestock grazing patterns and practices, and scientific management is rarely practised.

Most of the rangelands in the region are located in the arid and semi-arid areas, supporting sparse vegetation cover with a low-carrying capacity. The productivity of grasslands within the reach of monsoon rainfall is high. However, many grazing areas are gradually being replaced by crop cultivation, exerting extra pressure on the already exhausted and degraded range resources. In addition to permanent pastures, livestock graze in forests, on marginal lands, and in many other areas. Technology is available to increase the productivity of rangelands in the region, thereby enhancing the availability of animal protein for the ever-increasing human population.

The issue of range development covers a number of concerns. These vary from institutional and socioeconomic to technical aspects. One major factor is that, while the rangelands are state owned, their users are private households. Policy decisions should therefore recognise the needs of the private households that depend on these public resources. Adequate technical support for rangeland management has been lacking in most of the countries and there has been very little attempt to incorporate bioclimatic considerations while formulating action plans. One major gap in this respect is lack of problem-oriented research activities.

The main cause of desertification of ranges and grasslands is a combination of improper land-use practices. Overgrazing, neglect of the biodiversity of the system, and increasing monoculture are identified as some of the common problems. Combatting the desertification process requires better information through research and monitoring, implementation of suitable development options, and promotion of indigenous as well as modern technologies for better land management. Capacity building at national and sub-national levels is critical for combatting desertification in mountain areas.

Pastoralism in the Central Himalayas and the Tibetan Plateau - Dr. D. Miller, USAID, Nepal

It is essential to understand traditional pastoral practices prevailing in the area before any development interventions can be made. A large number of people, in excess of 10 million, are dependent on livestock for meeting their livelihood in this area which has unique range resources extending over 2.5 sq. km. It was one of the largest ranges in the world. The important river system of South Asia originated in the

Tibetan Plateau and the Himalayas. The range was home to a wide variety of wildlife and had diverse floral assemblage and forest grazing areas. The pastoral production system was unique and different from other systems. The system was also built around long-distance trade through the use of pack animals. Profound changes were taking place in the pastoral system as a result of modernisation. Improved access had intensified market processes leading to increased sales of yaks. Nomads of the area were being permanently settled, leading to reduced movement of livestock. Herd sizes were no longer adequately regulated, resulting in over stretching of the carrying capacity. Over-grazing was already visible in many areas.

While not all the range grazing lands are in a similar state of degradation, expansion of agricultural land at the expense of grazing land is a major cause for concern. New regulations regarding user rights under community forestry, especially in Nepal, are having negative effects on sheep pasturing. The traditional pasture rights of these nomadic people are being restricted by user communities. Exploitation of mineral resources, limited veterinary services, tourism-related encroachment, etc are also negatively affecting highland pastoral life. In short, many of the problems identified can be ascribed to the modernisation process going on in the area.

The major issues identified were poor understanding of rangeland ecosystems, inappropriate pastoral policies, lack of appreciation for pastoral strategies, ineffective management of wildlife resources, and inappropriate project evaluation criteria. The need to bring in a fresh perspective, which included greater appreciation for pastoral strategies, was emphasised. There is a need to develop appropriate concepts to explain ecosystemic processes and to use alternative methods of cost and benefit analysis to account for natural resources. A systems' approach and bottom-up planning are considered essential for improving the living conditions of these agropastoral groups and planning and management of these range resources. Sensitive ecosystems demand sensitive approaches. Sustainable development requires the use of a holistic approach linking different components of the system, better management of wildlife, and integration of the use of new technology such as satellite imagery, with ground-level research.

Discussion

An appropriate entry point for local communities to be integrated with the planning and management processes for rangeland management should be identified. Groups of herders should be recognised as user groups. Similarly, associations of livestock owners and tribal groups could be developed. Such experience existed in the region. Factors regarding increasing livestock needed to be better understood. Economic returns are as important as social factors such as prestige associated with livestock ownership. The South American experience indicated that the role of animals was greater as altitude increased. More animals provided opportunities to sell some for purchase of crop seeds. Similarly, some of the animals were kept as pack animals (e.g., the alpaca). The West Asian experience also indicated that economic and social factors played key roles in determining livestock number, including the conditions of grazing areas.

Alternative planning approaches for rangeland management were also discussed. It was pointed out that the values and the attitudes of the people were important in determining regulatory mechanisms. Indigenous knowledge had played an important role in managing the system in the past and this resource should be more extensively tapped. The tendency to promote growth at the expense of the overall development of the area should be avoided. The latter can be achieved only by an active participation of the people. Planning and management approaches need to maintain a judicious mix of top-down as well as bottom-up systems. There was a need to distinguish between tribal culture and nomadism. Nomadism was an approach different from the culture of the people. The need for a political commitment to safeguard the rangeland areas was emphasised in view of the pressure to expand agricultural lands.

Session IV: Management of Mountain Watersheds and Forest Resources

Watershed Management is an essential dimension of successful development of fragile mountain ecosystems. In spite of the large number of highly diverse ecosystems within a small geographical area, there are a number of common problems in mountain watersheds. Increased use of marginal and easily eroded lands, overgrazing of fragile upland pastures and widespread deforestation have aggravated poverty and environmental deterioration. What is needed to resolve these problems is a comprehensive approach to mountain resource management and improving the well-being of mountain people that is consistent with the socioeconomic needs of the people and with the carrying capacity of the land and its resources. While these aspects of watershed management have been long understood, practice is still strongly sectoral. The progress that has been made in managing watershed resources and the important lessons being learned need to be carefully reviewed. Management of forest resources also need to be examined in this context.

Status of Watersheds and Forests - *Dr. K.G. Tejwani, Land Use Consultants (Int.), India*

Watershed Management (WSM), within the last 40 years in Asia, has been extremely important and is receiving increasing attention from national and international agencies. However, there still is a need to assess the region's experience on a systematic basis and to identify the future direction needed in managing mountain watersheds in the context of sustainable development of mountain areas. Traditional farming systems, such as shifting cultivation and terracing, are appropriate responses of the people for farming mountain slopes. However, on account of increasing pressures on limited land resources, questions are raised regarding the sustainability of these systems. Deforestation is a major factor behind degrading watersheds with increasing loss of plant and animal species. Reforestation rates are only half as much as deforestation rates in large parts of the Asian mountain areas.

Proper watershed management needs a holistic approach with greater efficiency and effectiveness of watershed management policies and activities. There is considerable knowledge and experience available in the countries of the region which could be shared for mutual benefit through networking, exchange of visits, and training. The prevailing gaps between desirable and actual watershed conditions and the inadequacy of action in implementing watershed management programmes need to be closed. Developing countries need to allocate more funds to watershed management programmes. Ecological and administrative/political boundaries need to be better integrated. Farmers' difficulties in understanding concepts and practices of watershed management should be overcome through their greater participation in watershed planning and management. Continuing lack of integration of related activities need to be corrected. Despite these problems, governments have been responding to the needs of watershed management through greater support to development activities. Even farmers are taking greater interest once they experience its benefits.

Participatory Management of Mountain Resources, Watersheds, and Forest Resources - *T. Michaelson, FAO*

Participatory watershed management seeks to combine the essential components of bottom-up and top-down planning and implementation. It identifies workable mechanisms to establish linkages between decision-makers at different levels - the government, the region, different sectors, and the people living in the watershed. Incorporating people's needs and knowledge and giving them an adequate share in decision-making have been a major challenge in watershed management activities so far. In the past, scientists and technical people have played intermediary roles, providing some link between the government and the people, but this has not been satisfactory as it was *ad hoc*, narrowly focussed, and did not provide a continuing mechanism for dialogue. Government policies have also not been very favourable. When huge investments are made in upstream areas, it has been easier for the government to enact sweeping legislations, protecting upstream areas rather than addressing the needs of upstream people, even when these investment decisions adversely affected these people. While it is common practice to bring forests and watershed areas under government control, experience has shown that the approach is no longer workable.

A number of important points are beginning to emerge. First, watershed management cannot be expected to cope with all the extraordinary geological events experienced at different points in time in the watershed, but the community must learn to live with them. Early warning systems, evacuation plans, and disaster mitigation schemes would be helpful. Second, people have been living in these watersheds for thousands of years, modifying the environment in various ways, and yet most programmes assume that major improvements can be brought about rapidly. Watershed management needs to be seen as an ongoing geological and people-based process in which the government, NGOs, and others can have some impact for some period of time. Third, it should be realised that in any watershed there are different stake holders, both within and outside the watershed, and without their involvement watershed management activities cannot be expected to be effective. Fourth, the role of the government is also changing with governments handing back more of the responsibility to the local community and private groups. Fifth, more and more evidence is showing that people can be fairly effective in managing watershed resources whenever they stand to benefit from it.

Participatory management of watersheds should therefore take into account all the different stake holders and provide adequate opportunities for them to interact with each other. Technical support is needed for these groups so that their decisions and actions are technically sound. It is therefore proposed that a Watershed Commission be established involving all the different actors. It should have representatives of local interest groups, local and national development agencies, different types of NGO, and the private sector. Such a body will function as a clearing house for watershed management activities. The exact composition will vary from place to place but this represents one approach to overcoming the *ad hocism* of the past approaches and allows participation by a large group of interested parties. Obviously there will be cost involved in supporting such a body, but that is the price for introducing a more participatory and, hopefully, a more effective watershed management approach in mountain areas in the future.

The Role of Agroforestry - Dr. Tony Djogo, Polytechnic University of NUSA, Indonesia

Agroforestry issues based on the experience of Timor in Indonesia highlighted many areas of common concern to the upland areas of East Asia. In the past, agroforestry activities focussed on bringing about changes in farmer activities, while watershed management concentrated on environmental problems. There is now a need to integrate the two areas because, without addressing people's needs, the environment will continue to be further damaged while increasing degradation of the environment will make it more difficult to meet people's needs.

Past approaches in the development of agroforestry in upland areas have highlighted different types of problem. The tendency to focus on only tree crops, without considering the food-related priorities of upland farmers, has made it difficult for farmers to adopt and sustain agroforestry practices. The lack of a uniform language of agroforestry has given conflicting signals to the farmers. Agroforestry programmes under forestry agencies focussed only on timber crops. Agricultural agencies emphasised food crops, while environmental organisations concentrated on biodiversity preservation. Similar confusion has also been created by terms such as community or social forestry. Conflicts have also been evident in other areas. Economists tend to focus on those activities giving higher returns while other considerations favoured enhancing farmers' food security. Most public programmes have tended to select public lands for their activities while farmers have clearly preferred to work on their own plots. Similarly, farmers are now favouring commercially-attractive activities, while agroforestry programmes have tended to focus more on ecologically-sustainable options.

Many aspects of agroforestry are already a part of traditional farming systems in these upland areas and efforts made to either understand these or improve existing systems have been limited. The sophistication of local systems in meeting the multiple needs of the farmers through harnessing plant and animal species needs to be better appreciated before introducing changes from outside. Many local technologies have proved to be quite harmful under changing environmental conditions but there are others with potentials for development. Simple aspects like establishing farmer nurseries have been overlooked. Significant improvements are being achieved with stronger participation of farmers in all aspects of research, planning, implementation, and evaluation of agroforestry development in upland areas.

Session V: Sustainable Use and Conservation of Biodiversity

Loss of biological diversity in mountain areas is a serious but quiet crisis. However, the significance of this crisis is still not adequately appreciated. Considered as reservoirs of biological diversity, mountain areas are slowly losing their rich variety of flora and fauna. This is happening not only in the wild through loss of natural habitat on account of deforestation, overgrazing, and other similar problems, but also on farm as mountain farmers are being forced to concentrate increasingly on food production.

Some efforts have been made to develop special protected areas but the biodiversity in the wild and on-farm remains grossly unattended. Governments are also hard pressed to develop the capacity needed to monitor and preserve the natural living wealth of their mountain areas. Some of this is slowly changing, but a great deal remains to be done in this area.

On-farm Management of Biodiversity - Dr. W. Roder, IRRI, The Philippines

In most mountain areas, farmers have maintained high levels of biodiversity in the past because of a number of factors. These are relatively small farms, the need for self-sufficiency, difficulties of access, lack of improved varieties of crops and animals, reducing risks, and spreading the use of labour by using species with different maturity periods.

Higher levels of on-farm biodiversity have also been important for overcoming diseases, pests, and fluctuations in climate and markets. Even within one group of annual crops, farmers may be using species as diverse as self-pollinating rice or wheat, cross-pollinating maize, or a vegetatively multiplied crop such as the potato.

Recently there has been increasing attention on the role of the farmer as the manager of on-farm biodiversity. In the past, preservation was mostly carried out in germplasm banks or in botanical gardens. It is now being argued that whereas some species cannot be preserved in germplasm banks, others have only local importance and preservation in germplasm banks stops the evolution of the species. It was therefore essential to enhance farmers' awareness regarding the need for preserving on-farm biodiversity.

There are, however, a number of problems. Like any other system, preservation depends on the people in these farms and their understanding and priorities. The administrative problems in following up on thousands of species cannot be underestimated. In addition, there are important motivational factors. When farmers are confronted with high-value alternative crops, there may be little incentive to preserve low-yielding species.

While some of the traditional systems are quite harmful in terms of preserving biodiversity, there are also cases in which farmers are using both improved and traditional varieties of plant species. In many of these societies' strong food preferences favoured cultivation of some species and other varieties had cultural and religious significance.

More recently there were also cases where some of the older varieties had become fashionable in the market and therefore also socially acceptable, thereby encouraging farmers to cultivate and market the varieties.

If on-farm biodiversity is to be preserved there is need for more education and greater awareness regarding the value of traditional crops, food habits, farmers' practices, and greater support for soil conservation policies, maintaining traditional germplasm and increasing economic incentives for traditional crops.

Biodiversity and Protected Areas in Qinghai-Xizang Plateau - Prof. Li Bosheng, CAS, China

This vast Qinghai-Xizang plateau has a total area of 2.5 million sq. km. with an average elevation of 4,500m and a population of about 10 million.

The natural conditions that prevail there have given rise to diverse and complex species. The high plateau is important in terms of formation and differentiation of mountainous bio-species, which occupy an extremely important position in the world's biodiversity resources.

The current status of conservation in this high plateau focusses on the issues listed below.

- i) The establishment of protected areas, including natural reserves and national parks. So far 58 natural reserves and national parks have been established, covering 10 per cent of the total area.
- ii) The reduction in poverty is an urgent task in the region, as it has strong linkages with biodiversity conservation. So far, efforts have been made to develop high-value plants, eco-tourism, and adventure trekking for enhancing the economic opportunities of the local people, so that they would be motivated to preserve the biodiversity of the area.
- iii) The effects of global climate change on the plateau are manifest in changes in tree line and grassland lines, Net Plant Productivity (NPP) change, and changes in the vertical vegetation distribution patterns.

Future thrusts in the preservation of biodiversity in the area should focus on

- building up of a comprehensive natural protection system covering the various ecosystems in the region,
- establishing a network of protected zones in the region, and
- the development of environment-supporting "enterprises" around the Qinghai and Xizang plateau region to reduce the poverty of the people in the area.

In all the above activities it is essential that the local people be involved closely so that the preservation activities do not have a negative effect on the local people but promote their well-being and enjoy their full support.

Session VI: Natural Hazards and Disaster Management

Many mountain areas are geologically unstable and experience extreme weather events, increasing the susceptibility to various natural hazards. Some mountain areas are also located in high seismic zones. In spite of these potential risks many parts of mountain areas are becoming densely populated with people modifying fragile environments and moving into highly sensitive areas. One important consequence has been that many natural hazards are increasingly turning into disasters with heavy loss of life, property, and other economic assets.

Environmental changes in upstream areas are also reported to be having significant downstream effects. Development activities have also modified mountain environments bringing with them different types of risks. The increase in risks, however, has not been accompanied by adequate awareness, understanding, and development of the capacity to cope with these problems. Major efforts are needed to develop these aspects for better disaster preparedness in mountain areas.

Speaking from the chair, *Prof. Jack D. Ives*, President of the International Mountain Society, highlighted some of the hazardous phenomena (such as glacial lake outburst floods [GLOF]) or *Jokulhaup*) inherently associated with high mountain environments and emphasised the need for a proper understanding of the respective roles of Man and Nature with regard to natural hazards and disasters in the mountains and their lowlands with examples from Nepal, China, and Iceland.

Mr. Thomas Hofer of the Institute of Geography, University of Berne, spoke on *Upstream Degradation and Downstream Flooding and Sedimentation* with examples based on his study of floods in Bangladesh which showed that floods in the plains are essentially governed by phenomena that occur in the immediate surroundings. Mr. Hofer emphasised the need to understand the processes that cause disasters and hazards better and cautioned that general understanding of these processes is an inadequate basis for action or solution.

The presentation on *Landslide Hazards and Infrastructural Risk Management* by *Dr. Megh R. Dhital* of Tribhuvan University, Kathmandu, was based on studies from Nepal, highlighting the importance of geological knowledge in dealing with landslide problems in the mountain areas. ICIMOD's work in mountain risk engineering, with particular reference to road construction in the mountains, was also briefly highlighted.

Mr. H. Oi, Chief Technical Advisor from JICA to the Water-Induced Disaster Preparedness Technical Centre (DPTC), Nepal, spoke on *Disaster and Sustainable Development of Mountain Areas*, with examples from the disastrous events of 1993 in south central Nepal, and indicated the importance of risk and hazard maps for disaster-prone and disaster-affected areas. He emphasised the need for international cooperation for rehabilitation and reconstruction of disaster-affected areas.

Prof. Li Tianchi of the Institute of Mountain Hazards and Environment, Chengdu, China, spoke on *Natural Hazards and Disaster Management* with examples from China. He emphasised the importance

of a proper understanding of watershed characteristics prior to rehabilitation work and presented a successful example of mulberry farming for sericulture in the reclamation of flood-affected lands in China.

Discussion

Some of the major issues highlighted during the discussion that followed the above presentations are as follows.

- Lack of data to prove or disprove linkages between upland degradation and lowland (the plains) floods. Mountain people (farmers) have been seen to manage their environment - sometimes deliberately triggering changes followed by extensive rehabilitation work. Few of these activities have been studied systematically.
- Analysis of available data does not show a direct correlation between deforestation - erosion in the uplands with floods in the lowlands. Some argue that there are more trees now in the HKH than before.
- No trend in the increase in flood frequency in Bangladesh has been observed. Floods in the plains are governed by local phenomena.
- There is no correlation between rainfall in the mountains and the plains in the HKH.
- Floods in Bangladesh are more influenced by the Brahmaputra River than the Ganga River, including rainfall in Assam, Meghalaya, and Bangladesh.
- Glacial Lake Outburst Floods (GLOFs) are inherently associated with the high mountain environments of the HKH.
- ICIMOD has contributed to the body of knowledge on risk engineering and has produced a useful manual on mountain road construction.
- Governments have also been responsible for damaging environments by implementing technically unsound development projects, for example, environmentally-inappropriate roads, bridges, and dams and generally poor construction methods that are lacking in sound understanding of mountain geology, slope conditions, and hydrological systems.

Areas needing immediate attention were identified as those listed below.

- Greater efforts were required to develop a relevant database for a better understanding of the processes that govern the Himalayan environment.
- Regional cooperation and collaboration were required in the exchange of pertinent data to understand clearly how and to what extent upland environmental degradation (erosion) contributed to floods in the plains.
- A study of river basins at different levels in different geographical settings using similar methods and approaches was required for monitoring changes and identifying critical parameters.
- Preparation of hazard maps for disaster-prone and disaster-affected areas should be given high priority. This would also help increase public awareness and avoid settlements in disaster-prone locations.
- Donors should not only provide relief during disaster periods but also continue to work together with national governments during the rehabilitation period in order to ensure that the pace of national development of the countries affected by disasters does not slow down.

Session VII: Women and Mountain Development

Women in rural areas throughout the developing world play a major role in managing natural resources through their tasks in agriculture, animal husbandry, and in the house. They have a very good understanding of the environment around them and its resources. Women also participate actively in the commercial sectors. Mountain women also perform similar roles but have to do so in a far more difficult environment where travel times for subsistence activities are very large, lands are more difficult to cultivate, and basic facilities and services are lacking. Their key role, in reducing population growth, educating children, improving household environment, better management of natural resources, and diversification of economic activities is gradually being recognised. A major effort is needed to develop their full potentials for sustainable mountain development.

Conceptual Understanding of Gender - Dr. Govinda Kelkar, AIT Institute, Bangkok

The first presentation of this session outlined a theoretical overview of gender and attempted to clarify the distinction between women and development and gender and development. There are two well-known issues that are a manifestation of attitudes rooted in gender. The first is the issue of women's subordination within and outside the household and the second is that of women's access to resource and decision-making. The key problem lies in the relationship between men and women which has evolved over a long past and is based on social, cultural, and educational backgrounds and settings.

At an ideological level, gender cannot be separated from the power which is used to ensure that women continue to remain subordinated and marginalised. There exists an element of structured coercion in society which has today led to women internalising the belief that men are superior to women. This belief is an outcome of the social construction of gender relations.

The economic sphere presents a classic example in which the role of and contributions made by women are ignored. This is specially relevant in farming systems. In this context, modern agricultural systems have eroded the position of women within societies and households.

Organising Mountain Women - Ms. J.D. Gurung, ICIMOD

The second presentation began with a look at how women are affected by the biophysical features of mountains. The changing circumstances of mountain societies brought on by commercialisation, development interventions, tourism, political movements, communication systems, and population growth have a direct or indirect impact on women's work and status. Generally, women's workloads increase while they remain without access to technologies, credit, or rights over resources needed to manage the farm under increasingly difficult conditions.

Improving the status of women and enhancing their capabilities and opportunities to participate fully in the development process is the aim of some agencies in the HKH Region. One effective means is through

the formation and strengthening of women's groups. Examples of successful women's organisations from Pakistan, India, Bangladesh, and Nepal were provided along with a summary of the features of such initiatives.

Women and Technical Skills - Ms. F. Kellker, SDC, Nepal

Out of the three professional courses offered in the Jiri Technical School, Nepal, in health, agriculture, and construction, women candidates have mostly preferred health. This has been successful as there have always been sufficient applicants and jobs for them after they finish the course. Agriculture and construction have come to be perceived as 'male courses'. However, more recently, the number of women in agriculture has increased and a recent survey indicates that potential employers would prefer to employ qualified women rather than men. This decision is guided by the fact that women in comparison to men are seen to be more diligent, sincere, and disciplined.

In the construction profession men feel that, whereas the presence of women will inspire men to be more disciplined, women may not be able to command sufficient respect from labourers if they are placed in middle-level supervisory positions.

Discussion

- While several tools and methodologies for environmental impact assessment and economic assessment were available, tools for the social impact assessment of development projects were lacking and needed to be addressed.
- Law is an important issue. The introduction of modern law has in many cases eroded the rights granted and guaranteed to women under customary law. The patriarchal society continues to hold on to power and this has been the situation over thousands of years.
- The status of women in several mountain societies is still relatively high; better understanding of how this is lost in the process of modernisation is needed.
- Although men migrate to the plains for a living, many of them live in harsh surroundings and send remittances home for their families. We are often dismissive about this caring behaviour of men.
- There should be harmonious development and it should not disturb existing social structures. Being conditioned by education, cultures, and religions, interventions must be disaggregated rather than generic for all areas and contexts.

Four tasks for future work were identified in the discussion:

- undertake additional research in law and how it affects gender relations;
- ensure that the economic contribution of women is reflected in national accounting;
- advocate for joint ownership of resources; and
- document case studies on the higher status of women in mountain areas and incorporate them into the Mountain Agenda.

Session VIII: Review of Selected Mountain Development Processes and Opportunities

A large part of the discussion on mountain development was dominated by problems with little attention given to positive changes, particularly those with a strong economic impact. Some of these dealt with the development of high-value products and tourism, while others were related to increasing urbanisation in some mountain areas. This session focussed on highlighting some of these experiences and their underlying forces.

High-value Crops and Activities - Dr. Tej Partap, ICIMOD, Nepal

Mountain farming is undergoing a process of significant transformation. First, subsistence mountain agriculture is on an unsustainable path manifested by resource degradation, soil erosion, loss of soil fertility, and the increasing poverty of mountain farmers. Second, seen only in a few selected areas, is the increasing commercialisation of agriculture through cash crop farming, leading to the economic prosperity of mountain farmers. The latter situation is seen in areas where infrastructure, such as roads, marketing information and facilities, credit support, and strong technical backstopping, has been developed.

The experience with high-value cash crop farming in the State of Himachal in India, Ningnan County in China, and Ilam and Dhading districts in Nepal showed that commercial farming provided far greater net returns per hectare than the production of cereal crops. Marginal lands unsuitable for cereal cultivation have been brought under high-value tree crops. Different kinds of cash crops can be cultivated depending upon climatic conditions, the 'niche' of particular areas, and prevailing market conditions. To promote the sustainable cultivation of cash crops, it is essential to provide better access through improved transport services, thereby reducing transport and handling costs. Similarly, efforts are required to provide better post-harvest handling methods and facilities such as grading, storage of goods, and availability of marketing information.

A number of problems has also been encountered in cash crop development. It is important to avoid monocultures while promoting cash crops. Harnessing local diversity in the form of cash crops through R & D initiatives requires far greater scientific and marketing efforts. Excessive use of chemicals and pesticides in cash crop production has to be avoided through better awareness and training about environmental impacts and judicious use of these inputs.

The farmers' risk-bearing capacity in the initial stage is low, access to market poor, and the ability to take advantage of existing support institutions almost non-existent. Therefore, in the initial phase of transition, government support in the form of an incentive package is essential. It should also include institutional intervention mechanisms when market failures occur. It has been observed that sometimes the outsiders and not those targeted have taken advantage of such support packages. It is therefore essential to restrict the initial access of such support to the local population only. There are instances of such policies being put into operation in a number of countries of the HKH Region. Efforts should be made to replicate successful cash crop experiences in new areas so that high-value crops can be a practical mechanism for sustained growth of on-farm agricultural income as well as off-farm employment opportunities in poor mountain areas where subsistence agriculture is becoming economically weak and environmentally damaging.

Promotion of Tourism - Dr. K. Banskota, CREST, Nepal

There is a need to examine the potential of tourism for initiating wider-scale development in mountain areas. What is lacking is vision. Prior to the promotion of a particular tourism development package, assessment of the potential for different forms of tourism on a location-specific basis is required. There is no unique packet applicable to all regions. Eco-tourism is one of the many options for the HKH Region. Sustainable mountain

tourism requires a holistic focus on physical, biological, social, and economic aspects in order to maximise the opportunities and mitigate the problems. This requires substantial shifts in policy and priorities at the national level. The governments and their line agencies, NGOs, tourists, private agencies, and the local people have definite roles to play as partners. Success depends on how these partners are organised and coordinated through shared responsibilities, particularly the mobilisation of local people through grassroot institutions. Environmental considerations should be integrated with economic decision-making from the very beginning and at different levels. Proper assessment of environmental resources through economic accounting should receive immediate attention at both local and national levels. A number of major issues has emerged from the Nepalese experience in mountain tourism development: establishing an agency responsible for guiding the development of mountain tourism, management of demand and supply aspects, valuation of the use of natural resources, the need for ploughing back revenue generated by tourism, and integration of mountain tourism development in the overall development strategy.

It is important to operationalise the concept of carrying capacity and unsustainability using a critical factor approach. Identification of internal characteristics of a defined geographical area and its interaction with other regions and an assessment of the potentials and constraints of a region's development may provide the basis for identifying critical factors. These critical factors can be further examined in terms of resources, specific areas or niches, infrastructure, and institutions. They could serve as focal points for both development and policy interventions as well as monitoring. It is not possible to think about preserving all the resources for all time. There may be a need to forego some opportunities. Inter-temporal depletion of some aspects of environmental capital may take place depending on the substitution possibilities available. Nevertheless, conservation of the Himalayan environmental resources should receive prime importance in such an exercise.

Hunting as an aspect of mountain tourism development has potential, but at present most of the national parks and nature reserves in the HKH countries emphasise protection and preservation of biotic diversity. There are very few hunting reserves in the region. Underpricing of natural resources is highly visible and some corrective measures have been adopted in this respect, e.g., in the Annapurna Conservation area.

Urban and Industrial Development - Dr. Pitamber Sharma, ICIMOD, Nepal

In the context of a rapidly increasing population in the mountains, urbanisation has become imperative. What is important is to streamline this process of rapid urbanisation into a desired direction. Experience with urbanisation in the Kathmandu Valley in Nepal and the Dehradun Valley in India provide valuable lessons on the use of natural resources in rapid unplanned urbanisation. The demographic and economic processes operating in the mountains make it quite clear that the space economy of the mountains is being transformed. This transformation has been rapid in some areas and sluggish in others. While the desirability of transformation may be debated in particular demographic and economic contexts, the more fundamental question is how to ensure that this transformation is compatible with the environmental reality and economic needs so that urban areas become the locus of sustainable livelihoods. The role of urban development in the positive transformation of densely populated mountain economies will remain significant in a number of ways. Urban areas can take the pressure off the land by providing a variety of off-farm activities, basic central services to the vast rural hinterland, markets for rural production, and the impetus for the diversification of rural economy.

A mountain-sensitive approach to urban-industrial growth is needed and this has to be guided by a number of considerations such as decentralisation of urban-industrial functions, promotion of non-polluting industries, determination of the range of threshold population for particular urban complexes, implementation of integrated environmental management and a participatory planning process, and promotion of small and medium towns. Managing urbanisation and urban growth on a scale compatible with economic potentials and environmental quality is the major challenge to policy-makers in mountain areas. This challenge has so far been neglected and urban development has tended to be largely spontaneous. Sustainable development of mountain areas calls for innovative policy initiatives for promoting decentralised urban-industrial growth based on local community action.

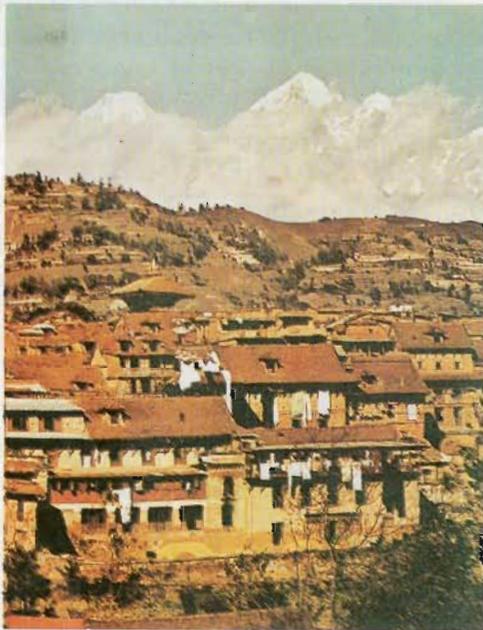
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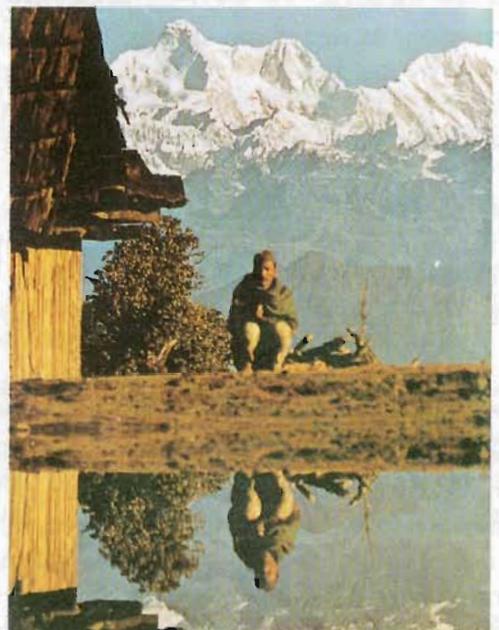
Watershed Conservation and Improved Agriculture



Control of Desertification and Natural Hazards



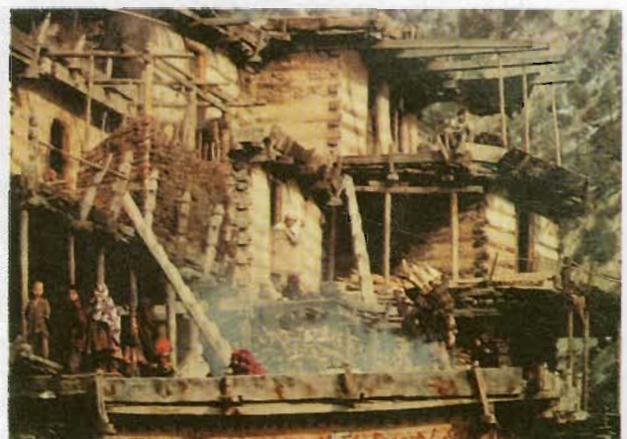
Improved Land-use Planning



Harness Potentials for Tourism



Improved Pasturelands and Animal Husbandary



Improved Living Standards of Mountain Populations