13. Iba bahi Restoration Project	Patan Mangal Bazar		Restoration of Iba bahi	Nippon Institution of Technology, Japan
14. UNESCO/Danida Project	National Library	1989/90-1995/96 20 Dec. 1994, 19 Dec. 1999	Development of Libraries with special reference to National Library	Danida (Danish aid)
15. Gorkha Durbar Conservation Project (as per Master Plan)	Gorkha	1987/88-1998/99	Restoration of monuments , sites and preservation of natural and historical environments	HMG (Nepal)
16. Archaeological Conservation and Development Project	Whole Nepal	on-going programme	Restoration, excavation, exploration of monuments and display of documents	HMG (Nepal)
17. 55 Windowed Restoration Project	Bhaktapur 55 Window Palace	1995-97	Restoration of 55 windows palace.	HMG Nepal - 10% German Govt -30% SolteeGroup -60%

THE JHIKHU KHOLA WATERSHED PROJECT

P.B. Shah and H. Schreier

Overview of the watershed study

Given the lack of long-term information on land use, resource degradation, sediment transport and soil fertility in Nepal, it was decided in 1989 to use the Jhikhu Khola watershed as the key research area for a long-term monitoring programme. With the support of the International Development Research Development Centre (IDRC), Canada, we focused our research on documenting climatic conditions, soil erosion, sediment transport and redistribution, stream flow, irrigation, deforestation, agricultural intensification, soil fertility, socio-economic conditions and population growth in the watershed. After the first three years, we then initiated a number of smaller projects which attempted to translate our gained knowledge into development efforts. These activities included the construction of a suspension bridge, upgrading of rural water supply systems, reclamation of degraded areas, electrification of three houses with solar-powered photovoltaic cells, and introduction of a water-conserving trickle irrigation system. Computer technology was used in monitoring as well as in data organisation, and a PC-based Geographic Information System (GIS) was used as the main tool for data integration and modelling.

Background

The Jhikhu Khola watershed, which is one of the most intensively used Middle Mountains areas of Nepal, was chosen for the project because all of the problems commonly associated with population growth, agricultural intensification and deforestation in a marginal environment are present in this watershed. The watershed has all of the infrastructure and make-up of a typical Middle Mountain valley. What sets it apart is that the watershed can be reached by a motorable road and the Arnica highway which connects Kathmandu with Tibet passes through the centre of the watershed. This road can be reached from the most remote village by a five-hour walk, and the distance to Kathmandu is about 40 km. This watershed provided a number of advantages since it allows us to examine how traditional subsistence agriculture can be modified to a more market-oriented economy. In some ways this makes the Jhikhu Khola a futuristic Middle Mountain watershed and should allow us to document possible development opportunities that can be applied to other watersheds within the Middle Mountain region.

The watershed is located in the Kabhre Palanchok district some 40 km east of Kathmandu and covers 11,000 ha. The elevation ranges from 750-2,100 m, and the watershed is subject to a monsoonal climate with an extensive dry season from October to May. A 1:20,000 scale topographic base map and was produced as part of the project and served as a basis for all resource inventories

and GIS analysis. Historic 1972 aerial photos were available, and new aerial photos were obtained in 1990. These photographs served as a basis for the historic analysis of land use, and the 1990 cover was also used for the soil survey study. Both sets of photographs were enlarged to 1:5,000 scale and became the basic planning tools for the socio-economic survey and determination of population trends since each individual house could be identified on the enlargements.

Justification of the project

The reasons for the selection of the Jhikhu Khola watershed as the study site is manifold but the most important ones are:

. Hydrological processes in the Himalayas are substantially different from those in more temperate regions, yet little good scientific data is available to document the differences. This is particularly critical in view of the fact that the Middle Mountains represent one of the most modified human landscapes in the mountains of the world. The hydrological processes also need to be better understood in view of the extensive hydro-power potential that is constantly advertised by Nepal and aid agencies. The philosophy of building large hydro-dams is still prominent in spite of recent concern about environmental stability and economic viability.

. Agricultural intensification is putting into question the long-term sustainability of the productive capacity of the mountains, and in this context soil erosion, soil fertility maintenance, and irrigation are the key issues.

. In order to progress from a subsistence economy towards a market system, transport is a basic necessity. Having a road infrastructure which is currently being upgraded, and having a potentially growing market access in the capital city which is within 40 km of the watershed, provide the essential footing for introducing more cash crops into the agricultural system.

. Historic aerial photographs (1972 and 1979) and land use change evaluations are available to provide historic land-use dynamics which are required to document rates of degradation and levels of sustainability.

. The watershed has a very active afforestation programme called the Nepal-Australia Community Forestry Project (NACFP), and their staff expressed interest in obtaining better resource information in exchange for supplying vital historic information about forest management practices and afforestation efforts.

. Successful tree planting programmes have been introduced at the community level by NACFP, but until now, little attention has been paid to soil fertility issues. The forests are losing nutrients by fodder and litter removal, and the long-term sustainability of forest productivity is being questioned. The existing community forestry infrastructure will facilitate the introduction of new fodder trees and new approaches for forest soil fertility management.

. Relationships with local farmers established in Phase I will facilitate on-farm experiments such as fodder tree establishments and vegetable introduction. As a result, we are optimistic that many of the research

findings can be translated into development that has a better scientific basis and points the way towards sustainability.

Project aims

The main aims were to:

1. produce a detailed inventory of current climatic, soil, hydrological, land use, and socio-economical conditions in the watershed;

2. determine rates of change in land use over the past 40 years;

3. identify major degradation processes such as soil erosion, sediment transport and soil fertility declines, and determine the rates of change in these processes under different land use practices;

4. quantify stream flow and sediment dynamics, and differentiate between naturally and human-induced processes and their effects on productivity and management in the watershed;

5. identify successful land use practices (traditional and introduced) that can be used as a model to improve land use, productivity and management in other parts of the Middle Mountains;

6. develop GIS techniques that facilitate the integration of resource information, assist in quantitative modelling of processes and serve as effective communication tools in educating farmers and managers about carrying capacity and sustainability;

7. provide suggestions on how the scientific information can be used

for development and translated into actions leading towards more sustainable resource management in the watershed.

Research programme and team composition

Research Components. During the first three years, a basic resource inventory was conducted which included the generation of a general geological map, detailed soils map, current and historic land use map, topographic map and detailed drainage system map. All of these maps were digitised into a PC-based GIS system and have formed the basis for our integrated analysis. Part of this inventory also included a number of socio-economic surveys, and all of the houses used in the interviews were geo-referenced and incorporated into the GIS system.

The second component included setting up a detailed monitoring network and an intensive monitoring programme. A large effort was made to set up a climate monitoring programme which consisted of five automated tipping bucket rain gauges, about fifty manual 24-hr rain gauges, and five stations equipped with manual and automated air temperature monitors. Erosion monitoring was conducted at five erosion plots located in upland bari fields. Seven hydrometric stations were selected, staff gauges were installed in all of them, and four were equipped with automated pressure transducers to measure stage height on a continuous basis. A flow and sediment monitoring programme was carried out from 1990 to 1995. During the pre-monsoon and monsoon season the monitoring effort was

particularly intensive, allowing us to monitor most of the important storms each year. In addition to these networks, twelve forest plots were selected for a very detailed analysis of soil and biomass conditions in 1989, and these sites were resurveyed in 1994 to determine biomass and soil fertility changes. Similarly, ten agricultural fields were selected in 1989 and resurveyed in 1994 to determine soil fertility changes. A socio-economic survey conducted in 1989 was partially repeated in 1993/94 to document changes. Finally, 200 agricultural fields and grazing land sites examined in 1993/94 were used for monitoring changes in biomass, soil fertility and management practices. All of these monitoring networks were set up to determine rates of changes in the key processes affecting biomass production and land use management.

The third component involved actual community development projects where we tried to assist local communities and farmers in upgrading the infrastructure in the watershed. These activities included constructing bridges, upgrading water supplies, introducing solar energy for electricity and irrigation, reclaiming degraded lands, and training in fodder tree nursery operations. Training and technology transfer are important activities and included computer use, data base management, automated logging and data transfer and use of Geographic Information Systems.

Research Team. Multidisciplinary, integration, and enthusiasm were the key themes that characterised the team which consisted of three

groups: local farmers, the ICIMOD/MRM & UBC teams and a number of graduate students. Farmers became an integral part of the field monitoring programme. Typically up to 40 farmers are employed on a part-time basis to carry out a number of tasks such as measuring daily rainfall, collecting daily sediment samples, making discharge measurements, monitoring erosion plots and assisting in reclamation work. Many of them allowed us to use their fields as a research laboratory, and all participated in the socio-economic surveys.

The MRM team was made up of a core group consisting of a soil scientist, geologist, geographer, and hydrologist. Additional members, participating on a contract basis, included an agronomist, land use specialist, engineer and several assistants with various backgrounds. The UBC team provided expertise in GIS training, hydrology, soil, land use and socio-economic analysis. Finally, many graduate students participated in the project and they came from many different areas and had experience in forestry, agronomy, soil, hydrology, economics and geography.

THIRD INTERNATIONAL HINDUKUSH CULTURAL CONFERENCE, CHITRAL (PAKISTAN), 26-30 AUGUST 1995

Conference report by Hermann Kreutzmann

The 3rd International Hindukush Conference was held at the centennial of the Chitral Siege of 1895 in the heart of the eastern Hindukush. This auspicious date commemorates the event which led to British colonial domination of this mountainous district. About two decades after the decolonization took place, Chitral was fully integrated into Pakistan in 1969. Nevertheless, this former principality remains a remote valley society since communication is interrupted in winter and a project to link it with down country Pakistan through a tunnel road still awaits implementation.

Chitral, the administrative centre of Pakistan's northernmost district in the North-West Frontier Province (N.W.F.P) for the second time hosted an international conference. Due to the activities of the local cultural association, Anjuman-e-Taraqqi Khowar, it had become feasible to repeat the organisation of a conference with more than 100 scholars in attendance.

Following the First Hindukush Conference[1] held in Moesgård (Denmark) in 1970, it took twenty years to organise the follow-up meeting. One of the most encouraging experiences of this meeting was that more than half of the 54 presentations were made by

[1] The proceedings of this meeting were published by Karl Jettmar in collaboration with Lennart Edelberg (1974): *Cultures of the Hindukush*. Selected papers from the Hindu-Kush Cultural Conference held at Moesgard 1970 (*Beiträge zur Südasienforschung 1*). Wiesbaden: Franz Steiner.