

**WATER AND LIVELIHOODS IN MOUNTAIN AREAS:
A CASE OF MODI WATERSHED, NEPAL**

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LETTER OF RECOMMENDATION

We certify that this dissertation entitled "*Water and Livelihoods in Mountain Areas: A Case of Modi Watershed, Nepal*" was prepared by Shiba Prasad Rijal under our guidance. We hereby recommended this dissertation for final examinations by the Research Committee of the Faculty of Humanities and Social Sciences, Tribhuvan University, in fulfillment of the requirements of the Degree of *DOCTOR OF PHILOSOPHY* in *GEOGRAPHY*.

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ABSTRACT

The main objectives of the study are: analysis of different assets and their implications in livelihoods, assessment of present livelihood strategies adopted by the people and assessment of the role of water in livelihoods in terms of its utilization and management. The study area Modi Khola watershed is located in Western Nepal, which consists of 28 VDCs of Kaski, Parbat and Myagdi districts and covers an area of 676.8 sq. km. Its total population as per the census of 2001 is 75,000. The area displays cross profile of Middle Mountain, High Mountain and the High Himalayas within a short physical distance of about 51 km. Its altitude ranges from less than 500 meter in the south to above 8000 meter in the north and represents sub-tropical to alpine climates.

The study is based on livelihood concept developed by Robert Chambers and framework of DFID with development of additional water use model. Necessary information was collected through maps, documents and field surveys. Household survey, group discussions, mapping and observation techniques were adopted for field survey. A total of 360 households were covered from 12 communities for household survey and 12 group discussions were carried out. An inventory of different water uses was made through consultation with local people and field observation. Both statistical and non-statistical tools were applied for data analysis.

The households of study area possess a number of livelihood assets of five different categories upon which their livelihoods are based. Land, water, physical landscape, bio-diversity, pasturelands and trees in farm are the main natural assets of this area. Shelter, household facilities, water delivery infrastructures, transportation and communication linkages are physical assets and community groups like Mother's group, Youth clubs, and Users committee are social assets. Human assets include literacy level, size of economically active population and general health condition. Likewise, livestock and money inflow (pension and remittances) are the financial assets of this area. These assets have significant contribution in shaping local livelihoods however, their importance varies by household and localities. The association of different assets to household income is assessed. Assets like remittance and pension received by household, land owned, rooms in the house, trees in farmland and literacy level have positive association with household income while livestock owned and facilities like provision of water tap, improved latrine and the availability of radio/television in the

house do not show positive relationship with household income even though these are essential for betterment of livelihoods.

The people of Modi Khola area adopt diverse strategies such as agriculture, service in government and non-governmental agencies, business, tourism, industrial activities, migration, wage labor, fishing and others for their livelihood security. Livelihood strategies vary by household and localities as a result of spatial variation in terms of availability of assets, people's capability for exploiting these assets and environment. People's livelihood is largely based on tourism activities and regular inflow of money in terms of pension and remittances in the upper parts while in the lower parts it is based on the combination of different activities mainly service, agriculture, business and remittances. Household members adopt one or more, often several activities to meet their household needs. Households adopting diverse strategies have higher income and more secure livelihoods as compared to the households adopting single or lesser number of activities.

Water, an important constituent of environment, has paramount importance on local livelihoods. It is used in a wide variety of livelihood activities in the Modi Khola area. The common water users are irrigation, household, power plants, watermills, woodcarving workshops, fishing and cultural activities. The yield and cropping intensity in this area is highly determined by irrigation facilities. Piped water supply and hydro-electricity have significant contribution not only in human health but also for reduction of drudgery. It has significant role in tourism activities too as it is heavily used by tourists in hotels/restaurants and for pilgrimage bath in hot water springs. Besides, processing of raw material, operation of watermill, woodcarving, liquor making and fishing are other water users contributing to local livelihoods.

The recorded data on both temperature and precipitation in the Modi Khola area show the increasing trend as a result of changes in local climate as caused by global warming. The changes in climatic elements have direct implications on water availability resulted in rising discharge in the Modi Khola for many decades. The changes in water availability have direct implications on livelihoods affecting different productive activities, infrastructures and health. The impacts will be both positive and negative and varies by temporal and spatial scale. Local people are also aware about changes in climatic elements and their possible impacts on their lives.

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LIST OF ABBREVIATIONS

ACAP	Annapurna Conservation Area Project
ADB	Asian Development Bank
ANOVA	Analysis of Variance
C	Celsius
CARE	Co-operation American Relief Everywhere
CBS	Central Bureau of Statistics
CEMAT	CEMAT Consultants (P) Ltd.
CPR	Common Property Resources
CR	Common Resources
CRT	Center for Rural Technology
DDC	District Development Committee
DFID	Department for International Development
EIA	Environmental Impact Assessment
FAO	Food and Agricultural Organization
FIT	Free Individual Trekkers
GDP	Gross Domestic Products
GEOCE	GEOCE Consultants (P) Ltd.
GIS	Geographical Information System
GPS	Global Positioning System
GT	Group Trekkers
GTZ	German Technical Co-operation
ha	Hectare
HMG/N	His Majesty's Government of Nepal
IFAD	International Fund for Agricultural Development
IWRM	Integrated Water Resource Management
ISC	Industrial Service Center
IUCN	International Union for Conservation of Nature and Natural Resources
LRMP	Land Resource Mapping Project
kg	Kilogram
KMTNC	King Mahendra Trust for Nature Conservation
KW	Kilo Watt
LEDCO	Lamjung Electricity Development Company

m ³	Cubic meter
MCT	Main Central Thrust
METCON	METCON Consultants (P) Ltd.
MW	Mega Watt
NEA	Nepal Electricity Authority
NRAC	Natural Resource Advisory Committee
PCO	Public Call Office
PDDP	Participatory District Development Program
PQT	Partnership for Quality Tourism
PRA	Participatory Rapid Appraisal
Rs	Rupees
SLC	School Leaving Certificate
SPSS	Statistical Packages for Social Sciences
UN	United Nations
UNDP	United Nation's Development Program
VDC	Village Development Committee
WCED	World Commission on Environment and Development
WESC	Water and Energy Commission Secretariat