

Resource Constraints and Management Options in Mountain Watersheds of the Himalayas



Proceedings of a Regional Workshop held 8-9 December, 2003
in Kathmandu, Nepal

About ICIMOD

The **International Centre for Integrated Mountain Development** (ICIMOD) is an independent 'Mountain Learning and Knowledge Centre' serving the eight countries of the Hindu Kush-Himalayas – Afghanistan , Bangladesh , Bhutan , China , India , Myanmar , Nepal , and Pakistan  – and the global mountain community. Founded in 1983, ICIMOD is based in Kathmandu, Nepal, and brings together a partnership of regional member countries, partner institutions, and donors with a commitment for development action to secure a better future for the people and environment of the Himalayan region. The primary objective of the Centre is to promote the development of an economically and environmentally sound mountain ecosystem and to improve the living standards of mountain populations.

The **People and Resource Dynamics of Mountain Watersheds in the Hindu Kush-Himalayas Project** (PARDYP) is a regional research for development project funded by the Swiss Agency for Development and Cooperation (SDC), the International Development Research Centre (IDRC) of Canada, and the International Centre for Integrated Mountain Development (ICIMOD) and active in watershed and natural resources management in five watersheds in China, India, Nepal, and Pakistan. PARDYP's aim is to contribute to balanced, sustainable, and equitable development of mountain communities and families in the Hindu Kush-Himalayan region. To achieve this, it is focusing on data collection, processing, exchange, and dissemination in major areas such as the understanding of community institutions, determination of reasons for social and gender inequity, investigation of the status and dynamics of natural resources, and the potential for improvement of the livelihoods of mountain communities.

Resource Constraints and Management Options in Mountain Watersheds of the Himalayas

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held 8-9 December, 2003, in Kathmandu, Nepal

Editors

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Sanjeev Kumar Bhuchar

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Foreword

The middle mountains of the Hindu Kush-Himalayas are intensively used and highly populated. Conventional wisdom considers these areas as suffering from significant environmental degradation with increasing shortages of water, declining forest cover, increasing soil erosion and reducing water quality. The reality is more complicated – and less pessimistic.

The importance of addressing these critical mountain issues led ICIMOD to amalgamate earlier projects on the rehabilitation of degraded land and mountain natural resources into the People and Resource Dynamics in Mountain Watersheds of the Hindu Kush-Himalayas Project (PARDYP). Based on research undertaken by these previous projects in the middle mountains of Nepal, and to some extent in other countries of the region, PARDYP was conceptualised in 1996. In 2003 PARDYP entered its third three-year phase with regional collaboration throughout the Hindu Kush-Himalayan region as the basis for its operations and research. The Swiss Agency for Development and Cooperation (SDC) and the International Development Research Centre (IDRC) of Canada continue to provide funding and intellectual support.

The primary objectives of PARDYP are to carry out research for development to better understand the processes of natural resource degradation and to recommend sustainable community and farm-based options to promote the rehabilitation of degraded lands and make sustainable increases in on-farm productivity. It examines the impact of natural and man-made interventions on soil fertility and the linkages of these natural factors with the socioeconomic environment in which they are found. The human factor is perceived as the critical basis for future improvements; hence, the project is implemented through a participatory research process in mountain communities.

PARDYP is also an example of the collaborative regional approach taken by ICIMOD in carrying out its mandate for the Hindu Kush-Himalayan region. Research and the daily management of project sites are undertaken by the collaborating focal institutions in China, India, Pakistan, and Nepal. The participating scientists from these countries are the project's researchers and the source of its strength. As the central executing agency, ICIMOD is also extremely fortunate in having the help of specialists from the universities of British Columbia (Canada), Zurich, and Bern (Switzerland). We are confident that the work carried out by PARDYP will contribute to the better management of mountain natural resources and help reduce the poverty in agricultural communities throughout the greater Himalayan region.

Dr. J. Gabriel Campbell
Director General
ICIMOD

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PARDYP's pioneering research work on watershed management and resource dynamics in the Himalaya region is a team effort that draws on the contributions of many people. PARDYP thanks and gratefully acknowledges:

- the financial support and strategic guidance provided by the Swiss Agency for Development and Cooperation (SDC), the International Development Research Centre (IDRC), and the International Centre for Integrated Mountain Development (ICIMOD);
- the invaluable technical inputs of researchers Professor Rolf Weingartner and Dr Juerg Merz from the University of Berne, and Dr Hans Schreier and Dr Sandra Brown from the University of British Columbia;
- the facilities and support provided by the directors and staff of the regional partner institutions: the G.B. Pant Institute of Himalayan Environment and Development, the Pakistan Forest Institute, the Center for Biodiversity and Indigenous Knowledge (Kunming), the Kunming Institute of Botany, and ICIMOD;
- the dedication and hard work of the four PARDYP country teams that have been ably led by Hakim Shah (Pakistan), B.P. Kothyari (India), Bhuban Shrestha and P.B. Shah (Nepal), and Xu Jianchu (China);
- the authors of the papers in this publication and the people who assisted in improving drafts of the papers;
- the diligence of the local PARDYP observers and field staff in the study watersheds in their daily data collection work;
- the office support provided by Samma Shakya;
- the cooperation of the local people in the study watershed for giving freely of their time and allowing their land to be used for trials and demonstrations;
- the cooperation of NGOs and line agencies in the PARDYP watersheds for extending help to conduct trials and demonstrations and for helping in disseminating PARDYP's findings;
- the ICIMOD Publications' Unit, in particular Dharma R. Maharjan and Asha Kaji Thaku who prepared the figures and diagrams and the layout;
- and especially Stephen Keeling who edited the contributions, liaised with the authors, coordinated the compilation, and supervised the layout of this volume.

The successes and lessons learned during Phase 2 are due to the hard work and cooperation of all these (and other) people. Many thanks!

Executive Summary

This document is a compilation of the papers presented at the wrap-up workshop for Phase 2 of the People and Resource Dynamics in Mountain Watersheds of the Hindu Kush-Himalayas Project (PARDYP), held in Kathmandu in December 2003. This project is funded by the Swiss Agency for Development and Cooperation (SDC), the International Development Research Centre (IDRC, Canada), and the International Centre for Integrated Mountain Development (ICIMOD). PARDYP Phase 2 began in October 1999 and ended in December 2002, and has been active at the watershed scale in the four ICIMOD countries of China, India, Nepal, and Pakistan.

PARDYP is a research for development project that evolved out of previous IDRC-funded projects that were concerned with natural resource dynamics and the rehabilitation of degraded areas in the middle mountains of the Hindu Kush-Himalayas (HKH). These field studies provided much experience and a number of important lessons. Their main findings were that 1) geographical generalisations should only be made based on the results of long term replicated tests and trials, 2) water is as important as soils in terms of both dynamics and sustainability, 3) institutional and policy settings must be supportive in order to obtain sustainable development, and 4) common methodologies and scientific rigour are crucial for monitoring biophysical parameters and change. The PARDYP project was developed at a 1996 workshop and was based on these findings and the need for longer term data generation and field study, and the need to work more closely with watershed communities. The second phase of the project was worked out at a 1999 workshop following the presentation of the Phase 1 findings at a workshop in Baoshan, China in May 1999 (see Allen, R.; Schreier, H.; Brown, S. and Shah P.B. eds (2000) *The People and Resource Dynamics Project: the First Three Years, 1996-1999*. Kathmandu: ICIMOD.)

PARDYP's primary objectives are to provide a basic understanding of natural resource degradation processes, to recommend proven strategies and programmes for community and farm-based prevention of degradation, and to promote the rehabilitation and improved management of natural resources in five watersheds of the Hindu Kush-Himalayas region.

ICIMOD is the central executive agency. The project is implemented in partnership with many collaborators. Specialists from the universities of British Columbia (Canada) and Berne (Switzerland) have provided technical back-up. The Kunming Institute of Botany in China, the GB Pant Institute of Himalayan Environment and Development in India, and the Pakistan Forest Institute are the focal institutions and have undertaken the day-to-day management of the project in the watersheds. Each of these institutions identified their own national partners from other government offices, NGOs, and grassroots organisations. Project staff at ICIMOD have managed and undertaken the activities in Nepal along with a number of local partners.

PARDYP has covered substantial ground in its second phase by establishing benchmark watersheds. In some of the fields of study, for example the hydrological and erosion plot studies, standard methodologies for all five watersheds have been developed. In other areas a variety of study foci and methods have been followed to reflect the differing conditions and

local traditions of particular watershed societies. In all aspects, the emphasis has been on participatory research and management.

The work carried out up to the end of the Phase 2 workshop identified the major common issues as:

- population issues leading to land use intensification and consequent soil nutrient deficiencies;
- drinking and irrigation water shortages in the dry season; and
- water quality problems due to the improper use of fertilisers and widespread very high levels of faecal coliforms.

The widely perceived high levels of soil erosion have been found to be not as widespread, or as significant, as previously thought. In fact soil erosion rates from agricultural land have been found to be generally low in all of PARDYP's watersheds. Degraded land has shown high rates of erosion. PARDYP has been able to successfully demonstrate techniques for rehabilitating land and has turned some areas of degraded land into productive land. Although the techniques for rehabilitating land degradation are well understood, more work is needed on the key elements of ensuring community management and overcoming social and gender equity concerns to maintain improvements.

Forest degradation has been found to be not so significant. In all five PARDYP watersheds, forest cover has been maintained or is increasing. In Nepal, community management has helped stabilise forest cover. But in China, Pakistan and India there continues to be a major focus on centralised forest management.

While poor agricultural productivity is still a very significant issue, PARDYP has shown the many opportunities for increasing farm productivity. This has been demonstrated successfully in all the watersheds. Initial results indicate that a proper mix of simple technologies and institutional linkages can substantially increase agriculture productivity.

PARDYP has carried out many studies to identify potential interventions to combat some of the key resource problems that affect the watersheds. This publication assembles the results of three years of painstaking research by the country teams. More time is needed to ensure that these options are adequately demonstrated and promoted by farmers. These proceedings should serve as a valuable resource for researchers, development workers, policy makers, and students of natural resource management working in the HKH.

The many findings from PARDYP Phase 2 are documented in the 21 papers in this volume. An introductory paper explains the background to PARDYP and summaries the main Phase 2 achievements. The papers are grouped together under the three main workshop themes of on-farm activities, water and erosion, and common property resources. The papers by Gafur, Acharya et al., Biggs and Messerschmidt, and Rai are not reporting on PARDYP work but were included in the workshop, and in these proceedings, to give an appropriate forum and for the PARDYP teams to hear of similar innovative work.

A planning workshop for Phase 3 was held in September 2002, and the three major donors approved the funding of a further three-year phase to the end of 2005. Phase 3 is already well underway elaborating options open to farmers and developing them through action research.

Acronyms and Abbreviations

BGC	Bheta Gad-Garur Ganga Catchment, India
BGW	Bheta Gad-Garur Ganga watershed, India
CHT	Chittagong Hill Tracts
CIMMYT	the International Maize and Wheat Improvement Centre
Danida	Danish International Development Agency
DAP	diammonium phosphate fertiliser
DFID	UK Department for International Development
FAO	Food and Agriculture Organization
GIS	geographical information system
hh	household
HKC	Hilkot catchment, Pakistan
HKW	Hilkot watershed, Pakistan,
HKH	Hindu Kush-Himalayas
HMGN	His Majesty's Government of Nepal
ICIMOD	International Centre for Integrated Mountain Development
IDRC	International Development Research Centre
JKC	Jhikhu Khola catchment, Nepal
JKW	Jhikhu Khola watershed, Nepal
masl	metres above sea level
NARC	National Agricultural Research Council
NARMSAP	Natural Resource Management Sector Assistance Programme (Nepal)
NGO	non-governmental organisation
NWFP	Northwest Frontier Provinces
PARDYP	People and Resource Dynamics in Mountain Watersheds of the Hindu Kush-Himalayas Project
SDC	Swiss Agency for Development and Cooperation
SLCP	Sloping Land Conversion Program
SRI	system of rice intensification
SSMP	Sustainable Soil Management Program
TM	traditionally managed (rice cultivation)
VAM	vesicular arbuscular mycorrhiza
VDC	village development committee

WOCAT	World Overview of Conservation Approaches and Technologies
XIC	Xizhuang catchment, China
XIW	Xizhuang watershed, China
YKC	Yarsha Khola catchment, Nepal
YKW	Yarsha Khola watershed, Nepal

Non-standard units and exchange rates (as of 2004) used in papers

IR	Indian rupees (exchange rate of US\$1: IR 46)
mu	Chinese local unit for land size (1 ha = 15 mu)
NR	Nepali rupees (exchange rate of US\$1:NR 74)
PR	Pakistani rupees (exchange rate of US\$1: PR 59)
yuan	Chinese currency (US\$1: 8.3 yuan)

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