People and Resource Dynamics in Mountain Watersheds

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PARDYP India

Demonstration of off-season vegetables at a PARDYP site in Bhetagad, Uttaranchal, India

The People and Resource Dynamics in Mountain Watersheds of the Hindu Kush-Himalayas (HKH) Project (PARDYP) was managed by ICIMOD and funded through Swiss Development Cooperation (SDC) and the International Development Research Centre (IDRC) of Canada. The PARDYP Project ran from 1996 until June 2006.

PARDYP evolved from two IDRC-funded initiatives managed by ICIMOD.

1. The three-year 'Soil Fertility and Erosion Project', and four-year 'Mountain Resource Management Project', both of which undertook studies of resource dynamics in the Jhikhu Khola watershed of Nepal from 1989 to 1996.

2. The 'Rehabilitation of Degraded Lands in Mountain Ecosystems' Project' (1992/1996) carried out in China, India, Nepal, and Pakistan, and which involved testing and developing ways of rehabilitating and re-greening small patches of degraded and denuded land on valley slopes in the HKH.

PARDYP carried out research for development in hydrology and meteorology, farming systems, land cover, water availability and management, soil erosion and fertility, on-farm and off-farm conservation and rehabilitation, community forestry, access and rights issues of common pool resources, agronomic and horticultural initiatives, and social, economic, gender and marketing issues.

The main partners were:

- in China, the Kunming Botanical Institute, and the Centre for Biodiversity and Indigenous Knowledge (CBIK);
- in India, G.B. Pant Institute of Himalayan Environment and Development (Almora);

- in Pakistan, Pakistan Forest Institute (Peshawar); and
- in Nepal, the Department of Forests, the Department of Soil Conservation and Watershed Management, Department of Hydrology and Meteorology, and others.

Three international institutions have provided considerable advice, support, and consultancy services to PARDYP from its inception. The University of British Columbia provided inputs focused mainly on Nepal in the fields of soil fertility management and productivity through periodic visits to Nepal by its staff, while the University of Berne provided expert advice on hydrology through periodic visits and the services of a part-time research hydrologist based in Berne. Inputs from the University of Berne covered all five watersheds. From January 2003, the Geography Department of the University of Zurich assisted, particularly with issues related to access to natural resources and by providing broad backstopping in social sciences.

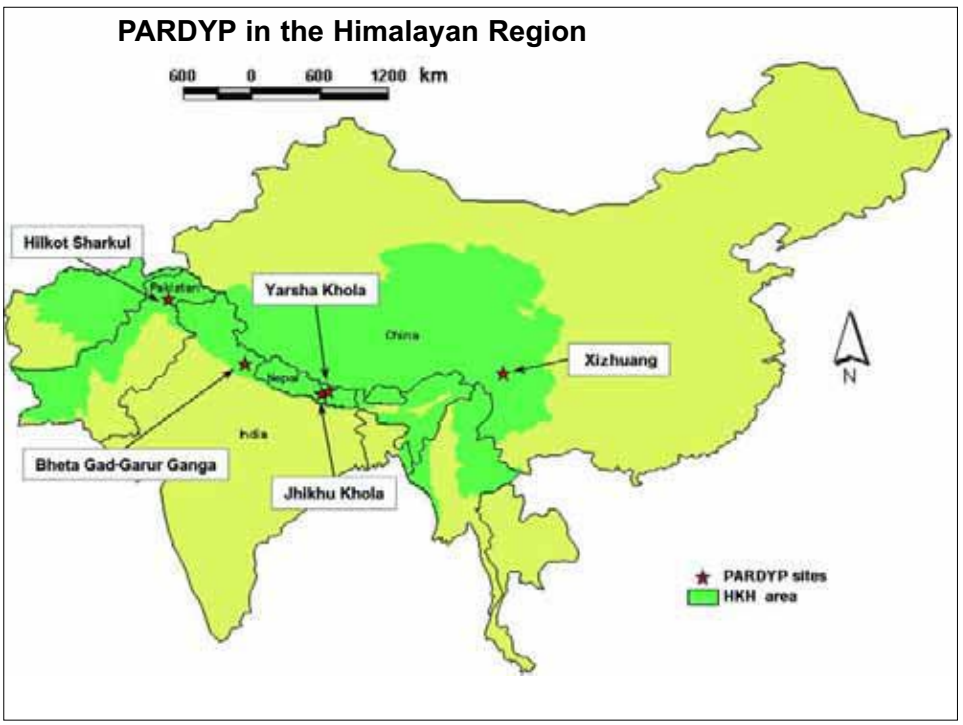
Changing perceptions

Water scarcity. When research commenced, the problems and issues of middle mountain watersheds were thought to be deforestation, increasing erosion, declining crop yields, and farm incomes. Floods were seen as significant problems for both middle mountain inhabitants and downstream dwellers. However, after nine years of research a different picture emerged, backed by interaction with watershed residents and farmers as well as by exhaustive data collection and analysis. The research carried out is undoubtedly one of the most detailed and geographically widespread environmental research projects undertaken in the Himalayas.

To farmers and non-farming residents in these rural watersheds, water scarcity is a pressing issue; floods are not normally of great concern to the watershed inhabitants. To them, long walks to springs or lining up at taps are the reality, and this situation is getting worse year by year. This is inconvenient and wastes time, but almost inevitably it is the women and children that collect water and they suffer the most. In addition there are indications that, even in rural areas, water quality is deteriorating and environmental health problems lie ahead. Juerg Merz, in his article on water scarcity (p.16) describes the problems people face in these watersheds.

Deforestation. The massive deforestation identified as a problem at the start of the research is not taking place. In all PARDYP watersheds, tree cover has been maintained at least or is increasing. Why is this? In China, recent devastating downstream floods have been blamed on bad land management in the hills. Consequently, the Government of China embarked on a land conversion policy aimed at reforestation of steeply sloping agricultural land. The government has also launched massive reforestation programmes that are increasing tree cover. Central government interventions are leading to increased tree cover (see Xu Jianchu's paper on p. 22).

In Nepal the impact of the well-documented community forestry approach is clearly visible in the Jhikhu Khola watershed where there are 39 active forest user groups. Central government policies are allowing people to manage their own natural resources. We are seeing big increases in both areas under forest and the quality of forests.



Five PARDYP watershed sites in four ICIMOD member countries: Bhutan, China, India, and Nepal

At our research site in Pakistan, the process is in transition. Forest cover is very low nationally and the topic is widely discussed and debated. Much of the forest in the PARDYP watershed in Hilkot is privately-owned. For many years, forests have been overexploited, either by owners or by surrounding villages. No one was really benefiting and the resource was diminishing. PARDYP has helped to resolve conflicts between the landlords who own the bulk of the forests and the villagers who get their timber and firewood from them. By recognising each other's use patterns, there are signs that forest cover is improving.

The tree cover in the PARDYP watershed in India was 56%, but much of this was reserve forest of *Pinus roxberghii,* of poor quality, and of little use to the local people.

There are tried, tested, and proven technologies and management practices that can help the farmers, but many of these ideas are not reaching poor farmers.

Soil erosion. Extensive soil erosion was considered to be a significant problem. This is a widely-held perception and quite believable given the steep slopes and fragile nature of the middle mountains. Our results showed that degraded land did, as expected, have high rates of soil erosion if the soil particles were detachable. However, the agricultural land and, in particular, rainfed 'bari' lands showed unexpectedly low rates of erosion in all the research watersheds. In Pakistan, where rainfall is distributed more evenly throughout the year, and therefore vegetative cover is maintained, annual erosion rates were rarely above one ton per hectare per year. Of far greater importance is nutrient management, leaching of nutrients through the soil profile. Farmers can potentially save money by timely application of mineral fertilisers.

Keshar Man Shapit

Adoption of fish ponds in the PARDYP India watershed site

Hydrometeorology. One of the core activities – and accounting for 60% of our budget – was a detailed hydrometeorological network in each of the five research watersheds. This work proceeded well with solid backstopping from the University of Berne. However, our conclusions are that, in order to get a clear picture of rainfall at 95 confidence limits, the minimum period required for data collection would be 27 years. While the data have helped us understand several processes, such as runoff generation, rainfall intensity, and flood generation, our data could not be used to analyse climate change.

Logistics involved in carrying out research. While extraordinary technological advances have taken place in the last nine years, the realities in our study areas and with partners do not bear this out. Many of our partners still do not have good Internet and email connectivity and, in 2006, some transactions have had to take place by post and a letter often takes six weeks to arrive! Some of our partners have not been able to open files or intranet sites - technologies at our disposal at ICIMOD in Kathmandu that we offen take for granted. Similarly, we are all aware of the great advances in satellite imagery and remote sensing, but the reality has been that, in two of our four partner countries, we have been unable to get air photography or satellite imagery for security reasons.

Improving livelihoods as the vehicle for reducing land degradation

PARDYP has not only documented problems and issues, it has also tried to come up with ways of overcoming the problems. Solutions are being developed and a great deal can be done to promote successes in one geographical area to other mountain areas.

Water scarcity can be mitigated to some extent by improving the efficiency of water use. For example, low cost drip irrigation sets produced and promoted in Nepal by the International Development Enterprises are really liked by farmers in areas where water scarcity

PARDYP Nepal

Water discharge measurement in the Jhikhu Khola watershed in Nepal

in the dry season can reduce home garden or vegetable production. With PARDYP assistance, farmers in China and Bhutan have been given drip sets to test. In addition, water scarcity can be addressed by improving water harvesting methods.

As a research network, PARDYP has been criticised for not coming up with new ideas. Recent reviewers said we promote solutions that are already well known. This may be true but, in the absence of an effective extension service, farmers are just not aware of many cheap and simple solutions. The reality on the ground is that provision of good seeds, timely and appropriate application of fertiliser, and community management of natural resources can transform rural livelihoods. Another important finding of PARDYP is that the transfer of knowledge among countries in the mountains and between communities and 'experts' is still not taking place effectively. Sharing knowledge and demonstrating best practices can make a tremendous difference to people's livelihoods and to the sustainable management of natural resources in the Hindu Kush-Himalayas.

What our watershed management research has led us to conclude

1. There are good ideas – tried, tested and proven technologies and management practices that can help farmers to manage their land in a sustainable way. However, many of these ideas are still not reaching farmers, especially poor farmers.
2. Demonstrations of these options – beacons of innovation – with farmers in a watershed setting can help adoption, but extension staff involved in scaling up need to establish credibility and trust with the farmers if we are to see widespread adoption.
3. Working with farmers to develop their ideas for improved management of natural resources can be both rewarding and achieve good results.
4. Natural systems appear more resilient to changes in land use and farming practices than we think, but there may be a strong 'buffering' effect, where we do not see gradual change but rather crashes (for example in N levels in water and soil acidity).
5. In these research watersheds over the last 10 years, watershed health has at least been maintained or improved significantly in terms of an increasing or maintenance of tree cover.
6. Soil erosion rates from agricultural land are much lower than was originally thought, although contributions from degraded land may be high. To reduce soil erosion, it is better to tackle the degraded land not the agricultural land.
7. Hydrological issues are more about low flows and how to improve water management rather than about floods and how to reduce peak flows.
8. New, unforeseen problems may arise – like different and changing nutrient deficiencies in increasingly intensively used soils.