TOOLS AND APPROACHES TO COMMUNITY DEVELOPMENT: PARDYP NETWORK EXPERIENCES

S. S. Bisht[1*], B.P. Kothyari[1] and S.K. Bhuchar[2]

[1]G B. Pant Institute of Himalayan Environment and Development, Katarmal-263643, Almora, India,
[2]International Centre for Integrated Mountain Development, Khumaltar, GPO Box 3226, Kathmandu, Nepal

ABSTRACT
Smallholder farmers in the study watersheds, including the Garur-Ganga in India, under People and Resources Dynamics in Mountain watersheds of the Hindu Kush-Himalayas (PARDYP) are generally poor and one of the reasons for this is lack of efforts to develop and disseminate improved on-farm options for agriculture productivity, particularly in the rain-fed conditions. In response to this, the on-farm research team in India has been carrying out (since 1998) research with farmers in the watershed, on a number of potential measures such as off-season vegetable cultivation, use of bio-fertilisers and improved seeds. This paper describes the findings of the research on these and about efforts made by the project to spread the findings.

INDEX TERMS
Mountain watershed, action research, agriculture, improved options, research process

INTRODUCTION
People and Resource Dynamics in Mountain Watersheds of the Hindu Kush-Himalayas Project (PARDYP) is an integrated research-for-development project concerned with natural resource dynamics and degradation processes in the middle mountains of the Himalayan region. The project is funded by the Swiss Agency for Development and Cooperation (SDC) and International Development Research Centre (IDRC) and being executed by research and development institutions and individuals from China, India, Nepal, Pakistan, Canada and Switzerland. The International Centre for Integrated Mountain Development (ICIMOD; www.icimod.org) is responsible for the regional coordination, guidance of PARDYP and dissemination of its outputs. In India, G.B. Pant Institute of Himalayan Environment and Development located at Almora, Uttaranchal executes the project in Garua- Ganga watershed.

PARDYP operates in five watersheds in HKH region: one each in China, India, and Pakistan and two in Nepal (Figure 1). The watersheds were selected because of degradation problems and poor conditions of the smallholder farmers. All the teams designed their action plans so as to:

1. Develop and test options for improved farming systems productivity (including land and water resources, as well as interactions with forest and livestock)

[1] Corresponding author email: ssbisht1@yahoo.co.in

2. Test and disseminate options to increase productivity of agricultural land (focusing on soil conservation and soil fertility)
3. Identify, test and disseminate water management options for more efficient use and equitable access
4. Identify and disseminate options and approaches to improve sustainable and equitable access to water, land, and forest resources

The present paper presents the findings of the research on improved options for agriculture productivity in PARDYP India watershed - Garur Ganga (GG). Under this component, the three activities that have yielded very good results are: a) Application of bio-fertilisers, b) Demonstration and promotion of off season vegetables, and c) Adoption of improved seeds of wheat.

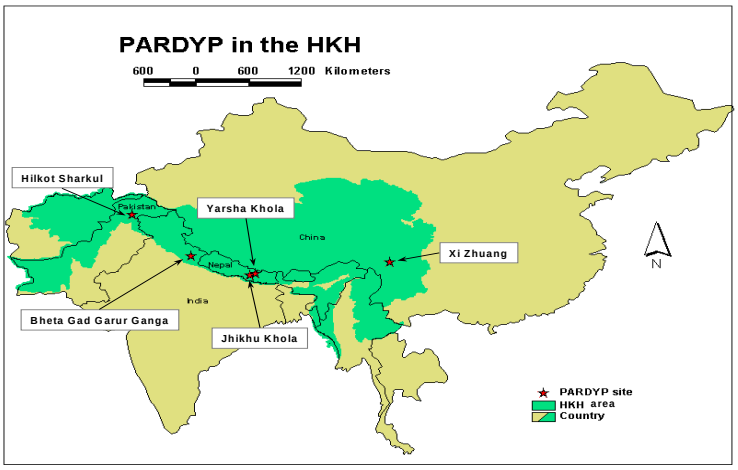

Figure1. *Map of PARDYP watersheds in the Hindu-Kush Himalayas*

THE SCIENCE COMMUNICATION PROCESS

The selection of improved options for testing was based on a problem analysis with the farmers using participatory rural appraisal methods; review of literature on problems related to farming systems in the hills and mountains; understanding of watershed's agriculture calendar and market analysis. This was followed by consultations with scientists for possible solutions and identification of potential options, and eventually trying out the options with farmers.

The reasons for selection of off-season vegetables were: improved economy and better nutrition of the families. Integration of bio-fertilisers was considered to be an eco-friendly approach to maintaining soil fertility. We were initially skeptical about the results of this because the strain (*Azotobactor chrooconum* W_5) developed by the Indian Agriculture Research Institute (IARI; India) were for crops grown in the plains. It has been a matter of chance that these bio-fertilisers have had a good impact on the crop yields under rainfed conditions of the Central Himalaya also.

The improved variety of rainfed wheat (VL 738 and VL 616) developed by Hill Agriculture Research wing of Indian Council of Agriculture Research located in Almora (Uttaranchal; India) were chosen for testing with the farmers in the watersheds with an assumption that the increase in the grain yields would improve food security of the poor farmers.

The research targeted smallholder farmers. In the early stages of the research, farmers that were involved with some of the other project activities such as in hydro-meteorology studies, land rehabilitation, and had interest in the options got involved in the on-farm research. The project provided incentives in the form polyhouse materials, improved seeds, packets of bio-fertilizers and technical support. A team of research associates and field technicians were responsible for the research activities. A permanent office in the study watershed added to the credibility of the research work.

The first year was focused on testing the options. During repeat trials in the following years more farmers, including women, from the watershed were involved in the implementation, monitoring and evaluation of the improved options. During all the years, treated plots were compared with control.

The team also organized on-site training programs and group discussions, which have enabled many other farmers to adopt the practices demonstrated by the project. Information has been also shared during national and regional workshops, conferences, and seminars; through PARDYP extranet (launched by ICIMOD) and newsletter; during annual meetings of specialists working on agriculture productivity in PARDYP. The project invites NGOs, research and development programs' staff members, self help groups and other village institutions for during knowledge sharing events, such as farmer visits, on-site training (Figure 2a), farmer meeting (Figure 2b), etc.

Figure 2. *An on-site training on various aspects of off-season vegetable cultivation by PARDYP India team. In the foreground is the dummy of a polyhouse using bamboo (2a). A farmer meeting in progress (2b*)

EVALUATION

The results of the on-farm research with the farmers on off-season vegetable, bio-fertilisers and improved varieties of wheat are presented in Tables 1,2 and 3. The project team and the farmers are very happy with the results. The number of farmers, including women (Figure 3 & 4), adopting these improved options, is gradually increasing. The successful demonstration and participatory action research approaches are turning out to

be big attractions for local NGO's working in the area of natural resource management and line agencies, for instance Uttaranchal's Horticulture Mission. There are increasing requests to the project for training on these options.

Table1. *An analysis of one of PARDYP farmers growing off-season vegetable in the Indian watershed*

Activities	**Inputs/outputs (Rs)***					
	1999	2000	2001	2002	2003	2004
Polyhouse (1)	3500	-	-	-	-	-
Inputs: Seeds, manure, pesticides etc.	930	1600	2200	2800	2150	3350
Outputs:						
Vegetable nursery + horticulture plant	1020	5770	4000	4700	5075	7500
Vegetable production	4727	5955	9072	10466	11090	12786
Net gain/loss	1317	10125	10872	12366	14015	16936

***Cash value** (Indian Rupees; 1USD=approx. Rs. 47)*

Table 2. *Some results of bio-fertiliser research trials in PARDYP India watershed*

Research trial crops	**Biofertiliser applied**	**Change (% yield)**	**No. years trials conducted**	**No. of trials**
Wheat, local VL-616, 738	*Azotobacter chroococcum* strain W_5	+11.5 to 17.6%	5 yrs	250
Paddy, local, VL-81	Nutrilink (VAM)	+15.9 to 19.8%	3 yrs	75
Finger millet, local, VL-149	*A. chroococcum* strain A_{41}	+38 to 42.9%	4 yrs	180
Tomato	*A. chroococcum* W_5	+18.5 to 20%	4 yrs	115

Table 3. *Some result of high yielding variety research trials in PARDYP India watershed*

Trial crops	**Variety**	**Change (% yield)**	**No. years trial conducted**	**No. of trials**
Wheat	VL-616,	100 to 125%	3 yrs	50
Wheat	VL-738	+91.6 to 100%	5yrs	200
Finger millet	VL-149	+110	4 yrs	180

Figure 3. *A PARDYP research farmer with his off-season polyhouse nursery in Garur Ganga (India; 3a). The same farmer selling off-season seedlings to other farmers in the watershed (3b)*

Figure 4. *A woman farmer showing her off-season tomato crop to PARDYP regional coordinator (4a). Figure (4b) shows an exposure visit organized by PARDYP for women groups.*

DISCUSSION

Results of the on-farm research conducted by PARDYP India shows that farmers in the middle mountains of the Indian Central Himalaya can easily improve their crop yields by atleast 2 times. By adopting measures such as polyhouses, poly-pits, poly-trenches, they can overcome the constraints of very low temperature during winter season and grow off-season vegetables. This can, as demonstrated by the project farmers, increase their cash income considerably. The development programs must promote use of bio-fertilisers and further research needs to be carried out for identifying strains that suit hill environment.

Based on the lessons learned by the project teams, in order to adopt such measure by the farmers, the state-run extension agencies will have to play a more proactive role. Simultaneously, decision makers will have to ensure that the knowledge existing in these service centers is updated and that the institutional human and financial capacities are strengthened. Importantly, women must be involved in the research process as they are the ones who need to decide on new technologies and make adaptations. For instance the VL 616 variety of wheat have better grain yield than VL738 but the former was rejected

by the women as yielded straw is not satisfactory, which is crucial for fulfilling fodder needs.

CONCLUSION

It is concluded that it is time when technologies and approaches that are showcase in research stations are brought out and tested with the farmers in the real world. Decision makers, researchers and development workers have to join hands if they are serious about improving the lives of the poor farmers.

Finally, seeing is believing. Having on-farm demonstrations where people can come and learn from farmers is the key to transforming a farmer's perception.

ACKNOWLEDGEMENTS

The authors are thankful to Mr Roger White (Regional Coordinator PARDYP) for the support and guidance during this research; Swiss Agency for Development (SDC) and Cooperation and International Development Research Centre (IDRC) and ICIMOD for the financial support. Support from the Director GB Pant Institute, watershed farmers, line agencies and all PARDYP family members are gratefully acknowledged.

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