

I. Title

Biophysical and Economic Impact of Participatory Forest Management: A Case Study of Ramnagar and Akhnoor Sub-watersheds in Shivaliks

II. Abstract

In the context of Integrated Watershed Development Project (IWDP), Hills-II, Jammu and Kashmir, institutional reforms for participatory forest management (PFM) have been carried out by identifying the ways through which the poor people have been supported in identifying their emergent needs and priorities, with the goal of creating robust institutions to manage the forest resources in sustainable manner. The participatory social development functionaries have created the much needed awareness and help facilitated in evolving forest user groups (FUGs) for sustainable management of forest resources, for which they have been empowered through capacity building programmes to inculcate the habits of self reliance and sustainability of the assets created through project interventions. The system of financial management adopted by the FUGs has not been satisfactory. At present, there is lack of development of more balanced partnerships between IWDP functionaries and FUGs, which is reflected in the imbalance in power and control between IWDP and FUG. The project has not made any attempt to give a legal status to the FUGs created and none of the FUGs had been registered so far. The project in association with FUGs has created assets through closing degraded forestland and village common lands (VCLs).

The effect of regeneration of vegetation, along with soil and water conservation measures on hill-slopes and wastelands was substantial. In Shivaliks, the run-off soil loss on barren hills was 23.70 tons in the baseline period, which fell to 9.65 tons per hectare after treatment. The difference in average number of milch animals in project area with FUG and without FUG was – 0.4. The milk yield was comparatively high in project area with FUG than project area without FUG and non-project area. Similarly, wool yield was as high as 3.1 kg per sheep. The incidence of animal grazing on forestlands has declined more rapidly in project area with FUG than project area without FUG and non-project area. Not only the number of animals grazed on forestlands has declined but the number of animal grazing days on forestlands has also declined significantly. However, the creation of closures has resulted in heavy grazing pressure on non-protected and non-enclosed forestlands as well as private lands. The afforestation plantations on community land and forestland was comparatively high in project area with FUG than project area without FUG and non-project area. The project area with FUG has shown a remarkable performance in terms of both the green and dry fodder productions.

III. Keywords

Participatory forest management, Forest user groups, Participatory rural appraisals, Methodological aspects, Factor analysis, Biophysical and economic impact

IV. Background and Objectives

Historically, governments have tended to try to increase their control over common property resource (CPR) in pursuit of revenue and environmental objectives, and consequently have usually progressively limited local rights rather than supported them. However, in the last two or three decades this has begun to change. Probably the principal factor has been recognition that centralized management of forest in situations where local people also draw upon the forest has failed to conserve essential productive and protective aspects of the forest estate. A larger role for local management of forest has also been consistent with recent strategies to devolve and decentralize and to bring about greater participation by rural population in decisions and actions affecting them – empowering them to effect change. It appears likely that these shifts have been facilitated in some countries by declining economic importance of the forest sector at the national level and a related increase in interest in its environmental and socio-economic contributions.

The principal features of participatory forest management (PFM), which seeks to enhance environmental stability and the benefits to local people are: setting up of user groups, establishing and monitoring of management plans by the forest department, confining local use to grass and non-timber forest products (NTFPs) and potentially a share of the income from the timber sold by the forest department. Not surprisingly, in such a large and diverse country, the results of applying the participatory approach have varied considerably. With operationalization of PFM, the areas which previously suffered from overexploitation, depleting subsistence and income flows, and adversely affecting agricultural productivity experienced increased fuel-wood availability, significant improvement in the local environment (reduced erosion, improved water supplies, etc.) and a reduction in seasonal out-migration. Moreover, this appears to have been of greater proportional benefit to the poor because they are able to invest more labour in forest exploitation. Similar to the principles that make independent management of CPRs successful, PFM has been most successful in villages bordering extensive tracts of degraded forest land, where the forest-to-household ratio is relatively high, there are ethnically homogeneous communities possessing local forestry knowledge, and benefits accrue from minor forest products (MFPs) at a relatively early stage. However, some of the more frequently encountered problems relate to difficulties in pursuing the dual objectives of achieving both sustainable forest management and enhanced local benefits. Conservation usually means restricting or prohibiting existing gathering or harvesting activities of importance to sections of the poor, at least temporarily. The subsequent changes in the composition of protected forests can have differential impacts on different categories of users. PFM has traveled a relatively long way since its birth. However, very few studies have been carried out to evaluate its biophysical and economic impact, which is intended to fill through the present case study.

With the above backdrop, the following questions have been probed in the present case study:

1. What are the methodological aspects and practices of participatory forest management and its biophysical and economic impact?
2. Does participatory forest management result in extraction of more or less forest products?
3. Are there any differences in biophysical and economic gains between participating and non-participating households and beneficiary and non-beneficiary households?
4. Does participatory forest management improve the welfare of poor households?
5. Does community forestry result in conservation of resources?

Now a days most of the countries both developed and developing have been facing the problem of environmental degradation. The environmental crisis in developing countries is more severe and is mainly due to poverty, rapid population growth (both human and livestock), increasing process of industrialization and urbanization, which have led to the massive destruction of natural resources. India has created institutional mechanism and established a set of robust legislation, programmes and conventions for poverty reduction, livelihood diversification and environmental conservation, which are the basic premises of the current development plans. Moreover, it has also been one of the Millennium Development Goals (MDGs) of the United Nations in 2000. PFM is one of the major institutional reforms introduced in India, which seek to develop partnership between the government and local community institutions for protection, promotion and sustainable management of degraded public forests on the basis of sharing forest management responsibility and costs and benefits of forest products. So, it is strongly believed that PFM helps in poverty reduction, livelihood diversification, and environmental conservation.

PFM has been implemented in India since late 1970s and numerous studies have been undertaken on the issues related to institutional change and forest resource management. However, the areas of biophysical and economic impact have not been focused in the required manner and have been ignored. Therefore, the present case study is an attempt in this direction. The study has focused on the impact of PFM on biophysical and economic gains. Last, but not the least, it has provided some policy recommendations for further improvement of programme based on field experiences. Therefore, the present case study is highly significant and contemporary.

V. Methodology

The present case study has been based on the data and information collected as a part of a major research project titled “Participatory Approaches and Environmental and Economic Impact: With Special Reference to Integrated Watershed Development Project, Hills-II, Jammu and Kashmir, India” sponsored by Ministry of Environment and Forests, Government of India and World Bank Aided ““India: Environmental Management

Capacity Building (EMCaB) Technical Assistance Project” and completed in May, 2003.

During the Khon Kaen Conference (1985), different types of Rapid Rural Appraisal (RRA) techniques were identified, one of which was labeled “participatory”. The orientation of a participatory rural appraisal (PRA) was to facilitate or stimulate community awareness and capability regarding a problem or issue. Particular attention was given to enabling local people to conduct their own analysis of problems, and to share their findings. The role of the outsider became one of catalyst, rather than one of expert. Stimulation of community awareness and capability was also intended to reduce the extractive nature of RRA, and to help local people to empower themselves. In that regard, what became known, as PRA is consistent with some of the basic aspects of sustainable development (local empowerment, equity, social justice) (Conway and McCracken, 1990). The primary data has been collected using well-structured and pre-tested questionnaires, PRA techniques and group meetings.

Through participatory observations and focus group discussions, it is possible to describe what goes on, who and what is involved, when and where things happen, how they occur, and why—at least from the stand point of participants—things happens as they do in particular situations. The methodology of participatory observation and focus group discussions has been used to ascertain important differences between the views of insiders as opposed to outsiders. Keeping in view, the objectives of the present case study in mind, the participant observation inquiry has been helpful in an open-ended logic and process of enquiry as well as qualitative description of the phenomenon under study. The sample size has been restricted to the members of the forest user groups (FUGs) selected under IWDP (Hills-II) in the selected sub-watersheds. Two FUGs each has randomly been selected from the sub-watersheds of Akhnoor and Ramnagar.

Table 1: Total Population and Sample Size (No.)			
Types of Village	Household	Sample Size	Members of FUG
Project Area with FUG			
Sub-Watershed: Ramnagar			
Sunetar	500	98	15
Johnu	72	18	12
Project Area without FUG			
Kuh Nala	160	32	
Badhak	100	25	
Non Project Area			
Darsoo	175	35	
Chapper	65	13	
Total	1831	376	27
Project Area with FUG			
Sub-watershed: Akhnoor			
Chohara	184	62	21
Maira	279	55	12
Project Area without FUG			
Chigial	75	15	
Palwan	90	19	
Non Project Area			
Bhamla	400	80	
Amb Garota	238	49	
Total	1266	280	33

The team strategy has been used to collect data and information. Both the unfocused and focused observation techniques have been used. The unfocused initial has been used to become increasingly familiar with the insider's world to refine and focus subsequent observation and data collection. All the observations have been recorded on site and misunderstanding, if any has been corrected thereof. In all the focus-group observations, 10-12 stakeholders have been recruited from different settings. Highly formal interviews have been conducted using structured interview schedules. In-depth interviews have also been conducted to elicit opinion regarding strengthening of participatory processes, of stakeholders with extensive knowledge of the phenomenon under study. Besides, study has been supplemented by utilizing potentially rich sources of secondary data and research materials.

To evaluate the methodological aspects and practices of the PFM, two forest user groups (FUGs) each with a sample size of 27 members and 33 members respectively have been selected randomly from the forested sub-watersheds of Akhnoor and Ramnagar. For the collection of primary data and information on biophysical and economic impact at household level, two forested villages each from Akhnoor and Ramnagar, where a maximum number of people are known to have benefited from the PFM, have been selected. In the non-beneficiary category, two forest villages each have been selected on random basis, each 20-25 km away from the project area. A purposive sample of approximately 20 per cent of household level respondents in 'project' and 'non-project' area was selected as the base of enquiry (See table 1).

The content analysis technique has been used to analyze the data and information qualitatively and quantitatively (using descriptive statistics). The content analysis technique has been supplemented by use of code and labels, field notes, sorting, shifting, constructing and reconstructing these materials. The data has been analyzed qualitatively and quantitatively using descriptive statistics.

VI. Description

Numerous schemes for development of land resources are in operation in India. Some are watershed based while others are based on administrative boundaries. The objective of all the schemes is to put emphasis on management of soil and land resources for sustainable crop production and protection of environment (Sadhu and Sudan, 1999). In the last decade, in order to prevent and reverse the degradation process of the *Shivaliks* and *Karewas*, Integrated Watershed Development Project (IWDP), Hills-I was undertaken. Originally, the project was for a period of 7 years (1990-97), but was extended for another year up to 1998. The project was supported by the World Bank and was implemented in the four states: Jammu and Kashmir, Himachal Pradesh, Punjab and Haryana (World Bank, 1999). In the state of Jammu and Kashmir, IWDP (Hills-I) was initiated in three sub-watersheds of Devak and Ramkote in *Shivalik* hills (Jammu region) and Dudh Ganga in *Karewas* (Kashmir Valley). The overwhelming evidence from natural resource management projects is that without people's involvement the benefits are not sustainable in the long run. After the funds from the government or donors dry up, conservation structures disappear, committees are disbanded or abandoned and the

livelihood base of the people remains only marginally improved at all (Saxena, 1999). Fortunately, these shortcomings were taken care of, to some extent during the implementation of IWDP (Hills-I) (Sadhu and Sudan, 1999). IWDP (Hills-I) was implemented for soil and water conservation in the watershed areas aiming at proper land use according to land potential, protection of land against all kinds of deterioration, building and maintaining soil fertility, conserving water, proper management of water for drainage, flood protection, sediment reduction and increasing productivity from all kinds of land uses. Besides, improved vegetative coverage of treated areas, increased community participation and formulation of engaged village users' group, increased crop yields and increased household incomes of marginal and small farmers, the landless and the women were included as major objectives of IWDP (Hills-I) (World Bank, 1998).

IWDP (Hills-I) has made only a modest impact and it can't be denied that as it has been the first phase of this experiment, some shortcomings were bound to remain, but, at the same time, it must have enriched the experience of the project functionaries which should equip them to carry out their role more efficiently in second phase (Sadhu and Sudan, 1999). Seeing the physical targets being achieved by the participating states, the World Bank decided to further extend the programme in the form of IWDP (Hills-II) not only in other areas of states selected in phase-I, but also including the state of Uttar Pradesh, in 1999, for five years. This was aimed at providing a uniform integrated rural development platform to address the social and natural resources problems of the entire *Shivaliks* in India (World Bank, 1999). The experience gained through implementation of IWDP (Hills-I), J&K encouraged the State Government to extend the watershed development project to other rainfed areas of the State viz. Akhnoor and Ramnagar in *Shivaliks* (Jammu region) and Rajwar and Rambiyara in *Karewas* (Kashmir Valley). Following are the objectives of IWDP (Hills-II), Jammu and Kashmir:

- (i) to restore on a sustainable basis the productive potential of the region and improving the quality of life,
- (ii) to reduce soil erosion and improve availability of water,
- (iii) to help increase production and income, grain crops, horticulture, fodder, fibre, fuelwood, livestock and household based products,
- (iv) to promote holistic and sustainable agro-ecological development involving people's participation,
- (v) to strengthen community participation, and
- (vi) to develop local level institutions to enhance the sustainability of the model (World Bank, 1999).

Watersheds Covered in the Study

The State of Jammu and Kashmir with an area of 1,38,214 km² comprising the uppermost drainage of Indus, Jhelum, Middle Chinab and Western Rabi exhibits great contrast in relief features, climate, soil and vegetation within comparatively narrow geographical spread. The climate of lower plains of Jammu and Kashmir that merges with plains of Punjab is sub-tropical. The climate is predominantly sub-tropical in the main *Shivaliks*. The climate in the region covering upper reaches of Pir-Panjal forming

the main mountain backdrop changes from sub-tropical in the lower reaches to moist-temperate in upper reaches. The climate of Kashmir Valley (bordered between the Great Himalayas and the Pir-Panjal) is dry temperate. The great Himalayan range: the innermost line of high mountains with Ladakh situated in trans-Himalayan zone is a cold desert and experiences sub-zero winter temperature.

IWDP, Hills-I was started in 1990, and concentrated on integrated development of high priority zones of rainfed areas. The total area of *Shivaliks* and *Karewas* is 9.45 lakh Ha. (*Shivaliks*: 7.50 lakh Ha and *Karewas* : 1.95 lakh Ha) ; and about 5.9 lakh Ha. is identified as problem area, out of which, 0.52 lakh Ha. (8.81 percent of the problem area), have been treated under IWDP (Hills-I). This includes the sub-watersheds of Devak and Ramkote in *Shivalik* hills (Jammu region) and Dudhganga in *Karewas* (Kashmir Valley). IWDP (Hills-II) targets another 0.61 lakh Ha. (10.33 percent of the problem area), leaving balance of 4.77 lakh Ha (80.86 percent of problem area) still untouched.

Agro-Climatic Zone	Formation	Sub-Watershed	District	NO.of MWS	Area Hectare	Area to be treated
Sub tropical	<i>Shivalik</i>	Ramnagar	Udhampur	39	32630	22500
		Akhnoor	Jammu	37	42350	23200
Temperate	<i>Karewas</i>	Rajwar	Kupwara	8	29813	6700
		Rambiyara	Pulwama	24	28500	10000
Total				108	133293	60700

Source: *Project Implementation Plan, IWDP (Hills-II), J&K, 2000.*

IWDP, Hills-II, Jammu and Kashmir covers two sub-watersheds in *Shivaliks*, viz. Ramnagar and Akhnoor and two sub-watersheds in *Karewas*, viz. Rajwar and Rambiyara. The proposed study will be confined to two sub-watersheds of Akhnoor (Jammu district) and Ramnagar (Udhampur district). While Ramnagar is in the inner *Shivaliks*, Akhnoor is on its outer part. Ramnagar sub-watershed is the catchment area of Ramnagarwali *Khad* (gorge) in the middle catchment of river Tawi. It has an area of 32,630 Ha. and is subdivided into 39 micro-watersheds. Akhnoor sub-watershed with an area of 42350 Ha. is sub divided into 37 micro-watersheds. It covers about a dozen rivulets (*nallahs*) and a large number of small *nallahs* originating from *Kalidhar* ridge and draining into Chinab river on the western portion of *Kalidhar* ridge, drains join Manawar Tawi which in turn also meets the Chenab river.

The *Shivaliks*, locally known, as '*Kandi*' comprise of piedmont deposits made of boulder and pebbles, gravel and sand with minor clays mixed in varying proportions. One of the characteristic features of the area is the stream called *choes* or *khads*, which remain dry for most of the year. Though total rainfall is high (average 1000-1500 mm.), but its distribution is very erratic resulting in frequent droughts. This area is subject to soil erosion due to undulating topography, steep slopes, poor vegetative cover (scrub forest) and coarse to medium texture of the sedimentary material. *Shivalik* hills consist of highly erodible sand stones, conglomerates, siltstones and shales.

The uncontrolled deforestation and overgrazing in the past has resulted in the reduction of vegetative cover and accelerated erosion in the *Shivaliks*. The area experiences paucity of water for plant growth due to excessive run-off, high evaporation especially during summer, unpredictable and erratic rainfall. The eroded material from *Shivalik* hills, brought down by the seasonal rivulets (*choes*) is deposited in the sloping piedmont plain and also in the area around *choes*. The repeated deposition of coarse sediments renders these areas comparatively low in agricultural productivity. Due to lack of irrigation, subsistence rainfed agriculture is the prevalent production system in selected sub-watersheds. In terms of physiographic features, there may not be 100 per cent similarity between the two sub-watersheds but, certainly, in terms of accessibility, natural resource endowment, infrastructure development and general index of socio-economic awareness, two sub-watersheds are comparable. IWDP (Hills-II) is spread over predominantly rural areas. The indigenous population in the sub-watersheds is Scheduled Tribes (STs). The Scheduled Castes (SCs) are other disadvantaged social groups. In total, the project area is dominant in terms of SC population and ST population is negligible. Other social groups in the project area are nomads. The predominant economic base of the project area is primary sector activities. Agriculture is the mainstay of the rural economy, as over two-third of the population is engaged in agriculture and allied activities. Tertiary (service) sector activity assumes greater significance next to primary sector activity in the near-absence of any manufacturing units, especially the small and medium scale manufacturing units.

Methodological Aspects of PFM

The government policies began to emphasize people's participation in development programmes during early 1990s. The *panchayati raj* institutions were given a constitutional status with the 73rd and the 74th constitutional amendments. The *panchayats* are given many more powers, apart from the setting up of reservations for the disadvantaged sections of women and low castes. In order to ensure local people's participation in development programmes; the most readily available institution was the *gram panchayat*. Nonetheless, IWDP (Hills-II), Jammu and Kashmir have formed separate committees in order to operationalized PFM. The *panchayats* are statutory bodies, whereas the FUGs are informal bodies and have no legal standing. After the *panchayats* were given a constitutional status, various development policies gave directions about involving the *panchayats* at different stage. However, when actually seen in the field, the link is weak and in many cases, as good as non-existent. Many users committees have a very poor relationship with the *panchayats*. Sometimes villagers see *panchayats* and FUGs as competing alternative forms of organization. At the initial stages of the phase second of IWDP (Hills), the *panchayats* were non-existent in the State of Jammu and Kashmir. The elections for *panchayats* took place later in the year 2001. Besides, the view of the project functionaries towards *panchayats* is also very clear. The *panchayats* are elected bodies, and although supposed to be representative of the people, don't remain so in reality. The *panchayats* are supposed to be non-political, but these are influenced by party politics, which does not allow for a fair representation of village interest. Hence, the need for the formation of separate FUGs at village level has been emphasized. A structure parallel to the *panchayats* is also necessary, as it gives scope to

the project functionaries to have parameters of their own choice in the membership and the executive body, addressing issues of equity in particular. Not only this, the government departments do not have any control over the expenditure of funds made by *panchayats*. Not trusting the *panchayat* system, the project officials want to have control over the disbursement and expenditure of money by creating parallel participatory institutions.

a. FUG Formation and People's Participation

The first step in organizing collective action is defining the boundaries of the CPRs and specifying those authorized to use it [Ostrom (1990)]. However, simply defining the resource boundaries and identifying the users is not enough. It is possible for a limited number of the appropriators to increase the intensity of resource use, so that they may totally destroy the resource. As such, the role of user groups in resource management is not overemphasized. PRAs reveals that IWDP (Hills-II) project functionaries along with local resource users conducted a walk through survey of the villages included in the sub-watersheds to identify the degraded forestlands and grazing lands to be enclosed for protection and regeneration. Special attention has been paid to include the women, landless, and disadvantaged in the user groups. The rural poor have a greater dependency on CPRs for livelihoods and thus their representation on user groups has been assured through positive discrimination. There have been wide variations in the size of villages (72 to 500 households) in which FUGs have been formed. FUG comprises a group of about 10-25 villagers from each of the villages. The participatory social development functionaries in the presence of village communities have formed the FUGs through adopting the process of selection of the members of FUGs, keeping mandatory gender and disadvantaged groups' representation into account. In none of the case, the FUG has been formed either by election or by nomination of the project functionaries.

The members of the FUG represent specific socio-economic classes within the community. The family background, experience, sobriety of behaviour, sense of tolerance, quality of impartiality and proven honesty appears to be the predominant consideration for the selection of FUG members across the selected sub-watersheds. In some cases, the possession of landholding has also been given consideration for selection of members to FUGs. Even though in a large number of cases, the relatively elderly persons or middle-aged persons were selected to FUGs, in some cases, although not many in number, persons of relatively younger ages were returned to these committees. In the forested sub-watershed of Ramnagar, more than 70 per cent of the FUG members reported that experience, family background, sobriety of behaviour, sense of tolerance and quality of honesty were the dominating factors in their selection on FUG. Similarly, in Akhnoor sub-watershed, honesty (in case of more than 80 per cent) of the member was given main consideration in selecting a member to FUG.

During PRAs, it was found that all the members of FUGs were not perceptible and receptive of project activities. The young members bubble with excitement and in many times tend to ignore the virtues of humility and healthy cooperation with development functionaries. The user groups, which had been formed, were not

necessarily represented in the watershed committees (WCs). Thus, they may be unable to directly influence the decision making process in terms of the activities of the WCs. However, the experience gained WCs formation is very valuable. They should be the building blocks of the farmers' organization or WCs. More than 77 per cent of the FUG members across the selected sub-watersheds reported that membership procedure was rigid. Guidelines need to be framed for enabling those who remained non-members in the beginning to join later on. While the early members have every right to demand that late joiners should pay in some form of the effort the former have already invested, FUG should be discouraged from believing that they can permanently exclude non-members from access to the resources. It is ironical to note that not even a single FUG has been registered. However, the lists of the members exist on the records of WCs and IWDP officials. The main reasons for non-registration of FUGs with appropriate authorities were reportedly lack of legal knowledge and cumbersome procedure involved in the process of registration. As a result, all of the sampled FUGs have not initiated the process of registration. A large proportion of the FUG members across the selected sub-watersheds reported that FUG has not been got registered due to lack of legal knowledge and cumbersome procedure. It is significant to note that in none of the FUG, factors like internal conflict and/or non-cooperation from the project/registration authorities have played a part in non-registration of the FUG.

The membership procedure was reportedly rigid in most of the cases. It is significant to note that no change in FUGs membership has taken, once the FUGs were formed by selection. It has also been noticed that educated traders with little or no land have dominated the FUGs in forested sub-watershed of Ramnagar. However, the interested landless and poor farmers were not accommodated in FUGs. During PRAs, it was revealed by some of the members that their names have been incorporated in FUG's list, but they don't know the purpose of such an inclusion. PRAs confirm that a new type of leadership has come to dominate the stage at the village level in the form of FUGs. The poor farmers and agricultural labourers, including the disadvantaged groups have very much come to the forefront, but the large landowners and educated traders were dominating the FUGs.

b. Women Participation in Watershed Management

Along with the project-implementing agency, it is the FUGs that are responsible for planning and decision-making. Most of the women are unaware of the role they can play. Project implementing agency efforts to involve women are often limited to awareness camps. One of the main objectives of these camps was to enforce the ban on free grazing and open access to forests. Given the prevailing socio-cultural constraints, it is only exceptionally strong women who are able to make themselves heard under such circumstances. Furthermore, single woman, or even two, may find it difficult to represent the interests of all women in the village. Although women in general can be divided into two broad groups, landed and landless, there will be different needs and priorities within these groups depending on the occupations and socio-economic groups. Women from lower status-households were more interested in watershed protection activities since

these directly affected their access to forests. Women from large landholding-households were less interested, as they were not directly affected by restrictions on forests.

One of the positive effects of the involvement of the users in project activities by forming FUGs is the increasing visibility of those groups who hitherto had not been expected to enter the public arena on equal terms. If we limit ourselves for the present to women, the record of FUGs is rather disappointing in active participation. The majority of the women FUG members were found in the age group of 30-45 with poor educational attainment. It is ironical to note that none of the women FUG member was educated above middle standard. Besides, their participation in FUG has been reportedly veiled and passive. Thus, their representation on FUG is reported as marginal and may be too restricted to facilitate the dynamic and vibrant participation of all the stakeholders. PRA reveals limited, often symbolic participation of women in the FUG. Out of four FUG selected for the present study, only one (forested watershed – Dehari) had significant involvement of women, due to their participation having been facilitated by participatory social development functionaries. In other FUGs, 2-3 women have been made members of the managing committee. By and large, women remain outside the participatory process. As women are often the largest single group of resource users, their absence from FUG decision-making has often resulted in their priorities remaining unheard and the negative impact of increased labour and time required for water, fuel-wood and fodder collection. This applies particularly to women of the poorest households with no private property resources to fall back upon when forest areas are closed or certain types of usage are forbidden. It has been observed that a few women were aware about the existence of FUG in their villages and their functioning. This is not an issue of gender equality alone but may also have a critical impact on the sustainability of both the FUG and PFM, without which the programme objectives will only remain rhetorical.

The mandatory requirement of at least one woman, or an adequate number of women on FUGs encourages their participation but does not demonstrate a committed effort to involve women in decision-making. For effective participation, it is essential that at least one-third, preferably one-half, of the committee should consist of women. Furthermore, female FUG members need to be given specific responsibilities and made signatories to the bank account, in order to emphasize the importance of their role. As a first step towards strengthening the involvement of women in decision-making, the objectives of the project implementing agency and the plans for intervention in the PFM should be made available to women in the community from the beginning of the project. PFM plans are usually presented by the project-implementing agency through the *gram sabha* and it is therefore essential that full participation of women in these meetings be attained. This can be achieved by specifying that the unit of participation is the individual adult and not the household. Sensitive scheduling of the time and location of the meeting can also encourage attendance by the poorest women in the community.

Women who want to participate in community activities can do so only after completing their household duties and other work-whether it is in their own fields or outside employment. Participation in PFM activities therefore becomes the third work burden of women. On the one hand, we recognize that women can make significant contributions to PFM and expect them to participate. At the same time, we criticize them

for not attending meetings and for their inability to take off from their domestic responsibilities to participate in PFM activities. Facilitating women's participation begins with understanding the community in which the PFM activity is to be undertaken. Gender roles, responsibilities and gender based division of tasks in the household and community need to be analyzed before planning any PFM activity. Although certain socio-economic generalizations can be made, each community will be unique in terms of specific norms and relationship. PFM depend on community action and it is important, therefore, to understand each individual community before any attempt can be made to overcome social and cultural barriers.

If decisions related to ownership, access and control of productive resources remain exclusively in the hands of the men; it is unlikely that women will receive a fair share of benefits. Efforts must be made to improve intra-household distribution of benefits through PFM. Forests not only meet daily household needs for fuel and fodder, but also provide livelihood options for women. Although forests remain heavily degraded in many areas, the imposition of accessing restriction on forestland has led to successful regeneration of the resource in PFM areas. Women, however, rarely benefits from this regeneration, mainly because they are unable to pay, for rights to cut and carry fuel and fodder. As a result, many women have been forced to reduce or sell their livestock. Furthermore, women have failed to fetch fuelwood even by increasing the time spent in collection. Only women from land-owing families are able to use gas or kerosene stoves as a substitute for the lack of access to fuelwood. PFM is, therefore, taking away livelihood options from women and increasing the drudgery involved in accessing fuel and fodder. It is important that project-implementing agency should develop mechanisms to enable the women a wider sharing of benefits. Women can be given rights over forestland to access the resource they need for their livelihoods. The project can provide infrastructural support to record and confer user rights to these resources. It can also help set up systems-such as social fencing or rotational grazing – to ensure that women do not completely loose their access rights.

c. Decision Making in PFM

Every FUG has convened monthly meeting as a routine affair to discuss the problems confronting PFM. In some cases, fortnightly meetings of Executive Committee (EC) also took place to discuss the pertinent issues. In most of the cases, the decisions have been taken by majority vote, although cases were also reported where influential members got their decision enforced. Some cases have also been reported where decisions have been taken at the behest of field functionaries. The EC was authorized to take decisions on behalf of the FUGs' members, whereas only the general body took some pertinent decisions. However, the working of the FUGs and ECs were reportedly not very transparent. The rules entrusting duties and responsibilities to the members of FUGs and ECs have been strictly complied with in most cases. In the sub-watershed of Ramanagar, 10 per cent of the FUG members reported that important decisions regarding PFM were taken only in the general body, whereas in Akhnoor sub-watershed, such proportion are as high as 21 percent.

The robustness of a participatory institution is reflected in the extent of the identification of its general body of members with the institutions and the latter's capacity to take up activities of common interest. Only one (forested watershed -Dehari) of the four FUGs selected had developed some self-governing traits of this nature. The livelihood needs of the disadvantaged had been over-looked, which have resulted in their further marginalization due to the less visible and subtle processes of exclusion, delegitimization of their traditional resource use patterns, and emphasis on monetary and wage incentives rather than making existing resource based livelihoods more sustainable.

d. Nature of Participation in PFM

PRA exercises revealed that with the formation of FUGs, community involvement in PFM has increased significantly, which have resulted in social mobilization and confidence building among the rural community. FUGs have implemented demand driven activities on priorities within the framework of the project design. The participatory social development functionaries have created the much needed awareness among the local community regarding sustainable management of forest resources, for which local stakeholders have been empowered through capacity building programmes to inculcate the habits of self reliance and sustainability of the assets created through project interventions. The idea of participatory decision-making has been appreciated and operationalized by the members of FUGs for which regular meetings were organized and pertinent issues confronting the village have been discussed. None of the FUG has played any role in fund management such as checking and allocation of funds for PFM activities. FUGs were found actively engaged in framing and execution of the development schemes, management of forest resources, maintenance of assets created through project interventions, solving internal conflicts, if any. For example, asset maintenance (85.18 per cent) followed by interaction with project functionaries (81.48 per cent) were reportedly the main activities of the FUG members in forested sub-watershed of Ramnagar, whereas creation of self help groups (SHGs) was reportedly the dominant activity of FUG members in forested sub-watershed of Akhnoor. FUG members were also helping the participatory social development functionaries in resource conservation activities.

e. System of Financial Management

The system of financial management adopted by the FUGs has not been reportedly satisfactory. In forested sub-watersheds in Ramnagar, 81 per cent of the FUG members reported that joint bank accounts were opened. FUGs were supposed to maintain record of all transactions. However, the project was reportedly playing a major decisive role in utilization of funds and keeping the records of all transactions in the name of FUGs. PRAs revealed that even the President and Secretary more often were made just a signatory on financial documents and project functionaries performed the key roles. The financial matters were discussed in the FUG meeting and the system of internal audit was put into practice in a few FUGs. No attempt has been made for fund mobilization from the community and use of savings from the sale of usufructs share for FUGs' fund capitalization. In a few cases, there has been system of provisioning of credit to the members out of accumulated FUG fund. However, in practice, this has not been

operationalized due to poor fund accumulation. FUGs have also been given autonomy in utilizing the available funds, but such provisions were impracticable due to non-availability of funds with them. The project has provided funds for resource conservation and protection activities and these funds were utilized specifically on planned activities. No diversion of funds was allowed under any circumstances, except the permission of project implementing agency at sub-watershed level.

f. Interaction with Project Functionaries

There is lack of development of more balanced partnerships between IWDP functionaries and FUGs, which is reflected in the imbalance in power and control between IWDP and FUG. The responsibility for maintaining FUG accounts, convening its meetings and preparing the village development plans, powers of dissolution and conflict resolution is largely held by project field functionaries. Thus, instead of the FUGs' ECs being accountable to the general body to assure democratic and responsive functioning of the FUGs, they are instead, accountable to project field officers. This defeats the very purpose of PFM. FUGs have interacted with project functionaries with regard to the types of schemes to be undertaken, developing norms and executing PFM interventions. In the forested sub-watershed of Ramnagar, more than 80 per cent of the FUG members reported that they interacted with the project functionaries with regard to types of activities to be implemented and maintenance of the assets created by the project. In the forested sub-watershed of Akhnoor, more than 70 per cent of the VDC members interacted with project functionaries on types of activities, manpower assistance, training, and forest resource management. On the whole, FUGs have played a useful role in the maintenance of assets created, although their participation in the supervisory work might have remained limited, but these must have brought about the motivation among the villagers to collectively safeguard the assets created for their benefit. It is significant to note that some of the basic features of sustainable participatory institutions have not been taken care of and no attempt has been made to explore the ways and means for fund capitalization by the FUGs. The poor villagers have not contributed in any form to provide technical assistance in project interventions due to inadequate capacity building. However, whatever and wherever possible, the FUGs have contributed in the form of arranging local manpower support, may be hired or voluntary, but mostly, the hired labour, because of poverty, the voluntary labour contribution was very small. FUGs have also sought IWDP help in solving internal conflicts over usufruct sharing, contract assignment to members of EC, etc.

Social and Economic Dimensions of Participation: Factor Analysis

The responses of the FUG members provide the necessary information for estimating their role and strategies at the FUG level. The random sample consists of 60 members in four FUGs selected from sub-watershed of Ramnagar and Akhnoor. A factor analysis, which is a method for translating a large set of variables into a few independent choice variables, separates participatory indicators into a set of principal components, known as factors. Each factor represents an independent choice. As a rule of thumb, variables with a coefficient in absolute value above 0.5 are said to be dominating in a factor. Another

rule of thumb is that all factor with a value larger than one should be used in the analysis. Table 3 shows the results for Ramnagar and Akhnoor sub-watersheds separately. The factor analysis yields two factors viz. social and economic. The social and economic factors tell us the dimensionality of participation. A perusal of data presented in table 3 make it clear that in case of forested watershed of Ramnagar, the dominating variables in social factor are all related to FUG members' attitude towards the meeting, which explain 42% of the variations. This is typically a social aspect of participation. The dominating variable in economic factor, which explain 14% of variations express contribution to and benefiting from participation as well agreement to decisions. The interest to attend the meetings and purpose it serves to the participant has again a high factor loading. While economic consideration is important, two participatory indicators related to meetings are also dominant. These two participatory indicators relate to the acceptance of the meetings, whether they are conformed themselves to the discussion in the meetings. The economic factor represents FUG members' perceived economic benefits and contribution and their acceptance of the institutional arrangement. This shows that participation in PFM in Ramnagar consist of two dimensions.

Level of Participation	Ramnagar		Akhnoor	
	Social	Economic	Social	Economic
Planting in forestland	0.376	0.054	0.284	0.082
Contribution to forest pool	0.234	0.572	0.168	0.631
Benefiting from forest pool	0.091	0.786	0.082	0.576
Ability to use forest pool	0.076	0.682	0.068	0.112
Benefits from using forest pool	0.162	0.732	0.098	<i>0.432</i>
Importance of meetings	0.632	0.084	0.092	0.621
Agreements with decisions	0.052	0.832	0.658	<i>0.482</i>
Attendance of meetings	0.789	0.162	0.762	0.184
Ability to influence decisions	0.672	0.376	0.252	0.286
Frequency of the meetings	0.786	0.018	0.688	-0.024
Interest in meetings	0.681	0.521	0.784	0.234
Gain from meetings	0.638	0.541	0.611	0.023
Suggesting in meetings	0.623	0.335	0.442	0.372
% of variance explained	42.20%	13.60%	43.60%	11.40%
Number of observations	27	27	33	33

Note: Numbers in bold face denote a dominating indicator (factor loading ≥ 0.5 or ≤ -0.5)
Numbers in italic face are almost dominating factor (factor loading close to 0.5 and -0.5)

In the case of sub-watershed of Akhnoor, the dominating variables in the social factor, which explain 44% of variations in forested watershed and all are related to people's participation in evaluation and decision making which typically symbolizes social choice. It also symbolizes the acceptance of institutional arrangement in the forested watershed. The dominating variable in economic factor, which explains 11% of variation, express people's contribution to the forest pool, which typically symbolisms an economic choice. The economic factor is also dominated by the importance of meetings and almost negatively dominated (factor loading - 0.24) by the frequency of meetings. This means that people who consider the meetings to be important also believe that the meetings are not held frequently; it is the reflection of FUG members who are pessimistic about the present practice of local institutional arrangements to manage forest resources.

In brief, the factor analysis shows that participation in the selected sub-watersheds is two-dimensional. In the social factor, all co-efficient that are related to meetings dominates. In the economic factor, the co-efficient that are related to economic aspects of participation dominate. On the combined level, we see a clear division of the participatory choice into two components where social considerations are most important, economic considerations constitute the second main important considerations.

The following analysis explains the conditions under which a person is most likely to participate in PFM. The links between several socio-economic variables and participation are found with the help of multiple regression analyses. The table 4 shows the general patterns for institutional settings in sub-watersheds of Ramnagar and Akhnoor. The following equation is estimated:

$$\theta = \alpha + \beta_1 \text{RES} + \beta_2 \text{FLDEP} + \beta_3 \text{AVAGE} + \beta_4 \text{EDVS} + \beta_5 \text{CASGR} + \text{error}$$

Where

θ is the level of participation;

α is a constant; and

β_1 is the coefficient of a socio-economic variable.

RES: Level of resources, based on the principal component of three indicators, present quality, change in quality, and availability of resources.

FLDEP: Dependence of forestland (FL) – total use of FL resources like fuelwood, fodder, etc. divided by total need for per family.

AVAGE: Average age in the family.

EDUS: Years pf schooling of the respondent.

CASGR: Caste group (higher number means a lower caste).

Besides regression, the descriptive variables are also checked for multi-co linearity by excluding correlated variables. For instance, the education of the respondent is strongly correlated to the average education in the family. The later is therefore excluded in all cases. The adjusted R^2 is low (< 0.17) and even negative in those cases where all considered descriptive variables are insignificant. The low R^2 is inherent to cross-section data and it is not caused by the sample size, it suffices to interpret linkages with significant t-statistics. The variables that are not significant in the regression equations can also be interpreted, namely, that they do not influence the behaviour of interest as it is described by the dependent variable. The regression outcomes are quite diverse for the institutional settings, but some general patterns are apparent. The level of resources is always positively linked to participation and significantly in eight out of twelve cases. This shows that participation is enhanced when people perceive their resource as being of a good quality. A similar conclusion can be drawn for the forest dependence. This link is also positive in all cases and significantly so in ten out of twelve cases, meaning that high forestland dependence stimulates people's participation in PFM. Better resources and increased and increased dependency on the forestland resource lead to a higher level of participation. This suggests that improving levels of forest resources strengthen PFM. A higher level of dependence on forestland resources means that people have a higher stake in the forestland, which is reflected, in their higher level of participation.

Participation	Ramnagar			Akhnoor		
	Social	Economic	Total	Social	Economic	Total
Constant	0.448*** (0.100)	0.486*** (0.088)	0.412*** (0.105)	0.402*** (0.044)	0.486*** (0.062)	0.372*** (0.050)
RES	0.0348 (0.0676)	0.0042 (0.0634)	0.0598 (0.0684)	0.136** (0.043)	0.246*** (0.060)	0.246*** (0.050)
FLDEP	0.225*** (0.052)	0.028 (0.0656)	0.186** (0.058)	0.238*** (0.058)	0.026 (0.0622)	0.188** (0.064)
AVAGE	-0.00352** (0.00128)	-0.00038 (0.00128)	-0.00289* (0.00138)	-0.00348** (0.00132)	-0.00200 (0.00130)	-0.00020 (0.00100)
EDUS	0.00472 (0.00258)	-0.00258 (0.00284)	0.00336 (0.00300)	0.00503** (0.00190)	-0.00340 (0.00250)	0.00348 (0.00200)
CASGR	-0.0014 (0.0201)	-0.0098 (0.0184)	0.0084 (0.0211)	0.0287*** (0.0072)	-0.0175 (0.0099)	0.0222** (0.0074)
Adjusted R ²	0.14	-0.04	0.11	0.16	0.04	0.17

Note: The value in the parenthesis is the S.D. *, P < 0.05; **, P < 0.01; ***, P < 0.001

The indicator of the average age in the family is only (negative) significant in three cases, which implies that younger people in forested watersheds of Ramnagar as well as Akhnoor participate most. When we look at the indicator for education of respondent, two positive significant linkages are found, namely social participation in forested watershed, which shows that when education is significant, it stimulates participation. The link between caste and social participation is significant and positive in forested watershed in Akhnoor. The above analysis shows under which conditions a person is most likely to choose a high level of participation. When the condition of the forestland resource is good and /or when people are dependent on the forestland resource, participation goes up. Low average levels of education in the family and high levels of education of the respondent enhance participation. A high level of people's participation facilitates the initiation of a participatory institution. Once an institution is created, a lower level of participation is needed to keep the participatory process going.

Biophysical and Economic Impact

In the selected sub-watersheds, the non-arable lands include public lands, forestlands, community lands and private lands. The non-arable lands have been treated under various components depending upon suitability or topography of the areas. The main component is afforestation in contour trenches besides other treatments. Under the non-arable land treatment, afforestation activities have been carried out on 90 hectares of village common lands (VCLs) in the sub-watershed of Ramnagar, whereas, 347 hectares of VCLs have been covered in Akhnoor in 1999-2000. In the next year, the hectare coverage of VCLs increased significantly in Ramnagar and stood at 200 hectares. Similarly, 338 hectares of VCLs have been enclosed in the sub-watershed of Akhnoor. Thus, degraded VCLs have received more attention in agriculturally dominated watershed than the forested watershed. However, in proportional sense, marginal decline has been recorded in hectare coverage between 1999-2000 and 2001-2002 in Akhnoor (IWDP, 2001 and 2002). It is to be noted that all the VCLs closures have been created with active participation of the people inhabiting the sub-watershed.

The silvi-pasture activities have also been under taken initially in both the sub-watersheds and 175 hectares of non-arable VCLs have been treated in Ramnagar, whereas, 95 hectares of degraded VCLs have been treated in Akhnoor. Later, the silvi-pasture treatment on VCLs has been abandoned in both the sub-watersheds. Besides, vegetative shrub barriers have also been created in project area to maintain and improve the soil moisture on the degraded VCLs. Over the period, project interventions on VCLs have shown their impact and the degraded patches have been regenerated and helped improving the productivity of these lands. With the regeneration of VCLs, system of rotational grazing and equal usufruct sharing has been created with active community participation of the beneficiaries. The fodder scarcity has declined considerably and fodder demand is met from the protected VCLs. The idea of fodder bank is propagated to accumulate the surpluses for selling to the scarce households/villages.

In addition to afforestation, silvi-pasture and vegetative shrub barriers, pasture development and forest rejuvenation activities have also been carried out on non-arable forestlands in the selected sub-watersheds. The afforestation activities have been implemented on degraded forests in both the sub-watersheds. In 1999-2000, 340 hectares of degraded forests have been covered for afforestation in Ramnagar, whereas, 246 hectares of degraded forests have been included under afforestation programme in Akhnoor. In 2001-2002, the area covered under afforestation activities has increased significantly, and stood at 573 hectares in Ramnagar and 618 hectares in Ahknoor. In proportional terms, the increase was recorded at 68.53 per cent and 151.2 per cent respectively in Ramnagar and Akhnoor. In the sub-watersheds of Ramnagar and Akhnoor, pasture development have also been implemented on 110 hectares and 145 hectares of degraded pastures respectively initially, however, later the interventions related to pasture development has been abandoned (IWDP, 2001 and 2002).

To begin with, the forest rejuvenation activities have been implemented in Ramnagar and laterally it has been extended to Akhnoor also. In 2001-2002, 409 hectares (Ramnagar) and 570 hectares (Akhnoor) of degraded forests have been enclosed for rejuvenation for which local population was actively engaged. The vegetative shrub barriers have also been created in the degraded forestlands in the project area. For instance, to begin with 203 hectares (Ramnagar) and 345 hectares (Akhnoor) of degraded forestlands have been treated with vegetative shrub barriers. In the year 2001-2002, additional 165 hectares and 345 hectares of degraded forestlands have been treated with vegetative shrub barriers respectively in Ramnagar and Akhnoor (IWDP, 2001 and 2002). Besides above, the silvi-pasture activities have also been carried out in both the sub-watersheds initially, but laterally it has been abandoned.

Over the period, the interventions on non-arable VCLs and forests have resulted in increased availability of fodder, forage/grasses, fuel wood and small timber, which is reflected in increased milk production, wool production, meat production, soil moisture regime, bio-diversity and reduction in soil run-off and soil erosion. For instance, significant increase has been recorded in forage/green grass production in the project area from a yield level of 3.40 ton per hectare (base line yield) to 10.60 ton per hectare as per crop-cut experiment carried out by the field functionaries of the project. Overall, the increase in yield of forage/grasses production has been recorded at 211 percent in the project area after the IWDP (Hills-II) intervention (IWDP, 2001).

After the project intervention, participatory approach has been adopted to mitigate the problem of forest degradation and poverty alleviation. The project interventions have improved significantly the forest resources in the shape of: (i) significant improvement in vegetal cover and bio-mass thereof; (ii) multifold increase in the production of local as well as HYV of grasses; (iii) decrease in biotic pressure on the natural forests; (iv) revised the trend of deforestation; (v) slowing down of water run-off and increase in water regime of the catchments; and (vi) increase in yield of different crops, milk, wool and meat. It is significant to note that soil loss has decreased from 23.70 tons to 9.65 tons and on average grass biomass has recorded a growth of 6 quintals per hectares. Besides, the selected sub-watersheds have shown considerable improvement in bio-diversity and better aesthetic look. The treated areas under afforestation, rejuvenation and silvi-pastures interventions have also produced more biomass in the shape of large-scale production of grasses and bushes.

a. Reduction in Rainwater Loss and Sediment Yield

Under IWDP (Hills-II), Jammu and Kashmir, soil and water conservation measures have been promoted using evolving participatory approach. The micro-level watershed planning was carried out using the sweeping transect and emphasis has been given on soil erosion control on hill slopes and gullies, regulation of water flow system in the watershed drainage, and rearrangement of farmlands. In the entire cultivated area, wastelands and area other than hills and hillocks which generally come under grazing lands, were fully treated with appropriate soil and water conservation measures like contour bunding, field bunding, gully plugging, field to field drainage outlet structures, etc. In addition to this, the diversion channels were also made along all the hills and hillocks to guide the high velocity runoff from these sites on a safe and controlled way, so that the runoff with soil loads should not enter the arable land and cause further degradation. For the stabilization of bunds and gully plugs, the entire bund area was sown with pastures grass and legume. Similarly, in the hills and hillocks several of the soil conservation measures were adopted. The adverse climatic factors of the *Shivaliks* necessitated the adoption of micro catchment techniques for run-off harvesting and conservation practices as done in similar areas elsewhere. The usefulness and scope of rainwater harvesting and conservation practices in improving tree growth in arid zones have been amply demonstrated. The staggered trenches ensured higher survival rate of out planted seedlings in the experimental plots. The contour trenches also helped in moisture retention but the most of the sub-watershed of Akhnoor being an undulated terrain without sufficient slopes – the contour interval had to be very wide. The soil and moisture conservation measures in the demonstration plots were much effective as evidenced by the enhanced survival rate of out planted seedlings. The effect of regeneration of vegetation, along with soil and water conservation measures on hill slopes and wastelands was substantial. In *Shivaliks*, the run-off soil loss on barren hills was 23.70 tons in the baseline period, which fell to 9.65 tons per hectare after treatment. In *Karewas*, it declined to 4.80 tons per hectare from 8.24 tons per hectare in baseline period (see table 5). The progressive reduction in soil loss and sediment yield as a result of quick recovery of vegetation on hillslopes and lands adjoining the foothills has resulted in a greatly improving surface and ground water regime of the selected sub-watersheds.

Table 5: Run-off Soil Measures (April 2001 to Sept. 2001)			
Month	Rainfall (in mm)	Run-off (in mm)	Run-off% $\frac{4}{3} \cdot 100$
<i>Shivaliks</i>			
1-Apr	85.6	-	-
1-May	57.4	-	-
1-Jun	228.1	106.4	46.65
1-Jul	475.9	223.8	47.03
1-Aug	285.1	120.9	42.41
1-Sept	201.7	87.4	43.33
Soil loss (Tons per Ha/ per Year): Baseline: 23.70, Current: 9.65 Tons/Ha.			
<i>Karewas</i>			
1-Apr	107.1	20.33	18.98
1-May	35.5	4.05	11.41
1-Jun	26	5.2	20
1-Jul	48.1	16.53	34.37
1-Aug	37.1	9.45	25.47
1-Sept	20.5	2.7	13.17
Soil loss (Tons per Ha./ Per Year): Baseline: 8.24, Current: 4.8 Ton/Ha.			

Source: Status Report for Supervision Mission of World Bank, IWDP (Hills-II), J&K, 2001

b. Afforestation, Horticulture Plantations and Fodder Production

Major efforts were made for revegetation of VCLs and grazing lands under hill and hillocks. Before project, these sites were totally devoid of vegetation and barren and cannot support and provide grazing resources to the animals of the villages of the watershed. The availability of the firewood was also negligible from these sites. The fast growing plant species like pasture grasses, legumes, shrubs and trees were planted. It is not easy to work and vegetate these highly degraded sites even without skeletal soils and also arrest runoff from rains in such steep slopes. Several of the soil conservation measures coupled with vegetational support helped in checking runoff soil loss and vegetate these sites. The trees and shrubs were planted in the pits putting earth and pebbles on the lower slopes so that these pits can hold rainwater. Small staggered trenches were also made for *in-situ* moisture conservation.

Table 6: Afforestation, Horticulture Plantations and Fodder Production				
Item	Unit	Project area with FUG	Project area without FUG	Non-project area
Afforestation				
Community Land	No./per Ha.	84	64	42
Forest Land	"	68	54	38
Horticulture				
Plantation	"	338	224	83
Demonstration	"	87	72	52
Rejuvenation	"	76	63	43
Fodder Production				
Green	Qntl./per Ha.	410	385	318
Dry	"	48.4	29.3	22.4

The afforestation plantations on community land and forestland was comparatively high in project area with FUG than project area without FUG and non-project area. It is clear from table 6 that more afforestation activities have been implemented significantly in forested watershed with FUG than non-FUG and non-project area. For instance, afforestation plantations on community land were 84 per hectare in forested watershed in project area with FUG. It was 68 per hectare in forested watershed in project area without FUG. Similarly, in non-project area, afforestation plantations on community land in forested watershed were 42 per hectare, whereas on forestland, it was 38 in forested watershed.

Table 7: Difference in Afforestation, Horticulture Plantations and Fodder Production

Item	Unit	Project area with FUG - Project area without FUG	Project area with FUG - Non-project area	Project area without FUG - Non-project area
Afforestation				
Community Land	No./per Ha.	20	49	22
Forest Land	"	14	38	16
Horticulture				
Plantation	"	114	255	141
Demonstration	"	15	35	20
Rejuvenation	"	13	33	20
Fodder Production				
Green	Qntl./per Ha.	25	95	67
Dry	"	19.1	2.6	6.9

In the project area with FUG, horticultural plantations were reportedly higher than project area without FUG and non-project area. The table 6 makes it evident that horticultural plantations were 338 per hectare in forested watershed in project area with FUG, whereas in project area without FUG, it was 224 per hectare. In non-project area, horticultural plantations were 83 per hectare, which were significantly lower than project area. Not only this, the survival rate of horticultural demonstration and rejuvenation were comparatively higher. For instance, survival rate of horticultural demonstration and rejuvenation was 87 per cent in forested watershed in project area with FUG and 52 per cent in non-project area (see table 7).

The average yield of fodder production across the selected sub-watersheds is shown in table 6. In this case also, significant differences can be noticed across project area with FUG and without FUG and non-project area. The project area with FUG has shown a remarkable performance in terms of both the green and dry fodder productions. The net difference in green fodder yield in project area with FUG and without FUG was 25 kg and the net difference in yield of dry fodder was 19.1 kg. When we see the net differences in fodder yield in project area with FUG and non-project area, very remarkable differences can be noticed. The net difference in yield of green fodder was as high as 95 kg, whereas, the net difference in yield of dry fodder was 26 kg (see table 7).

c. Livestock Development

IWDP (Hills-II), Jammu and Kashmir have made significant attempt to organize and develop animal husbandry in the project area and the facilities were provided for artificial insemination. The programme has made a modest dent on crossbreeding. The semen bank and deep-freezing of bovine semen as a part of this project was an important landmark in the field of cattle breeding in rainfed area of Jammu and Kashmir. However, artificial insemination and frozen semen technology has been restricted to few villages, the cattle sheds for good quality bulls have not been properly managed and they are underfed. On the whole, the breed improvement programme has been only moderately successful. There has been significant increase in milk yield, which may be attributed to higher productivity of crossbred animals. The yield rates of local milch animals remained stagnant, whereas, the yield rates of crossbred animals continued to increase at a rapid rate initially. The initiation of protection of VCLs and forestlands by creating enclosures and the poor usufruct sharing arrangements there from has resulted in marginal decline in the yield of even crossbred animals lately.

The growing economic opportunities for undertaking dairy farming as a commercial proposition combined with the interaction among the number of factors in agrarian rainfed economy, households have been progressively reducing their holding of drought animals and increasing their stock of milch animals. It has been observed that the requirement of work animals in the project area has been declining rapidly. The factors underlying this process are decline in the average size of cultivated holding, shift in cropping pattern, increase in the cost of rearing work animals, less availability of VCLs, common grazing lands, protection and closures of VCLs and forests. On the whole, the decline in the requirement of work animals and increase in the requirement of milch animals has resulted in significant changes in the composition of cattle population. While the adult male cattle population showed a sharply falling trend, the adult female cattle population has shown an increasing trend. Consequently, sex ratio of adult cattle has shifted in favour of females; the population of buffaloes has shown a declining trend. At the same time the rise in the profitability of milk production has resulted in an intensive selection process in the rearing and maintenance of cows for milk. Thus, while attempts are being made to rear the best young female to adulthood, the unproductive and low productive animals are eliminated from the herd by disposing them off in the market.

The average number of milch animals per household and milk yield is given in table 7. The average number of milch animals was reportedly higher in non-project area and project area without FUG than project area with FUG. The differences in average number of milch animals in project area with FUG and without FUG were quite small than project area with FUG and non-project area. For instance, in the forested watershed, the difference in average number of milch animals in project area with FUG and without FUG was – 0.4. The milk yield was comparatively high in project area with FUG than project area without FUG and non-project area (see table 8).

Item	Unit	Project area with FUG	Project area without FUG	Non-project area
Milch Animals	No.	2.8	3.2	4.2
Milch Yield				
Cow	Litre/per Animal	4.25	3.75	3.25
Buffalo	"	6.5	4.5	4
Sheep	No.	4.8	3.2	2
Wool Yield	Kg./per Sheep	3.1	1.5	1

The average number of sheep per household was comparatively high in forested watershed across the sample area. It is significant to note that average number of sheep were more in project area with FUG than project area without FUG and non-project area. Similarly, wool yield was as high as 3.1 kg per sheep in forested watershed in project area with FUG. In project area without FUG, it was reportedly 1.5 kg, whereas, in non-project area, it was comparatively low and stood at 1 kg (see table 16).

Item	Unit	Project area with FUG - Project area without FUG	Project area with FUG - Non-project area	Project area without FUG - Non-project area
Milch Animals	No.	-0.4	-1.4	-1
Milch Yield				
Cow	Litre/per Animal	0.5	1	0.5
Buffalo	"	2	2.5	0.5
Sheep	No.	1.6	6.8	1.2
Wool Yield	Kg./per Sheep	1.6	2.1	0.5

The indigenous livestock breeds of the forested watersheds in *Shivaliks* have been exposed to natural selection for a very long time and are thus well adapted to harsh environmental conditions. IWDP (Hills-II) focus on new breeds under insemination programme at subsidized price. These changes weakened indigenous breeding system that could improve livestock hardiness. The crossbred livestock of better quality is replacing the local cattle, sheep and goat. Thus, after project intervention indigenous livestock diversity has declined precariously more in the forested sub-watershed of Ramnagar than Akhnoor and the decline is reportedly more in those of the villages where the FUGs are taking all types of decisions related to PFM. It is, thus, urgently needed to speed up the development of sustainable and long-term crossbreeding programmes.

The sampled population reared the milch animals to supplement household nutrition and earnings through the sale of milk and milk products in the village nearby townships. In the project area with FUG, a higher proportion of the milk is consumed within household and more than one-third of the milk is sold. The milk-based products such as cheese, *ghee*, *kalari*, etc. are sold in the market, but often at very low price due to undeveloped rural markets. The data given in table 9 also reveals that sampled population in non-project area sell a small proportion of the milk and milk-based products in market, due to low milk yields of the local milch animals kept by them. It has been reported that the project has distributed improved grass varieties for plantation in fields and field bunds, which have resulted in improved fodder availability. The creation of FUGs have facilitated usufruct sharing on more or less equitable basis and ensured better

availability of fodder. The non-project area is reportedly scarce in fodder and VCLs and forestlands are severely degraded, however, with project intervention regeneration of the enclosed VCLs and forestlands has taken place in project area, which has increased the availability of feed and fodder.

Production Objectives	Project area with FUG		Project area without FUG		Non-project area	
	No.	%	No.	%	No.	%
Milk						
Self	147	67.74	34	56.66	103	88.79
Both (M & S)	70	32.25	26	43.33	13	11.20
Total	217		60		116	
Milk-Based Product						
Self	187	86.17	50	83.33	85	73.27
Both (M & S)	30	13.82	10	16.66	31	26.72
Total	217		60		116	
Agriculture						
Self	230	100	53	100	116	100
Both (M & S)	0	0	0	0	0	0
Total	230		53		116	

Note: M & S: Market and Self

Fodder is a very crucial biomass needed for maintaining their livestock. The immediate livelihood impact of creation of enclosures on VCLs, forestlands and grazing lands has been felt with regard to the grazing practices and the availability of fodder. The enclosed forestlands are forbidden for open grazing. The cost of restrictions imposed on open grazing in the enclosed area is to be compensated by increased grass production to some extent; the major concern remains one of ensuring fair or equal distribution. However, the usufruct sharing is reportedly inequitable. Most households in fact facing fodder scarcity and resort to one or the other mean to fill the deficit. Under IWDP (Hills-II), Jammu and Kashmir attempts has been made to protect the VCLs, forestlands and grazing lands so that natural resources should be conserved and rehabilitated. Such change has been noticed in both the project area as well as non-project area (see table 10). However, the incidence of animal grazing in forestland has declined comparatively more rapidly in project area than project area without FUG, and more decline in animal grazing has been reported in project area than non-project area. For instance, before project intervention, on average more than 7 animals per household were grazed in forestland. After project intervention, FUGs have been created to protect and maintain the enclosed forestlands. Consequently, the average number of livestock grazed on in forestlands declined to less than 4, a decline of 52 per cent.

Grazing on Forestlands	Project area with FUG		Project area without FUG		Non-project area	
	No.	% Change	No.	% Change	No.	% Change
Livestock						
Before	7.65		8.04		5.92	
After	3.7	-51.63	3.77	-53.02	3.36	-43.21
Difference	-3.95		-4.26		-2.56	
Grazing Days						
Before	365		365		365	
After	180	-50.68	210	-42.46	320	-12.32
Difference	-185		-155		-45	

Small Timber	Project area with FUG		Project area without FUG		Non-project area	
	No.	%	No.	%	No.	%
Month (s)						
Below 2	119	51.07	48	66.66	61	47.66
Between 2-4	58	24.89	15	20.83	22	17.19
Between 4-6	30	12.87	2	2.77	17	13.28
Between 6-8	10	4.29	3	4.16	14	10.94
Between 8-10	4	1.716	1	1.38	0	0
Above 10	10	4.29	2	2.77	0	0
Fuel wood						
Below 2	52	22.31	27	37.5	36	13.79
Between 2-4	86	36.98	28	38.88	41	32.03
Between 4-6	40	17.16	11	15.27	25	19.53
Between 6-8	12	5.15	3	4.16	15	11.72
Between 8-10	5	2.14	1	1.38	1	0.78
Above 10	11	4.72	2	2.77	0	0
Fodder						
Below 2	70	30.04	16	22.22	29	22.66
Between 2-4	64	27.46	23	31.94	31	24.22
Between 4-6	58	24.89	8	11.11	33	25.78
Between 6-8	23	9.87	4	5.55	13	10.16
Between 8-10	7	3.00	2	2.77	1	0.78
Above 10	2	0.85	6	8.33	0	0
Minor Forest Produce						
Below 2	83	35.62	26	36.11	35	27.34
Between 2-4	58	24.89	19	26.38	27	21.09
Between 4-6	58	24.89	6	8.33	26	20.31
Between 6-8	25	10.73	14	19.44	26	20.31
Between 8-10	8	3.43	0	0	3	2.34
Above 10	0	0	2	2.77	0	0
Deficit Strategy						
Purchase	22	9.44	2	2.77	1	0.78
Buffer stock	141	60.51	72	100	127	99.22
Fell own Trees	168	72.10	72	100	127	99.22
Illicit Felling	137	58.79	5	6.94	127	99.22
Rotational Use	8	3.43	0	0	0	0

Not only the number of animals grazed in forestlands has declined, but the number of animal grazing days in forestlands has also declined significantly. For instance, before project intervention, due to open access to forestlands, the animals were grazed throughout the year. Whereas, after the project intervention, the decline in number of animal grazing has been reported in the range of 48 per cent to 51 days in project area with institutional arrangement and 40 days to 42 days in project area without institutional arrangement. Similarly, a decline in animal grazing in the range of 12 per cent to 33 per cent has been recorded in non-project area. It is to be noted that recently the forest department has started enclosing the forests for regeneration and animal grazing has been banned. The creation of closures has resulted in heavy grazing pressure on non-protected and non-enclosed forestlands, which are facing severe degradation. Thus, there is urgent need to introduce new high yielding varieties of grasses and fodder, which could be planted in enclosed forestlands as well as private lands. Besides, more and more FUGs need to be created so that equitable usufruct sharing mechanism should be established. FUGs would also be helpful in introducing the system of stall-feeding on wider scale.

The creation of closures on VCLs and forestlands has resulted in significant decline in the availability of forest products, which were freely available before project interventions. After the project interventions, the regeneration of forestlands has taken

place, which have improved the availability of forest products. However, there are wide variations in availability of forest products across the selected watershed (see table 11). The villagers, who are unable to meet their fuel wood, fodder, small timber and minor-forest produce opt for a deficit strategy. The data makes it clear that rotational use of forest resources has been in use, where institutional arrangements have been made through formation of FUGs. In other cases, use of buffer stock, feeling of own trees as well as illicit felling of trees from the local forests are the dominant deficit strategy adopted.

d. Consumption of CPRs Products

The table 12 gives the data on average annual household consumption and the value of forest products collected by the sample population. A mere perusal of the data makes it evident that fuel wood collected from forestlands has declined very sharply in project area with FUG. The decline in fuel wood collected from forestlands in non-project area has also been reported, however, in fewer amounts than project area, which may be attributed to protection of forests by forest department, and/or decline in the potential of forestlands due to severe degradation. Similarly, decline has been noticed in fodder collection after project intervention. The decline in fodder collection is reportedly very sharp in project area with FUG. In non-project area too, a marginal decline has been reported in fodder collection. A decline in collection of timber and non-timber products and manure has been noticed. However, with project interventions, the value of horticultural product collected from forestlands has increased though modestly. Similar trend can also be noticed in non-project area.

In the project area with FUG, the decline in fuelwood collected from forestlands was to the tune of 51.95 per cent. It was 20.86 per cent in project area without FUG. The decline in fuelwood collection from forestlands has taken place in non-project area also, but at a very slow pace, and it was reportedly 15.35 per cent. More or less, a similar trend can be noticed for fodder and non-timber products collection from forestlands across the sample area. In case of horticultural products collected from forestlands, an increase was noticed. The increase was significantly marked in non-project area and project area without FUG, but when we observe the data in rupees terms, the amount of horticultural products collected from forestlands was significantly higher in project area with FUG than project area without FUG and non-project area. It is to be noted that collection of food and fodder from forestlands has declined significantly over the period in non-project area, whereas a positive trend was visible for project area with FUG and without FUG. Over the period, the fuelwood, manure and timber collection from forestlands have declined across the sample area, however, the decline is markedly high in non-project area than project area with FUG and without FUG. Thus, it can be inferred that with project interventions, the productivity of forestlands has increased very rapidly in project area with FUG followed by project area without FUG compared to non-project area.

Table 12: Average Annual Household Consumption and Forest Products Collected						
Forest Products Collected	Project area with FUG		Project area without FUG		Non-project area	
	Rs.	% Change	Rs.	% Change	Rs.	% Change
Fuelwood						
Before	3424		4324		4566	
After	1645	-51.95	3422	-20.86	3865	-15.35
Difference	-1779		-902		-701	
Fodder						
Before	4685		4690		4656	
After	2386	-50.92	3425	-26.97	4536	-2.57
Difference	-2299		-1265		-120	
Horticultural Products						
Before	657		458		272	
After	865	31.65	643	40.39	514	88.97
Difference	208		185		242	
Non-timber Products						
Before	865		579		565	
After	453	-47.63	455	-21.41	534	-5.48
Difference	-412		-124		-31	
Average Annual Forest Products Collected (Rs.)						
Food						
Before	435		342		185	
After	546	25.51	428	25.14	56	-69.72
Difference	111		86		-129	
Fodder						
Before	5399		5320		5434	
After	6656	23.28	5960	12.03	4536	-16.52
Difference	1257		640		-898	
Fuelwood						
Before	4224		4534		4985	
After	1645	-61.05	3422	-24.52	3865	-22.46
Difference	-2579		-1112		-1120	
Manure						
Before	400		356		249	
After	254	-36.5	143	-59.83	56	-77.51
Difference	-146		-213		-193	
Timber						
Before	1865		1563		1486	
After	258	-86.16	354	-77.35	85	-94.27
Difference	-1607		-1209		-1401	

Table 13: Average Annual Households' Fuelwood Consumption from Forestlands						
Fuelwood Consumption	Project area with FUG		Project area without FUG		Non-project area	
	Kg.	% Change	Kg.	% Change	Kg.	% Change
Monsoon						
Before	422		458		356	
After	248	-41.23	286	-37.55	324	-8.98
Difference	-174		-172		-32	
Winter						
Before	548		512		389	
After	288	-47.44	324	-36.71	346	-11.05
Difference	-260		-188		-43	
Summer						
Before	346		423		314	
After	198	-42.77	256	-39.47	226	-28.02
Difference	-148		-167		-88	

The annual fuel wood consumption from forestlands has declined after the project intervention. The decline in average fuel wood consumption was reportedly high in project area than non-project area (see table 13). The average decline in fuel wood consumption from forestlands was high in project area with FUG followed by project area without FUG and non-project area. On average, the decline in fuel wood consumption was 44.22 per cent in project area with FUG. In project area without FUG, the decline was to the tune of 37.83 per cent. The decline was comparatively low in non-project area and stood at 15.39 per cent. It is significant to note that decline in fuel wood consumption varies over the year. The highest decline is reported in winter followed by monsoon and summer seasons. The selected sub-watersheds are experiencing extreme weather conditions, where fuel wood consumption is comparatively high in winter, whereas, the highest decline is also recorded in the same season. They meet their fuel wood requirement in winter from the buffer stock maintained to meet the contingencies.

VII. Policy Recommendations

Policy changes are imperative for better trade-offs between forest protection and poverty reduction. These are likely to arise, especially when access to a resource is restricted for a period. A strong policy response, which recognizes this tension and which is developed in consultation with local people, is essential to the resolution of conflicts. It is suggested to recognize the poor villagers not only as beneficiaries of the PFM, but to assign them the status of stakeholders in real practice and provide them the opportunities to participate not only in conservation and protection phase, but equally in pre-project phase also. This will help realize the goal of minimization of transaction costs. One of the first efforts on entry into the PFM programme after the users are motivated should be on the formation of user groups. These groups should be as homogeneous as possible. A small group size not exceeding 15 families will create more vibrancy and dynamism. The user groups could be built around fast cash income generating multiple activities. The selection of these activities could include a cafeteria of choices. All the funding of the activities should be directly handed over to these user groups, once they are formed and trained in handling and managing the funds. All the decision-making on the activities to be taken up should also be the responsibility of the group leaders, based on the wishes of each household, who help them integrate it into village development plan on an annual basis. These organizations should also be asked to actively look at the question of incentives. This could result in savings and a more appropriate allocation of incentives.

Wider linkages are essential between local groups and development institutions, which will ensure institutional sustainability. Among others, links are needed with credit institutions, with agencies providing development investments and with institutions of local government, particularly the *panchayats*. To achieve this, project promoted structures has to incorporate the concerns and leadership of the *panchayats*, without losing the advantages of local user control and management of forestlands. The issue of the PFM programme sustainability also needs to be addressed, as it has strong implications for the sustainability of the resource base. The sustainability of the PFM programme will depend largely on the effectiveness of the resource management

institutions that are promoted. For institutions to be effective, they need to have adequate representation of the stakeholders interests, technical capability to tackle physical resource problems at the local level, organizational capabilities (including financial management), and mechanisms to resolve conflicts.

IWDP (Hills-II) should negotiate with revenue department and forest department for land use titling, so that authority to provide land use titles on the community lands (*panchayat* lands, village pasture lands, as well as nearby forest lands) may reside with project itself. It seems that forest development and protection through fruit plantation and community forest plantations will continue to be severely limited if users have not the full rights on the land. It should be remembered that one of the most serious causes of forest and land degradation has been skewed land tenure and the government owns most of the public lands, where they are unable to take much action to rehabilitate them. Thus, land use titling is a very important element in the PFM, which gives the ownership of the main resource base in the hands of user community.

Beneficiaries' contribution will become a necessary condition to ensure that people's participation is genuine. It can also pave the way for beneficiaries to make larger contribution to the cost, reducing the financial burden on the development agencies. The principle of 'users must pay' can over a period be extended to the principle 'payment of cost should depend upon the extent of benefit'. For PFM programmes to be sustainable, local institutions need to be strong and effective. Capacity building of local institutions for local management efforts will be of prime importance for achieving the stability of the institutions and the entire programme. The grass-roots organization should have sufficient knowledge and skills to deal with the organizational and technical issues, in addition to relevant managerial skills. Therefore, the training meant for grass-roots organization should deal with formation and structure of user groups; their roles and responsibilities; and account-keeping and financial management. There should also be technical training on the range of physical aspects of PFM with a view to build institution that can make PFM programmes sustainable.

VIII. Key Learnings

The government takes the first move to rehabilitate the degraded CPRs because they possess the resources. The local people lack the initiative to take the first move, which does not mean that a top-down approach should be followed. The process should commence in those villages where participation is most likely to take place. For instance, the best chances for voluntary participation can be found among the villagers who depend highly on the CPRs and perceive the quality of the forest as good. After initial performance in watershed management, the successful villages can then serve as an example for other villages to extend the process. Motivated by success in the first stages, resources can be mobilized to replicate the process in villages with less favorable circumstances, hence, the process should not be button-up either, but it should be an interaction between the state and the people, leading to a win-win situation. Transparency of the state and legal rights for the people are important aspects for success as well. In order to improve watershed management practices, people should be given more freedom to act on their own. The state should provide resources and assistance by formally

allowing them a share in rehabilitated CPRs. This would enhance the development of the village and the mutual trust between villagers, so that mutual participation can be sustained, by getting closer to the optimal level of watershed development.

IX. Conclusions

PFM has come into existence having felt the need for collective action to regenerate forest resources to meet consumption needs, or to gain access to such resources for economic empowerment to emerge from existing social oppression. PFM has been evolved by the project and not self-initiated. The strengthening of PFM in the formative years involves a great deal of efforts on the part of project implementing agency and local stakeholders including villagers, political leadership and NGOs. Over the period, participatory institutions have gained confidence and build their capabilities; they diversify their activities and have become more self-reliant. In project area, FUGs have a two-tier structure: the general body of its members, and the executive committee, which has representation from the hamlets/caste/clans/caste groups. One-third of women have been inducted which are mandatory under the existing provisions. FUGs met at least once a month. The organizational structure and practices of FUGs reflect the reverence for collective wisdom of its members as well as their democratic action and management of common resource such as VCLs, pastures and forestland. The creation and maintenance of closures on VCLs and forestland with the object of meeting their needs have been the primary activity of user groups. This initial activity has inculcated a sense of ownership and collective responsibility among members.

After the initiation of PFM, the vegetation has increased modestly and the forestland cover has also increased. Vegetation management practices included planting trees in the enclosed forestland, VCLs and private agricultural and community land. In most of the cases, only degraded natural forests have been handed over to the user groups, as there is an informal rule within the IWDP (Hills-II) not to hand over well-stocked forests. Consequently, access to many community forests has been restricted temporarily in order to allow these forests to recover. As a result, many user group members have to rely on unprotected forest to meet their basic needs. In non-project area, there is severe fuel wood and fodder scarcity. Grazing cattle in community forest is either prohibited to defined periods during the year. As a result, people rely heavily on unprotected forests and VCLs for fodder, which further add to the forest degradation. Livestock composition has changed substantially, however, the number of crossbred cows increased, but other livestock fell in number. An increase in milk production and productivity has been reported in project area. The decline in the sheep population was particularly steep, which was due to the fact that mostly landless and marginal farmers were keeping sheep and goats, which had free access to common grazing lands and wastelands. As a result of the project intervention, grazing was stopped in forest under regeneration, reducing the grazing area and depleting the forage potential. In spite of a reduction in total area available for grazing, dry forage production increased significantly compared to the pre- project phase. The increase in dry forage production is mainly due to reseeded of field funds and hill slopes with grasses and legumes, and regenerating old rootstocks on hill slopes. The average dry forage productivity went up during the post project phase.

Degraded VCLs and forestland, which are temporarily closed and effectively protected, will yield more forest-produce in the future. In this sense, PFM leads to a Pareto improvement for the members of a user group. In the short run, however, the poor have to suffer the most as the VCLs and forestland has been closed temporarily. Opposition to VCLs and forest closures has been noticed during the field visits. On the other hand, the better-off factions of a user group, e.g. land owners with tree on their own lands, do not oppose community forestry because they have alternative to forest use. At the user groups level, the heterogeneity and fragility of land resources along with the variable rainfall made it difficult to fully harness the potential of forest resources and adequately meet the environmental risks through private resources based on crop farming alone. The balancing of intensive (by cropping) and extensive (by pasture forest) use of land, as required by the resource characteristics became a part of collective strategies for risk management and production enhancement.

X. Acknowledgements

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XII. Key people and institutions

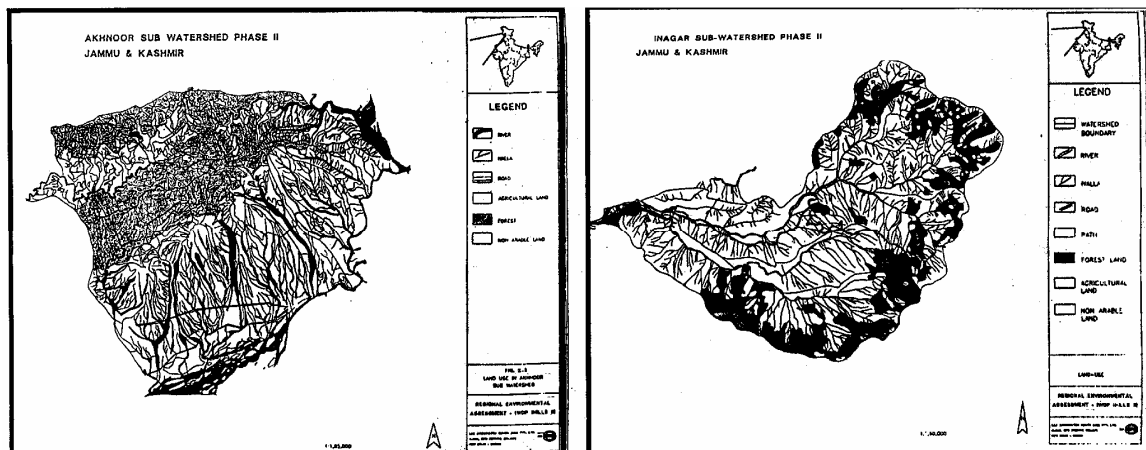
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1. Institutional Change and Common Property Resource Management in Shivaliks, Jammu and Kashmir, *International Journal of Environment and Development*, Vol. 2, No. 1.
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XIV. Map



Map of Akhnoor sub-watershed

Map of Ramnagar sub-watershed

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XVI. Brief description of association

The author was the Principal Investigator of a major research project titled “Participatory Approaches and Environmental and Economic Impact: With Special Reference to IWDP, Hills-II, Jammu and Kashmir, India” sponsored by Ministry of Environment and Forests, Government of India and World Bank Aided “India: Environmental Management Capacity Building (EMCaB) Technical Assistance Project” managed by Environmental Economics Research Committee (EERC) managed by Indira Gandhi Institute of Development Research (IGIDR), Mumbai. The project was completed in May, 2003.