SOUTH ASIAN ASSOCIATION FOR REGIONAL COOPERATION

Success Stories
in
Mountain Ecosystem Management

SAARC Forestry Centre
Thimphu, Bhutan

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Printed and published in Thimphu, Bhutan
SAARC Forestry Centre Office
Thimphu, Bhutan

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Mountain Ecology Division
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2013

FOREWORD

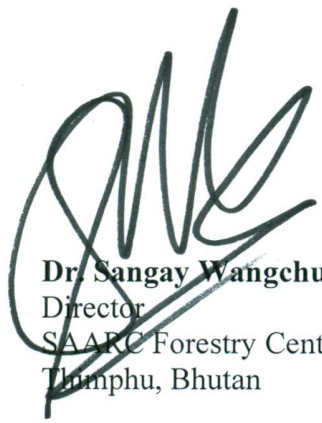
The enormous extent and types of mountainous regions in the SAARC region as well as the importance of mountains in terms of Biodiversity and Ecosystem Services makes it imperative for its conservation and sustainable management in the region. Though there have been several success stories in Mountain Ecosystem Management in the SAARC region, not all of them have been widely publicised. Hence, the SAARC Forestry Centre decided that it is extremely important to share such stories among the SAARC Member States and facilitated the documentation of such success stories to ensure that it is available to a wider audience through this publication.

The sharing of these success stories will ensure that the developing and working of successful models are accessible to a wide range of stakeholders in the SAARC region as well as across the world for gaining insight, replication and further development.

Six success stories were finally selected from the several received in response to our invitation. These stories cover a wide range of innovative models in the fields of Stream-shed protection, Watershed management, Joint Forest Management, Fodder bank development, Greening degraded sites and Clean Development Mechanism regeneration projects.

I would like to appreciate the team at the SAARC Forestry Centre for having put in considerable efforts in screening the various papers received, selecting and finally editing the same to meet the format of this publication.

We hope that this publication on the 'Success Stories in Mountain Ecosystem Management' would be useful to a range of stake holders involved in Management of various kinds of ecosystems and not just mountains.



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ENHANCING THE HYDROLOGICAL CONTRIBUTION OF MOUNTAIN ECOSYSTEMS: ENVIRONMENTAL CHANGE ADAPTATION EXPERIMENTS FROM THE SIKKIM HIMALAYA

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SUMMARY

The Himalayan ecosystem is under increasing threat from environmental change resulting from changes in climate, landuse and demography. With impacts of climate change on precipitation patterns such as rise in rainfall intensity, reduction in its temporal spread, and a marked decline in winter rain, coupled with other anthropogenic causes, the problem of water scarcity is being increasingly felt across this Himalayan region. While the rivers and glaciers play a vital role of ensuring water security in the densely populated lowlands, the mountain people mostly depend on the vast network of rain and snow-fed springs and streams. However, traditionally, the glaciers and rivers have received widespread attention, while the springs and streams are largely unstudied. The hydrological significance of the mountains has largely been assessed from the lowland perspective. The mountain people residing in remote, rural areas are marginalized and face the threat of declining discharge of these springs and streams. In order to address this growing threat, the Rural Management and Development Department, Government of Sikkim conceptualized and piloted the *Dhara Vikas* initiative with an objective to revive critical springs, streams and lakes with funding support from MGNREGA national flagship programme. Using a science based and people centric approach, activities related to enhancing ecosystem services of mountain forests in terms of the ground water recharge contribution of springshed and hill top forests was undertaken. Also, climate change related vulnerability assessment at gram panchayat level, creating the village spring atlas (www.sikkimsprings.org) and developing para professionals in geohydrology was initiated. The impacts of this initiative to enhance the hydrological contribution of the mountain ecosystem as water towers for humanity and the revival of 50 springs and 4 lakes in 20 drought prone Gram Panchayats is showing promising results and has the potential to be upscaled and mainstreamed in ongoing programs in the Himalayan region. The outcomes have also have been monitored by independent agencies and have helped in impacting national policy and the sharing of the learnings has benefitted other mountain regions as well.

1. Situation / Background

Water is the primary life-giving resource. Its availability is an essential component in socioeconomic development and poverty reduction. Ensuring rural water security is amongst the

most important duties of governments worldwide. One of the vital ecosystem services provided by the Himalayan mountain ecosystem is natural ground water recharge resulting in the perennial flow of springs and streams. This recharge helps in replenishing the mountain aquifers which ensure water security during the lean season. The IPCC report predicts large scale changes in temperature and precipitation over the Asian land mass[1]. Studies on temperature and precipitation for a few localized places show that warming in the Himalayas is three times greater than the global average[2]. The impacts of climate change on precipitation patterns in Sikkim has resulted in a rise in rainfall intensity, reduction in its temporal spread and a marked decline in winter rain[3-7].

The mountain springs locally known as *Dhara* (*naula,chashma* in other parts) are the natural discharge of groundwater from unconfined aquifers. The Himalayan landscape is dotted by these mountain springs which ensure water security for millions of households. These rural households access water from these springs, mostly through gravity based piped systems. With increasing population, degrading health of watersheds and impacts of climate change, the lean period discharge of these springs is rapidly declining[8-16]. It has been estimated that less than 15% of the rainwater is able to percolate down to recharge the springs, while the remaining flows down as runoff often causing floods. Hence, a need was felt to enhance the hydrological contribution of the forests ecosystems in ground water recharge, thereby contributing to rural water security[17-18]. Due to the declining lean period discharge of springs and streams, women have to travel longer distances to fetch water, which increases their drudgery, while compromising their ability to perform other essential and livelihood functions. Reduced access to water in turn impacts health, hygiene, sanitation and limits the livelihood options as well.

2. Programme activities

2.1 Conceptualizing spring-shed development initiative to revive dying springs

Principles of geohydrology, watershed and Geographical Information (GIS) were integrated to conceptualize and design a new initiative – spring-shed development under the banner of *Dhara Vikas* in the year 2008. This science based, people driven program, was initiated in collaboration with several government and non-government partners. During the first year, local expertise and experience was developed to identify the recharge area of the springs based on the structure, weathering and fracture patterns of the rocks. Successful demonstration of this rainwater harvesting technology started from the year 2010 onwards and now provides a successful model to revive springs in mountain region.

Being a new concept needing specialized knowledge and skills in the field of rainwater harvesting, geohydrology, spring discharge measurement, use of GPS and laying of contour trenches, the whole of 2009 was utilized in organizing more than 20 capacity building programs to train the existing manpower jointly with State Institute of Rural Development (SIRD) in coordination with various NGOs like WWF-India, Peoples Science Institute – Dehradun, Advanced Centre for Water Resources Development and Management – Pune, Department of Science and Technology, Department of Mines and Geology, Government of Sikkim, Central Ground Water Board and the G. B. Pant Institute of Himalayan Environment and Development.

This springshed development (*dhara vikas*) uses geohydrology to identify the recharge area. An incentive mechanism is provided to the farmers thereby facilitating the use of private lands and

their conservation. This approach also differs significantly from watershed development (which adopts the catchment approach) in terms of scale, costs, duration, treatment methods as well as success indicators. After few successful pilots, this initiative was scaled up in other drought prone regions of Sikkim(Fig 1). Over the last five years, 400 ha has been covered under spring shed development with a total investment of Rs 250 lakh resulting in an annual ground water recharge of 900 million litres. This has led to a revival of 50 springs and 4 lakes in 20 drought prone Gram Panchayats (Fig 2).

Fig-1: Women taking the lead to construct rainwater harvesting structures in the recharge area of the springs to augment the groundwater

2.2 Climate Change Related Vulnerability Assessment at Gram Panchayat Level

Climate change related vulnerability assessment was done at the Gram Panchayat level. This was done by constructing a village level, composite vulnerability index based on environmental, economic and social factors and its spatial presentation. This vulnerability assessment was undertaken inhouse for all the Gram Panchayats using standard scientific protocols of exposure, sensitivity and adaptive capacity as prescribed by the Intergovernmental Panel on Climate Change (IPCC). This is the first high resolution vulnerability assessment at the Gram Panchayat level undertaken in the country. The findings indicate that the most vulnerable areas are concentrated in the subtropical zone of the South and West districts (Fig 3). In general these results do not throw up any surprises to the commonly held perception since these villages face the highest exposure to climate change which coupled with high sensitivity and low adaptive capacity results in high vulnerability. South district was found to be the most vulnerable followed by West district. These highly vulnerable Gram Panchayats were prioritized under the Dhara Vikas initiative.

2.3 Developing a cadre of inhouse trained para hydrogeologists

Existing inhouse staff at Block level were trained in hydrogeology, springshed development and watershed management with the help of agencies such as WWF-India, People's Science Institute, Dehradun, ACWADAM, Pune and CHIRAG, Nainital. Implementing field pilots to revive springs, streams and lakes helped them to gain experience. Seven master trainers who are all young professionals have been now developed as para-hydrogeologists who are the resource persons for sustaining this program in future.

2.4 Resource Mapping and Preparation of Village Spring Atlas

Resource mapping of the springs on a GIS platform has been done to better understand this valuable resource, and the preparation of a village spring atlas has also been initiated. The data has been made accessible online in the web portal - www.sikkimsprings.org. This online

database provides information on the location, GPS coordinates, land tenure, catchment status, dependency, discharge (supply / demand) of nearly 700 springs of Sikkim and is also linked to the Google earth platform (Fig 4). The findings of this resource mapping study indicates that the rural landscape is dotted by a network of micro-springs occurring largely in farmers' fields, with an average dependency of 27 households per spring. The spring discharge generally shows an annual periodic rhythm suggesting a strong response to rainfall. The mean discharge of the springs was found to peak at 51 L/min during the post-monsoon months (September–November) and then diminish to 8 L/min during spring (March–May). The lean period (March–May) discharge is perceived to have declined by nearly 50% in drought-prone areas and by 35% in other areas over the last decade.

Fig 2: Map of the Dhara Vikas initiatives taken up to revive springs, streams and lakes

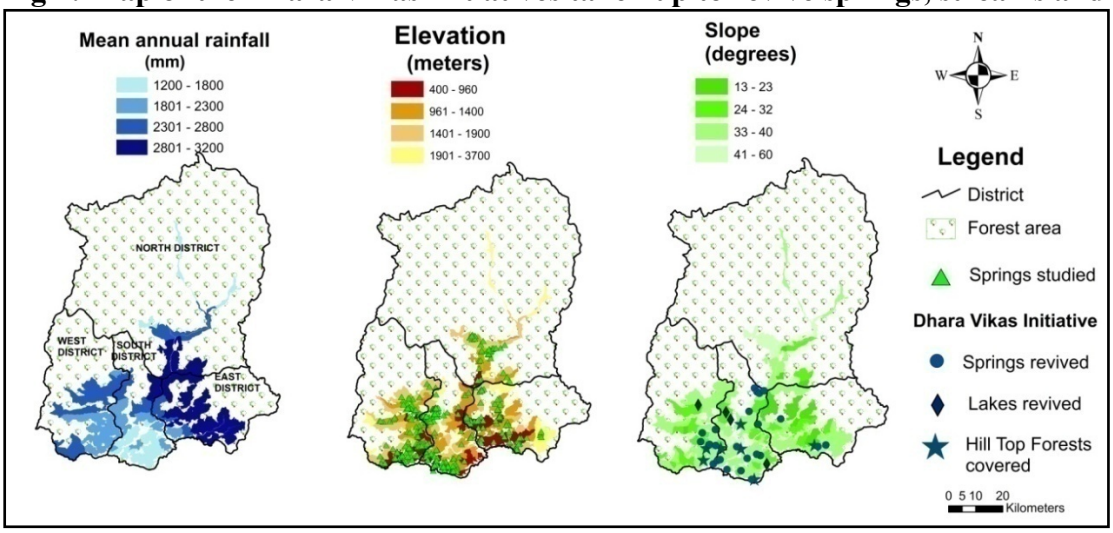
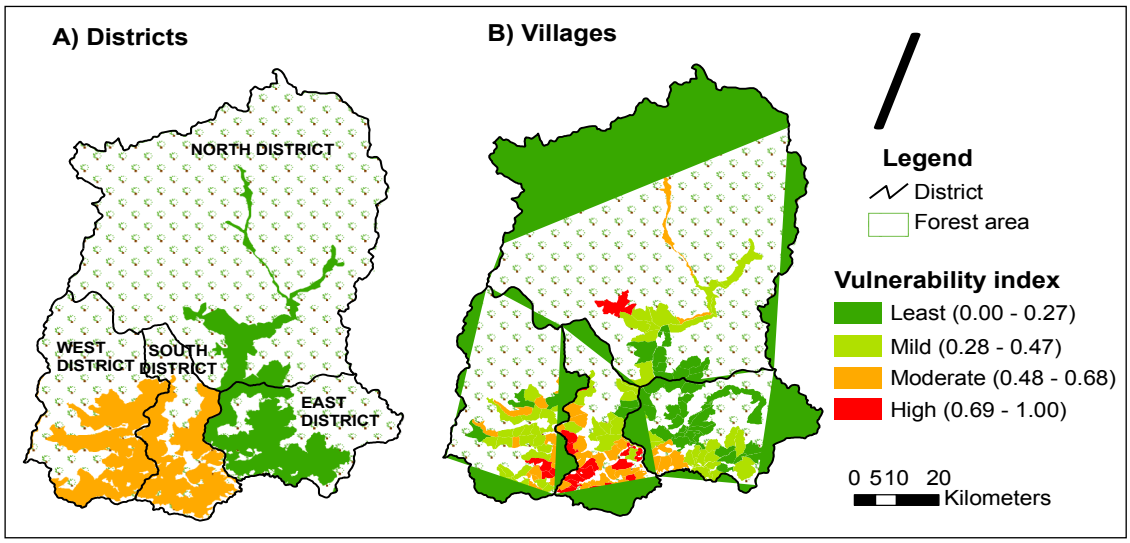


Fig 3: Climate change related vulnerability assessment at gram panchayat level



2.5 Enhancing the hydrological contribution of hill top forests

The natural ground water recharge in mountain areas is limited and in spite of adequate rainfall, most of it flows away as surface runoff causing soil erosion, landslides and floods. Sloping forest lands above villages are ideal locations to make ground water recharge structures like staggered contour trenches, ponds and check dams in appropriate locations (Fig 5). Location of these trenches and ponds is vital to ensure that each of them has a micro catchment and captures sufficient surface flow. This climate change adaptation initiative also helped in disaster risk reduction by reducing landslides and damage to farmer's fields downstream.

2.6 Reviving dried up lakes

Reviving dried up lakes by developing their catchment, de-silting to enhance their water holding capacity and piping water from water sources has been initiated. Healthy lakes translate to adequate ground water recharge, which in turn supplements the dry-period discharge (base-flow) of springs and streams located downhill. There are quite a few natural, dried up lakes strategically located above drought prone villages. These lakes were revived by piping runoff from seasonal water sources and functioned as recharge structures (Fig 6).

Fig 4: Planning for Spring-shed Development involving GPS survey, Socio-economic questionnaire, Catchment landuse mapping and Discharge measurement

Fig 5: Trenches and ponds trapping the runoff to supplement ground water recharge and enhance the hydrological contribution of mountain ecosystems

Figure 6: Reviving dried up hill top lakes by piping surface flow can supplement the ground water recharge for the water sources located downstream

3. Results / Impacts

The results and impact of the ground water recharge projects to revive the springs, streams and lakes were compared with the baseline to analyze the impacts. Perception of the water users was also documented to ascertain the impacts.

3.1 Sethi Khola (Namthang): Reviving a stream to transform a village plagued by perennial drinking water shortage to a vegetable exporter

The villagers attribute the drying up of Sethi Khola to many factors such as the landslide in the year 1968 which wiped away the upper catchment and resulted in the drying up of the Lampatey lake and later on the Nagi lake. Consequently, the Sethi Khola stream flowed only during the monsoons and completely dried up during the dry season. The villagers had lost hope on Sethi Khola and were left with no other option but to manually carry water from the source downstream and from across the hill. The downstream villages like Palitam, Kateng and Pamphok faced severe difficulty in meeting their drinking water requirement during the lean season (February to April). These villagers had to carry water from other springs like Karma Dhara which is about half a kilometre away. The villagers often used to have conflicts and competition at the water source. Many families even recalled of going down to Rangit river for bathing and washing clothes during the lean season (Feb-April) on a weekly basis.

The implementation of the dhara vikas initiative at Nagi Pamphok and revival of the Nagi lake has had a significant impact on the livelihoods of the downstream villages. This stream which used to be seasonal and dried up during the dry months from February to April became perennial and started flowing throughout the year. Consequently, the old pipelines and water tanks have now become functional with water available during the lean season. About 11 pipelines currently cater to about 110 households in 5 villages downstream and 5 new pipelines have been added last winter and 3 new water source tanks have been constructed which indicates the increase in the discharge and revival of this stream (Table 1). The villagers no more struggle for drinking water during the lean season. The water storage tanks constructed under MGNREGA and Horticulture Department have added to the water availability, with the surplus water now stored in this tank and also used for livestock and agriculture. The revival of this stream has brought about a green revolution in the downstream villages like Lower Kateng where the villagers have started cultivating off seasonal vegetables during winter and today annually produce more than 1500 kg of vegetables per household. These vegetables are supplied to the local market and meet about 70% of the vegetable requirement of Namthang. Lower Kateng is now considered as the largest

producer of green vegetables and tomatoes. This has resulted in an additional annual income of Rs 5.58 lakh (average Rs. 18,000/ household) for the 31 families of lower Kateng hamlet.

Table 1: Impact of spring shed development on the lean period discharge of springs

Key Spring	Dependent Village	Lean Period Discharge 2010	Lean Period Discharge 2012
Seti Khola Source 1	Palitam, Pamphok and Nalam	0.5 LPM	1.6 LPM
Seti Khola source 2	Middle Palitam	1.6 LPM	2.1 LPM
Seti Khola source 3	Lower Palitam and Upper Kateng	2.6 LPM	4.8 LPM
Waiba Dhara	Lower Kateng	1.1 LPM	1.8 LPM
Hittey Dhara	Namthang Bazar	3.8 LPM	5.4 LPM

3.2 Mellidara Paiyong (Sumbuk): Enhancing the hydrological contribution of hill top forests to revive the springs and streams downstream

Mellidara village is the largest producer of poultry and milk in South District. There are more than 60 poultry farms in the village that produce about 58,000 poultry in a span of 45-60 days. Dairy farming is another initiative taken up in the village in a large scale. This poultry and dairy farming required a lot of water which was sourced from the nearby springs and streams. Rainfall arrives as late as July and ends by September and in some years the villagers witness less than one month of rainfall. Drying of the perennial water sources and decrease in winter discharge of the streams posed a severe livelihood threat to this village. About 40 households located in the upper belt faced major difficulties during the dry season (Jan-April). These households transported 4000 litres of water twice a week from a nearby stream in a truck costing them Rs. 400 per truck. The water requirement during house construction, village ceremonies and social functions was all transported. On an average it used to cost Rs 3200 to meet the monthly household water requirements (Rs 400/truck x 8 times a month; 1 truck=4000/litre) during the dry season. This perennial water crisis was prevalent for more than a decade. The dhara vikas initiative in the hill top forests of Bakhor, Khopshe reserve forests and Tarey Bhir helped increase the discharge in Khani and Rolu Khola. The households constructed underground water tanks on their own to preserve water and reduce evaporation loss as every drop is precious. Few springs in upper Mellidara have revived and have become perennial after this initiative. This has helped the villagers in a big way and has saved close to Rs. 1.28 lakh per month from transporting water from the nearby streams.

3.3 Upscaling and expanding to other Himalayan regions

Based on the experiences of this initiative to revive Sikkim springs, the Planning Commission, Government of India, included springshed development in the new expanded list of permissible works under MGNREGA in 2012. This has now paved the way for upscaling this initiative across the larger Himalayan landscape. Teams from WWF Nepal, Bhutan Government, Arunachal Pradesh Government and others have visited Sikkim on an exposure visit to learn more about the spring revival initiative and implement similar initiatives in their respective states.

3.4 Innovation

Innovations

- **Developing para geohydrologists** to bridge the knowledge gap regarding geo-hydrology and revival of springs at the village level
- **Landscape level approach** by reviving springs, streams and lakes
- **Community driven initiative** which created a grassroots demand by successfully demonstrating pilot projects in springshed development
- **Linked with MGNREGA national programme for sustainable funding support**

3.5 Collaboration and networking

These conservation and development initiatives were taken up in collaboration and partnership with IIT Guwahati, Indian Institute of Science, Bangalore, Bhabha Atomic Research Centre (BARC), G.B. Pant Institute of Himalayan Environment and Development, Central Ground Water Board, Kolkata, ACWADAM, Pune, WWF-India, People's Science Institute, Dehradun, Arghyam, Bangalore, ATREE, Bangalore, ICIMOD, Kathmandu, German Technical Cooperation (GIZ) and others, which has helped in wider dissemination of science and technology, in building local capacity and significantly improving the quality of life of those who are at the bottom of the pyramid and their environment.

Exposure visit by officials from Bhutan Government: A technical team from the Government of Bhutan visited the Dhara Vikas project sites in Sikkim to learn how to revive springs, streams and lakes over a four day exchange visit from 18th to 22nd March 2013. The team included Shri Rinchen Wangdi, Chief Engineer, Shri Ugyen Rinzin, Executive Engineer, Shri Ugyen Thinley, Dy. Executive Engineer, Shri Karma, Executive Engineer and Shri Sonam Gyaltshen, Executive Engineer from the Rural Water Supply & Sanitation Program and Public Health Engineering Division (PHED) under Ministry of Health, Government of Bhutan. The Public Health Engineering Division of Bhutan came to know of the Dhara Vikas initiative of RM&DD through various publications and reports made available online at www.sikkimsprings.org. Since Bhutan is also facing the problem of drying up of water sources, the Bhutan team came on this exposure visit to learn from the best practices from Sikkim on reviving springs, streams and lakes. The officials from Bhutan left impressed with the springshed development work and other Rural Development Initiatives of the State Government. They also requested RM&DD to provide them technical support to launch similar initiatives in Bhutan.

3.6 Learnings from mistakes

In any new initiative, it is the learnings from mistakes that need to be documented with equal diligence if not more compared to the success stories. During the initial phase of the initiative quite a few mistakes were committed which were identified and analyzed and eventually became the stepping stone to more effective project implementation:

- Trenches in terraced fields were also dug which were not effective since the surface runoff on terraced lands is already low. Hence, the investment made in the digging of the trenches

was not worthwhile. Subsequently, only sloping lands in the upper catchments and springsheds were targeted for ground water recharge works.

- In certain locations only horticulture and forestry plantations were raised, with limited soil and moisture conservation works. These plantations did not show a healthy survival rate and would have benefitted significantly if the contour trenching and ponding was done before the plantations to improve the soil moisture. Also, it is the trenches and ponds which play a significant role in the ground water recharge and not the plantations.
- The digging of trenches and ponds is usually assigned to the workers on piece rate basis and they get paid based on the number of trenches and pits dug. In certain locations, where daily supervision was lacking, the workers dug the trenches and pits too close to each other and in the most convenient and easy locations, instead of following a placement strategy which would have maximized the trapping of the surface runoff. Now in all new works, a trained and experienced supervisor is engaged to identify the location of the trenches and ponds in order to ensure that the placement is correct.
- In locations, where the baseline information of the lean period discharge of the springs was not collected, the impact of the project activities could not be ascertained conclusively. Now, during the planning stage itself the indicator springs are identified and their lean period discharge acts as a baseline.

3.7 Future plans

An environmental isotope fingerprinting study of Sikkim springs has been initiated in collaboration with the Bhabha Atomic Research Centre (BARC), which aims to further deepen the understanding of the mountain aquifers, improve our ability to identify the recharge areas with greater precision and develop local human resource. Also, more landscape level initiatives are on the anvil following an integrated strategy of reviving springs, streams and lakes. A training handbook is also under preparation which will help to illustrate the process to be followed for ground water recharge in a step by step and user friendly manner. Preparation of village water security plans at gram panchayat level by documenting the village water budget, recharge areas and enhancing water use efficiency is also being piloted.

4. Evaluation / Evidence

Independent evaluation was done by reputed government agencies and academic institutions like IISc Bangalore (2013), Department of Administrative Reforms and Public Grievances, Government of India (2012), T. N. Khoshoo Memorial Award Jury (2012) and eNorth East Award Jury (2012). The MGNREGA - Dhara Vikas initiative was also recognized by the Planning Commission, Government of India when it added springshed development in the expanded list of permissible works under MGNREGA. Video documentation of the impacts was done independently by the India Water Portal and the water users were also interviewed, transcripts of which are also provided below:

4.1 Independent Assessment by I.I.Sc., Bangalore. This study titled, "Environmental Benefits and Vulnerability Reduction through Mahatma Gandhi National Rural Employment Guarantee Scheme" by the Indian Institute of Science, Bangalore was taken up during 2012-2013. This study indicates that according to beneficiary perceptions as well as bio-physical measurements dhara vikas has led to ground water recharge, by increasing percolation rates and checking surface runoff. Beneficiaries reported an increase of 10 to 15% in the quantity of water collected from springs for domestic purposes, throughout the year.
http://nrega.nic.in/Netnrega/WriteReaddata/Circulars/Report_Env_Benefits_Vulnerability_Reduction.pdf

4.2 Prime Minister's Award for Excellence in Public Administration for the year 2011-12 was awarded to the Rural Management and Development Department, Government of Sikkim. The initiatives highlighted in this proposal pertain to MGNREGA, Conservation of springs under Dhara Vikas, Chief Minister's Rural Housing Mission, Char Dham and Village Development Action Plan. Independent Assessment was undertaken by the Ministry of Personnel, Government of India, while screening for this highest award for civil service in the country. This Award was conferred by the Prime Minister - Dr. Manmohan Singh on the occasion of the Civil Service Day on 21st April, 2013. The citation of this award can be accessed at http://www.darpg.nic.in/darpgwebsite_cms/Document/file/PMAwards_Citations.pdf

4.3 Recognition by Planning Commission, Government of India
Based on these successful pilots, springshed development was added in the list of permissible works of the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) national flagship programme in 2012.

4.4 National Groundwater Augmentation Award to WWF-India for technical support to the *MGNREGA-Dhara Vikas* of RM&DD by the Ministry of Water Resources, Government of India, 2010-11. http://wwf.panda.org/wwf_news/?uNewsID=204208

4.5 T. N. Khoshoo Memorial Award by ATREE, the Ford Foundation and the Institute of Rural Research and Development, 2011. This award is in recognition of his efforts in sustainability and community-based governance of common property resources in Sikkim. For work ranging from improving efficiency in the management of MGNREGA scheme that has directly affected livelihood security, to biodiversity conservation, to addressing rural water scarcity through action on revival of local water bodies in drought prone areas of Sikkim. http://www.atree.org/sandeep-tambe

4.6 eNorth East Award 2012: Winner - For Village Spring Atlas www.sikkimsprings.org for the conservation of Himalayan springs and adapting to climate change. http://enortheast.in/about-tech-challenge-2011/

4.7 A story of resurgence - A video featuring the revival of Doling lake, Sikkim
Independent video documentation of the revival of the Doling Lake in South Sikkim by the India Water Portal which can be viewed at:
http://www.indiawaterportal.org/articles/story-resurgence-video-featuring-revival-doling-lake-sikkim

4.8 Presentation in the thematic session on Water at IMI SMDS2– Presentation of the paper titled 'Environmental change, Water Security and Adaptation Initiatives in the Sikkim Himalaya' during the Second Sustainable Mountain Development Summit of the Indian Mountain Initiative (IMI) held on May 2013 at Gangtok.
http://www.youtube.com/playlist?list=PLB05A67DDD779A6B6

4.9 Springs of Hope - A film on revival of dying springs in Sikkim
Independent video documentation of the revival of dying springs initiative in Sikkim by the India Water Portal which can be accessed at
http://www.indiawaterportal.org/articles/springs-hope-film-revival-dying-springs-sikkim

References

1. Bates, B. C., Kundzewicz, Z. W., Wu, S. and Palutikof, J. P., Climate Change and Water. IPCC Technical Paper VI, Intergovernmental Panel on Climate Change, IPCC Secretariat, Geneva, 210 pp, 2008.

2. Shrestha, U. B., Gautam, S. and Bawa, K. S., Widespread Climate Change in the Himalayas and Associated Changes in Local Ecosystems. *PLoS ONE*, 7(5): e36741, 2012.
3. Chaudhary P., Bawa, K. S., Local perceptions of climate change validated by scientific evidence in the Himalaya. *Biology Letters* 7(5):767–770. doi: 10.1098/rsbl.2011.0269, 2011.
4. Chaudhary, P., Rai, S., Wangdi, S., Mao, A., Rehman, N., Chettri, S., Bawa, K. S. Consistency of local perceptions of climate change in the Kangchenjunga Himalayas landscape. *Current Science*, 101(3), 2011.
5. Ravindranath, N. H., Rao, S., Nair, M., Gopalakrishnan, R., Rao, A. S., Malaviya, S., Tiwari, R., Sagadevan, A., Munsi, M., Krishna, N. and Bala, G., Climate change vulnerability profiles for North East India. *Current Science*, 2010, 101(3), 354-361.
6. Seetharaman, K., Climate change scenario over Gangtok. Letter to the editor. Meteorological center, Gangtok. Indian Meteorological Department, India. *Mausam*, 2008, 59(3), 361-366, 2008.
7. Tambe, S., Arrawatia, M. L., Bhutia, N. T. and Swaroop, B., Rapid, cost effective and high resolution assessment of climate-related vulnerability of rural communities of Sikkim Himalaya, India. *Current Science*, 2011, 101(2), 165-173.
8. Mahamuni K., Upasani D., Springs: A common source of a common resource. In: Sustaining Commons: Sustaining Our Future. Thirteenth Biennial Conference of the International Association for the Study of the Commons (IASC-2011). Digital Library of the Commons, Indiana University. http://sikkimsprings.org/dv/research/299.pdf; accessed on 22, Aug, 2011, 2011
9. Negi, G. C. S., Kumar, K., Panda, Y. S. and Satyal, G. S., Water Yield and water Quality of some Aquifers in the Himalaya.' *Int. J. Ecol, and Envionm. Sci.* 27, 55-59, 2001.
10. Negi, G. C. S. and Joshi, V., Drinking Water Issues and Development of Spring Sanctuaries in a Mountain Watershed in the Indian Himalaya.' *Mountain Research and Development*, 22(1), 29-31, 2002.
11. Negi, G. C. S. and Joshi, V., Rainfall and Spring Discharge Patterns in two Small Drainage Catchments in the Western Himalayan Mountains, India. *The Environmentalist*, 24, 19-28, 2004.
12. Sahin, V. and Hall, M. J., The effects of afforestation and deforestation on water yields. *Journal of Hydrology*178:293–309, 1996.
13. Singh, A. K. and Pande, R. K., Changes in the Spring Activity: Experiences of Kumaun Himalaya, India, *The Environmentalist*, 9(1), 25-29, 1989.
14. Tambe, S., Kharel, G., Arrawatia, M. L., Kulkarni, H., Mahamuni, K. and Ganeriwala, A., Reviving Dying Springs: Climate Change Adaptation Experiments from the Sikkim Himalaya. *Mountain Research and Development*, 32(1):62-72. 2012.
15. Valdiya, K. S. and Bartarya, S. K., Diminishing Discharges of Mountain Springs in a Part of Kumaun Himalaya, *Current Science*, 58(8), 417-426, 1989.
16. Valdiya, K. S. and Bartarya, S. K., Hydrological Studies of Springs in the Catchment of the Gaula River, Kumaun Lesser Himalaya, India. *Mountain Research and Development*11(3), 239-258, 1991.
17. Viviroli, D., Archer, D. R., Buytaert, W., Fowler, H. J., Greenwood, G. B., Hamlet, A. F., Huang, Y., Koboltschnig, G., Litaor, M. I., López-Moreno, J. I., Lorentz, S., Schädler, B., Schreier, H., Schwaiger, K., Vuille, M. and Woods, R., Climate change and mountain water resources: Overview and recommendations for research, management and policy. *Hydrology and Earth System Sciences*, 15:471–504, 2011.
18. Viviroli, D., Weingartner, R. and Messerli, B., Assessing the hydrological significance of the world's mountains. *Mountain Research and Development*, 23 (1):32–40, 2003.

Dhara Vikas Initiative

Successfully demonstrating the science and practice of reviving dying Himalayan springs in the drought prone rural areas by conceptualizing, implementing and monitoring a new, scientific, ground water recharge program using rainwater harvesting - Dhara Vikas (springshed development). Upscaling and sustainability of this new program has been ensured by innovatively converging the funding from the national flagship program – MGNREGA, and building a cadre of para-geohydrologists and knowledge base in collaboration with reputed government and voluntary sector institutes of excellence. Over the last five years, this initiative has been able to recharge 900 million litres of ground water annually at a nominal one time investment of 1 paisa per litre. Documentation of the impacts has also resulted in policy advocacy resulting in positive changes in the national policy and knowledge sharing with other mountain regions.

Profile

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Sandeep Tambe works in the Indian Forest Service. He is passionate about nature conservation, inclusive development, water security and mountain livelihoods. He has been instrumental in securing wildlife areas, effective implementation of MGNREGA and in the revival of springs and streams using scientific and people centric approaches. He has authored more than 20 research papers in reputed journals and has also penned four books. He was selected as the top 25 Persons of the Year by the Forbes India magazine in 2010, was conferred the T. N. Khoshoo Memorial Award in 2012 and the Prime Minister's Award for Excellence in Public Administration in 2013. He has graduated from IIT Mumbai, is a post graduate in Forestry from the Indira Gandhi National Forest Academy and a PhD from Wildlife Institute of India. He is posted as Special Secretary in the Rural Management and Development Department, Government of Sikkim.

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Sarika Pradhan is a member of the Sikkim State Civil Service and has been instrumental over the last decade in the successful implementation of several national and state government programmes like the inauguration of Indo-China Border Trade through Nathula pass in 2006, management of the Border Area Development Programme, management of North East Council Schemes and the preparation of the 2nd Human Development Report of Sikkim. She has excelled in the management of complex programs with an ability to lead multi-stakeholder teams in a changing environment. She is especially interested in the upliftment of the rural poor in general and women in particular with expertise in gender budgeting, strengthening district planning for human development, good governance and public administration. She is presently posted as Joint Secretary in the Rural Management and Development Department, Government of Sikkim. She holds a post graduate degree in Zoology from Chennai University and has worked as a lecturer in Sikkim Government College.

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M. L. Arrawatia is presently working as Chairman of the Sikkim Public Service Commission. Prior to that, he has served as Additional Principal Chief Conservator of Forests in the Forest Department and as Secretary, Department of Science and Technology and Climate Change in the Government of Sikkim. He was instrumental in ushering in scientific forestry in the state of Sikkim with enhanced focus on modern technologies. He grounded participatory approaches and empowerment of the local community with a number of pro-people policies.He drafted several pro-people policy initiatives like the Sikkim Biological Diversity Rules, 2005, Sikkim Trekking policy, 2005, Mountain Guardians Policy, 2006 and the Participatory Wetland Conservation guidelines, 2006. He was instrumental in pioneering climate change management in the State by setting up the policy, administrative and institutional setup. Various climate change studies related to glaciers, wetlands, forest fire, vulnerability assessment, springs, strategy and action plan etc were taken up. He is also an accomplished academician having authored more than 30 scientific papers on diverse topics and several books and reports.

REHABILITATION OF MOUNTAIN ECOSYSTEMS THROUGH DECENTRALIZED WATERSHED DEVELOPMENT IN UTTARAKHAND, INDIA

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SUMMARY

Watershed is a natural boundary of a human-inhabited mountainous ecosystem. These have experienced enormous anthropogenically induced adverse influences over an ecological age. The state government of Uttarakhand in Central Himalaya has established a Watershed Management Directorate (WMD) in 1982 as a nodal institution for effective coordination, monitoring and implementation of watershed based development programmes. It has so far implemented seven watershed development projects, including the recent World Bank sponsored Uttarakhand Decentralised Watershed Development Project (UDWDP), commonly known as '*Gramya*'. It was a totally community-owned and demand-driven project where the WMD and selected non-governmental organizations contributed merely as facilitator. The project has three major components, viz., participatory watershed development and management, enhancing livelihood opportunities and institutional strengthening. Implementation of the project through village-level- institution *Gram Panchayat* (GP=village council) and introduction of woman ward member as a co-signatory of water and watershed management committee (WWMC) has been a successful experience which is being mainstreamed into the integrated watershed management programme (IWMP), a centrally-sponsored scheme of the government of India. The concept of implementing the project through environmental and social management framework (ESMF) facilitated mitigation of negative effects, if any, of the Project activities since its formulation stage. The agribusiness activities were organized through farmers' interest group and farmers' federations for sustainable forward and backward linkages. The sustainability of the Project was ensured through establishment of users' groups and withdrawal plans. The activities under three components of the project were evaluated at definite intervals by the WMD, village-level committees, the World Bank professionals and external agency. This contribution presents a bird eye view of the achievements and experiences gained in the implementation of UDWDP-Gramya.

BACKGROUND / INTRODUCTION

Well-endowed with natural forests ranging from sub-tropical Sal (*Shorea robusta*) to sub-alpine *Quercus* and *Cedrus* forest and grasslands, and water resources, the state Uttarakhand ($77^0$34' to $81^0$02' E long and $28^0$43' to $31^0$27' N lat) harbours more than 12,000 glaciers and eight major river catchments in the Central Himalayan region of India. These river catchments besides sustaining the livelihood of the catchment inhabitants, act as the lifeline for the hydrological system of the entire Indo-Gangetic plain. These watersheds experience constant threat of mass wasting, flash flood and erosion owning to the depletion of forest cover, unsustainable agronomic practices, hydrological imbalances and natural calamities. The changes in life-style of the inhabitants and ever increasing population have further compounded the problem. Considering the magnitude of the problem and ecology of the state, the natural resource-based development programmes have thrust on integrated watershed development. The state government has established an independent institution- the Watershed Management Directorate (WMD) as a nodal agency for effective coordination, monitoring and implementation of

integrated watershed development programmes. As a service delivery organization, the WMD is working exclusively for and with the local community on the principles of good governance focusing on transparency, accountability and responsive administration.

Since its inception in 1982, the WMD has implemented seven watershed development projects including the recently completed World Bank (WB) sponsored Uttarakhand Decentralised Watershed Development Project (UDWDP), commonly named as '*Gramya*', predominantly in mountainous rainfed environment. The implementation has been recorded highly satisfactory even by the World Bank and the external evaluator (The Energy Resource Institute, 'TERI', New Delhi). The project has received co-financing under Global Environmental Facility (GEF) to implement Sustainable Land, Water and Biodiversity Conservation and Management for Improved Livelihoods in Uttarakhand Watershed Sector (SLEM) sub project. This contribution is an attempt to share the experience of mountain watershed management from UDWDP. The details of the activities and outcome may be seen in Implementation Completion Report, 2012 and Final Impact Evaluation Report, 2012 released by the WMD.

PROGRAM ACTIVITIES
THE UDWDP '*GRAMYA*'

Titled as '*Gramya*' the UDWDP was conceived with the objective of improving the productive potential of natural resources and income of rural inhabitants in selected watersheds in 11 districts of the state Uttarakhand (Fig.1) through socially-inclusive, institutionally and ecologically-sustainable approaches integrating scientific experimentation-based technology and knowhow and indigenous knowledge and practices. Costing about Indian Rs. 402 crores ($89.35 Million), the project cost includes 77.9 per cent, 18.6 per cent and 3.5 per cent contribution of, respectively, the World Bank, State government and the beneficiary. The project's areal span includes 76 selected micro watersheds(MWS) covering around 2348 km^2 land in mid-Himalayan region between 700 to 2000 m asl. About 468 *Gram Panchayat* (GP=village council) identified in 18 Blocks (a politically defined development unit) in 11 districts participated in the project. The selected sites include more than 80 per cent area as rainfed. The project duration was seven years (2004 to 2012).Human population numbering 2,58,000 individuals has been benefited from the project outcome directly.

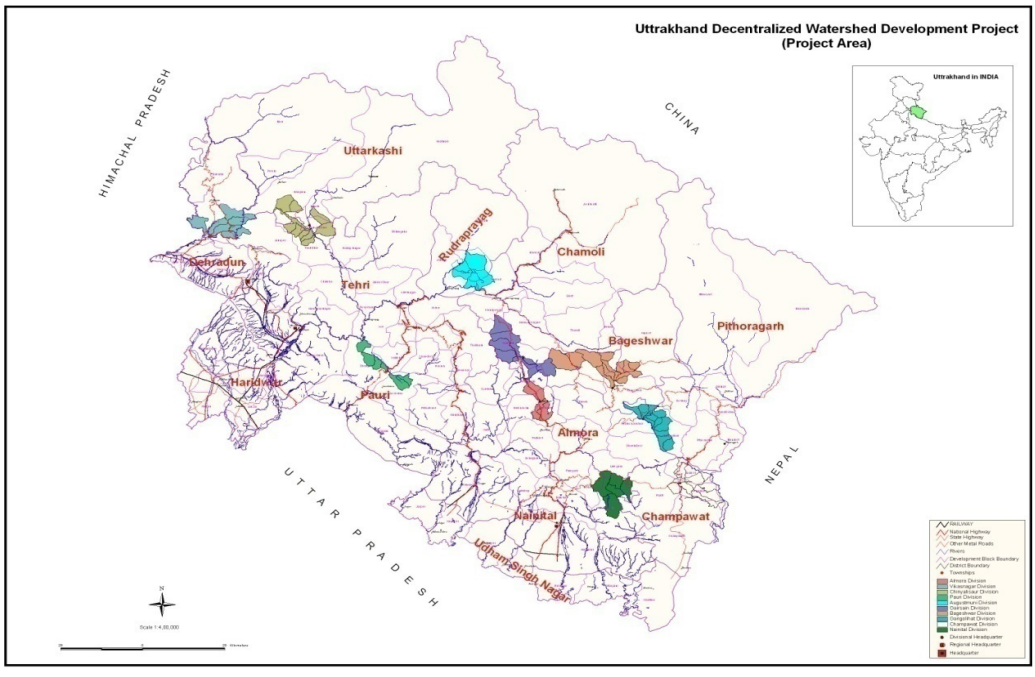

Fig.1. Area map

Implementation Strategy

As the Project was community-owned and demand-driven; the role of WMD as representative of the state government and the (involved) non-governmental organizations (NGOs) was merely of a facilitator. The *Gram Panchayat* Watershed Development plans (GPWDPs) were solely need-based keeping in view the safeguard guidelines of Environmental and Social Management Framework (ESMF). Allocation of funds for watershed treatment operations to each GP was based on the area and population of the concerned GP. Socio-economic equity was a cornerstone of this Project. The women participation in the watershed treatment activities was enhanced by enhancing their representation upto 50 percent in village-level committees and inclusion of their concerns, needs and women-related emerging issues in women *Aam Sabha* (Women's general meetings).A complete functional autonomy of the village-level local government, i.e., GP, was ensured for withdrawal and disbursement of funds from the watershed account of the Project through *Gram Pradhan* (Village Council Head) and one of the elected women ward member of the GP.

Project Components

The project has three broad components, viz., Participatory Watershed Development and Management, Enhancing Livelihood Opportunities and Institutional Strengthening

1. Participatory Watershed Development and Management

- **Promotion of social mobilization and community-driven decision-making:** It was organized through selected field NGOs and village motivators placed at the village level. Social mobilization was used as a tool to make community aware of the Project's objectives, implementation and management strategy.

- **Watershed treatment and village development:** It includes activities, such as, soil and moisture conservation, afforestation, water harvesting, agriculture terrace repair, agriculture interventions (like introduction of high value crops and value addition of farm produce, horticulture, livestock management and breeding activities, and fodder production), repair of roads, culverts and non-conventional energy programmes. The Environmental and Social Guidelines (ESG) were the integral part of the GPWDP and its Sub- projects to mitigate the adverse environmental and social impacts, if any.

2. Enhancing Livelihood Opportunities

- **Farming systems improvement:** This was focused on enhancing income and livelihood options by ensuring equitable participation of all groups like farmers, users groups and especially the landless and women who largely rely disproportionately on common-pool resources for fodder, fuel and other forest products. Farmers' Interest Groups (FIGs) of progressive and/or interested farmers, keen on taking up innovative agribusiness activities, were formed at the GP level. Demonstrations of culturable improved varieties of agronomic crops, orchard development and rejuvenation, cultivation of off-season vegetables, use of poly house/ tunnels and bio/ vermi-compost demonstrations were carried out through FIGs.
- The livestock development component was concerned with the improvement of genetic potential and health of indigenous livestock, increasing availability of feed and fodder, and reducing livestock pressure on farm land and forest for grazing and green-cum-dry fodder requirement.
- In the forestry component, farmers were motivated to establish nurseries of indigenous fuelwood and small timber species and fodder species, such as Ginni, Hybrid Napier, Hybrid maize and *Cenchrus* on community and private land.
- **Value addition and marketing support:** In agribusiness sub-component, the main thrust

has been on (i) dissemination of technologies and provision of advisory services; (ii) production and distribution of quality seeds and seedlings; and (iii) establishment of linkages between FIGs and suppliers for processing and marketing of off-season vegetables and high value crops. Six specialized Divisional Support Agencies for Agribusiness were hired to support value addition, marketing and forward and backward linkages.

Pine Briquetting: Pine (*Pinus roxburghii*) forests are spread over throughout mid-Himalaya. The pine needles are locally used conventionally as bedding material for cattle. In the Project, pine briquetting technology was used to provide alternate fuel for the local community. A total of 260 pine needle briquetting machine were installed.

- **Income generating activities for vulnerable groups:** The vulnerable group fund was established to enhance social equity in the villages and to further assist those who are either left out or receive very little benefit from watershed development activities. Till March 2012, 754 vulnerable groups and 3819 vulnerable individuals were granted funds.

3. Institutional Strengthening

- **Capacity building of GPs and local community institutions:** Capacity building of all the community-based institutions was carried out in different aspects regularly. The withdrawal plan for each GP was formulated. The management plan was provided to the Revenue Village Committee (RVC) Chairperson, *Gram Pradhan, Block Pramukh, Zilla Panchayat President*, Deputy Project Director, Project Director and Directorate to facilitate coordination and convergence with other programmes.
- **Information, education and communication (IEC):** This activity was planned for informing and shaping opinions within the community as regards to participatory watershed development and their roles in planning, decision-making and management of the Project's activities, transparency and accountability, dissemination of technical know-how, and documentation of the best practices.

  All forms of media (verbal to visual) were used at GP level. These include wall paintings, writings, flyers, boards, puppet shows, folk theatre and audio-visual shows, a six monthly video-newsletter, *Gramya Darpan* (quarterly newsletter), *Hamara Akhbar* (Community newspaper) and thematic short documentary films on various interventions in the Project.
- **Project management (PM) and information management monitoring and evaluation (IMME):**

  Monitoring arrangements:

  Internal monitoring: The progress of annual works plan was monitored on monthly basis through monthly progress report (MPR) generated at the divisional level and consolidated at the WMD level.

  External monitoring (Baseline, mid-term review (MTR) and final impact assessment consultancy): The Energy and Resources Institute (TERI) New Delhi was the External monitoring and evaluation(M&E) Consultant for Baseline, MTR and final impact assessment consultancy.

  Participatory monitoring and evaluation (PME): It was introduced in the Project not only to gauge the performance but more importantly to make timely improvement in the working of all the stakeholders. PME exercises were conducted on six monthly basis for broad objectives, viz., awareness, inclusiveness and equity, transparency and accountability, financial management, performance of committees and groups, inputs by multi-disciplinary team (MDT), grievance redressal and execution of withdrawal strategy. The PME, thus, contributed as a progress measuring and community feedback assessment tool.

Result Impact

Indicators of Sustainable Development through UDWDP:

During the implementation of Project, activities under various components (detailed above) were monitored continuously by the Project staff, ensuring quality inputs to achieve desirable outputs, with the focus on attaining the goals of the Project. Internal system of participatory monitoring and evaluation and supervision mission of the World Bank were carried out at regular intervals. External evaluator –The Energy Research Institute (TERI) conducted the Base Line, Mid-Term Review and Final Impact Assessment. Some of the highlights are enumerated as follows: (please see Figs.2.a-g)

Improving productive potential of farm land and natural resources

- The productivity and irrigated area under almost all key crops (wheat, paddy, maize, finger millet and kidney bean) showed an increment. The increase in area (21per cent) and production (27 per cent) has been significantly higher than the targeted values (10 per cent and 15 per cent, respectively). The key reasons for the increase are: increased availability of water and nutrient rich soil due to soil and water conservation interventions, viz., contour trenches and, vegetative/dry stone/crate wired check dams etc.
- In case of post-harvest operations, grading and packing of vegetables, spices, pulses etc., especially with different trade names, proved to be attractive for sale of these products in local markets, fairs and even in the outside market (*Azadpur mandi*, New Delhi).
- Agribusiness ventures have been successful in several places. The agribusiness activity at *Garsain* deserves particular mention on account of its innovative arrangement of 'reverse profit' especially for turmeric, ginger, coriander and chillies.
- About 41474 tones vegetables and value-added-products were marketed from the Project area. Total turnover through this activity was reported to the tune of about Rs. 48.69 crores. For the value addition of the produce, 19 processing centres' were established in the Project area.
- The improved livestock breeds showed a notable increase in income. Members of vulnerable groups have been the major beneficiaries. On the whole, there have been 19 per cent and 191 per cent increase in the holdings of improved cow and buffalo, respectively, in the sampled GPs.
- An overall 9.6 per cent increase in fodder availability has been recorded over the baseline. The average fodder production ranged between 0.5 -5.6 q/ha/yr across different land uses. The highest percentage change (24.18 per cent) in availability of fodder was recorded for irrigated agriculture land suggesting that farmers in the project area got motivated to grow fodder crops and multipurpose tree on the bunds / terrace risers.
- The percentage change in household dependency for fodder and grasses from private agricultural, barren land and other land is the highest (13 per cent), while dependency on fodder from forests and feed purchased from the market have declined by 8 per cent and 5 per cent, respectively. On an average, there has been 11 per cent reduction in time spent on collecting fodder by a household.
- It was observed that the overall biomass of the treated areas has increased by 9.37 per cent (across treated micro-watersheds). On account of increase in vegetation cover due to new plantations of *Quercus leucotrichophora, Grewia optiva, Alnus nepalensis, Aesculus indica Bauhinia spp.* and *Terminalia chebula,*etc., under the Project, and the natural regeneration of grasses, shrubs and tree seedlings because of the protection against grazing and over usage. The average survival percentage within the sites surveyed, was around 45 percent ranging between 23 per cent to 85 per cent.
- The impact of soil and water conservation measures was recorded in terms of increased amount of irrigated land (increased by 24.7 per cent), an increase in crop yield and access to domestic water.

- The time spent in collecting water reduced significantly with a sharp increase (48 per cent) in the number of households taking < 1 hour to collect water and a similar decrease (39 per cent) in the number of households taking between 1-2 hours.
- A total of 8020 households of 337 revenue villages were benefitted by the pine briquetting. The response from womenfolk was quite encouraging as the frequency to visit to forest for firewood reduced significantly.

Increase in income of rural inhabitants

- A total of 8819 vulnerable members (4499 male and 4320 female members) were benefitted by income generation programme. The total fund disbursed for vulnerable activities was INR 8,53,83,228. It was allotted to 49 per cent female and 51 per cent male members.
- The total increase in income across all categories was recorded 57 per cent, but the increase in overall farm income was higher (61.1 per cent) than non-farm incomes (56.6 per cent). The total increase in income of 57 per cent was translated to a real income increase of 17 per cent when adjusted for inflation using the Consumer Price Index (CPI) for rural labourers, using agricultural year average values, and accounting for the impact of non-project interventions. There has been almost a doubling in the ownership of consumer durables, indicating a general increase in living standards of the watershed people.
- The economic analysis of the Project included benefits from agriculture, livestock, horticulture, forestry, soil conservation, domestic water and employment. The economic rate of return is estimated at 18.5 per cent.
- Economic analysis has also been done for selected interventions as well as for selected income generation activities(IGAs). Irrigation channels and irrigation tanks return benefit : cost(BCR) values of 1.36 and 1.54, respectively, over a 10 year horizon, indicated their economic viability even in the medium run.

Institutional strengthening

- Participation in *Gram Sabha* (consist of all adult voters from GP) and *Gram Panchayat* (elected members headed by *Gram Pradhan*) meetings showed a sharp increase. For example, the attendance percentage in *Gram Sabha* meetings doubled and the attendance percentage of women in *Gram Sabha* meetings has increased fivefold. The average number of GP meetings increased from 5.28 in a year to 11.14 in a year.
- A high degree of transparency in the Project has been recorded. An average of 78.96 per cent of total households in a *Gram Panchayat*, were involved in the preparation of GPWDP. An average of 48.7 per cent of the community members were recorded aware of GP budget and expenditure, and 91 per cent of households were found aware of the Project's objectives, activities and methodologies.
- The initial response to the process of FIG formation was low. As the produce of off-season vegetables and cash crops increased and farmers started selling the surplus, particularly of tomato, capsicum, potato, french been, cabbage and cauliflower; the response picked up and progressive market linkages were established.
- Most of the interventions undertaken under the agriculture and horticulture component have strong potential of sustainability. For instance, minikits have been effectively utilized by almost all the farmers. Wherever the productivity has increased substantially, the farmers retained the seeds for use in the next season.
- Soil conservation structures that withstood the heavy rains in 2010 and 2011, have served their purpose to a large extent, and the formation of users' groups (UGs) for maintenance of these structures has been a step towards ensuring post-project sustainability.

- Most of the plantation activities were taken up by *Van Panchayat*, managed by *Van Panchayat* committees with strict code of conduct and usufruct sharing. These institutions are ensured adequate upkeep of the plantations.

Conclusion

It is now evidently clear, that the restoration of the mountain ecosystem needs a multi-pronged approach as adopted in the UDWDP. The level of participation of local communities has been raised to that of ownership wherein, the *Gram Panchayat* are the planner and implementer of the Project. Sustainability of the Project's interventions and ecosystem has been attempted by institutionalizing various village-level groups, viz., farmers' interest group, farmers' federation, *van panchayat*, water user group and self help group; and building up the capacities of individuals and the community on the whole.

Acknowledgements

The UDWDP-'*Gramya*' is a collective effort of the state government, the World Bank, staff of WMD, concerned NGOs, namely, 'Asian Society for Entrepreneurship and Development' and 'Institute of Himalayan Environmental Research and Education' (Partner-NGOs), and 'Himalayan Study Circle, for environment child education and research' and 'Manav Bharti (Field-NGOs), and above all the watershed people and village-level institutions. We owe our deep sense of gratitude to all of them. Because of the collective and complementary action of each stakeholder of the Project, the experiences cited above, have been possible.

Evaluation/ Evidence

(a) Social Mobilization through dissemination of information (left) and participatory rural appraisal (right)


(b) PME and Capacity Development activities



(c) Natural resource management (NRM) activities; water conservation through contour trenches and ponds (left above); afforestation (right above) and fodder grass production (centre below)

(d) Drainage Line Treatment (DLT) Works

(e) Energy conservation activities: Pine Briquetting (left) and efficient energy use (right)

(f) Income Generation Activities: based on farm land (left) and non-farm sector (right)

(g) National Ground Water Augmentation Award 2010 by Ministry of Water Resources, Govt. of India

Fig.2. Activities and achievements under UDWDP-Gramya

Profile

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Experience:

As a Divisional Forest Officer/ Deputy Director served at Dudwa National Park, Lakhimpur Kheri, Uttar Pradesh. After the formation of the state of Uttarakhand, worked in various divisions like -Kalsi Forest Division, Uttarakhand, Uttarkashi Soil Division, Uttarakhand, Ramnagar Soil Conservation Division, Uttarakhand.

As Conservator of Forest, was deputed to the Watershed Management Directorate, Dehradun, Uttarakhand. Worked as Project Director, Garhwal and continuing as Project Director (Admn) till date.

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Presently working as **ENVIRONMENTAL SPECIALIST,** Watershed Management Directorate, Indira Nagar, Forest Colony Dehradun.

Articles Published:

- Pandey J C (2003), Vegetation Analysis in a mixed Oak-Coniferous Forest of Central Himalaya, *Indian Jour. Forestry*. Vol. 26(1): 66-74.
- Pandey J C (2006), Resource utilization pattern of fuel wood in Oak Pine forest zone of Central Himalaya*, Indian Jour. Forestry.* Vol. 29(1): 109-112.

Studies Conducted:

1. Study of impact of farming system interventions *(WMD)*
2. Integrated Crop Management Analysis *(WMD)*
3. Analysis of agriculture production trend in the project *(WMD, with DPD Haldwani)*
4. Training Need Assessment *(WMD)*

Guidelines & information dissemination

- Guidelines for Waste Management in UDWDP villages.
- Guidelines for use of turbidity meter for silt observation.
- 'POPULAR ARTICLES' published in WMD's News Letter Gramya Darpan
    1. 'Gramya; Ek avsar'
    2. 'Vanikaran; Co2 kam karne karne ka upaya.
    3. 'Nayi raahain'
    4. Pirul se koyla nirman; ek abhinav gatividhi.
    5. Vanikaran; ek sarthak kadam.

Editorial Work:

- Editorial board member of "Gramya Darpan", quarterly News letter of Watershed Management Directorate Uttarakhand, Dehradun- 5 Yrs.

JOINT FOREST MANAGEMENT IN SWAT KHYBERPAKHTUNKHWA PAKISTAN

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Summary

The present Swat District has been a Princely State ruled by "Wali" from 1917-1969. The forests were the property of the State and remained safe from any misuse and unauthorized extraction. The State was merged in Pakistan in 1969 as part of Khyber Pakhtunkhwa Province. The strict control system of forest protection during the Wali rule could not be continued and before extending the institutional and legislative rule in 1975 much damage occurred to the forests and changed the concept of State Ownership in the minds of the forests fringe communities. The government declared the forests as government property but had to leave them with burden of all types of rights of the villagers. In case of commercial felling of trees, the communities were allowed entitlement of 60% share of the net sale proceeds. However, the forests remained subject to various threats of illicit cutting of trees and black marketing of timber, over grazing, encroachments, indiscriminate extraction of non-timber products and the like leading to continuous depletion of the forests. The control of the forest department remained weak and could not alleviate the threats.

In the changed scenario, a realization evolved that community participation is inevitable for on the ground management of the forest resources and the concept of Joint Forest Management (JFM) was institutionalized under legislation in 2002. Miandam Valley of Swat District, with moist temperate conifer forests, was one such site where the concept of the JFM was implemented. The concept envisaged the establishment of a Joint Forest Management Committee (JFMC) for an identified site, a broad based representative forum of the stakeholder villagers and forest department functionaries, with adequate powers of decision making and implementation of the concept. As collaborative partner to the forest department, the JFMC could address the various threats effectively and saved the forests from further depletion with reasonably sustainable practices and increase contribution to the community livelihood.

Situation /Background

Prior to its merger in 1969 in the Khyber Pakhtunkhwa Province, District Swat used to be a Princely State. Ruler of the area was recognized as "Wali Swat". The Princely State was then carved out from a tribal system without a central authority. The inter-tribal and intra tribal feuds had made the long inhabited valley of pristine nature as no man's land. Being sick of such a situation, the elders of major tribes met in an informal tribal council, called "jirga", and founded a Princely State in 1917 with hereditary centralized authority having all powers to adjudicate and implement the decisions in the State. The State territory extending over an area of about 8,250 km^2, for its large part has been covered with natural conifer forests. All these lands and forests were owned by the monarch as State Property and any unauthorized cutting of trees was subject to severe punishments.

For the domestic use there was provision of free grants of trees in the shape of Local Quota on village basis. For communal buildings like mosque and emergencies free grants of trees were earmarked under the Special Quota. People, who were bonafide residents of the State and residing in urban area and down below had the provision of timber/trees at concessional rates. Before the establishment of Swat State, the forests were owned by the local villagers and no cash income was generated from the forests and the communities had significant dependence on forests for their subsistence livelihood. After the establishment of the Swat State, there have been

few commercial logging of forests on small scale with nine-tenth of the income derived from the sale as state share and one-tenth paid to the local people. Because of the strong writ of the state, no illicit damage could occur and at the same time the needs of the people were met expeditiously whenever they applied for their quota of timber for domestic use. The forests remained by and large intact and remained in conservative use by the communities. A skeleton administration for affairs of forests was created in the State mostly consisted of non-professionals.

A few years before the merger of the Princely State, the Wali invited professional foresters to develop a management/working plans for the forests in the State with the impetus of commercial logging of forests for the State/Monarch revenue. The share of the village communities was then allowed as 15% of the commercial sale proceeds. Selective harvesting, mostly of deodar *(Cedrus deodara)* and Blue pine *(Pinus wallichiana)* was introduced through stump sale to contractors. However, the State was soon abolished in 1969, abruptly without a strategic home work for protection and administration of the forests and pastures.

Mass deforestation occurred after the merger of the Swat State and forests were ruthlessly destroyed by contractors on the one hand and on the other by the people themselves, who were previously kept under strict control. They got freedom all of a sudden. There was no check, neither on the contractors nor on the people and so was the unbounded freedom highly misused. The major problem started as a result of the slogan given by the Government of Pakistan People's Party in 1972 "Land to the tillers". The existing control system was abolished and was not readily replaced by new one which created a vacuum and resulted in the "Tragedy of the Commons" and further aggravated the land tenure and resource tenure issues.

This was quite later in 1975, after seven years, that the tenure of the forests and non-cultivated lands was defined under a legal regulation, and all the uncultivated lands and their resources were declared as government property. The forests were declared as Protected Forest under the forest laws and all the trees within these forests as Reserved, and cannot be cut without permission. However, the forests were allowed with burden of all types of rights of the villagers within the meaning of protected forests under the laws and therein everything is allowed unless it is prohibited. To create further stake of the villagers in the timber trees their share in commercial sale was enhanced from 15% to 60%.

Notwithstanding this de-jure ownership by the government, the villagers had appropriated the custody and established use rights of all types of resources amongst the agriculture land holding families in the village during seven years of intervening period. The villagers are the de facto owners with little control of the forest department to regulate the uses of the natural resources in the forests and pastures and on this account the resources of forests and pastures are facing various threats, including the following:

- The only valid and accepted restriction is commercial sale of timber for which the communities are penalized. Though trees cannot be cut without permission but they are cut quite often not only for domestic use but also for black marketing.
- Destructive lopping and pollarding of conifer and broad leaf trees is common practice for obtaining firewood and fodder.
- Unrestricted grazing is practiced all over the forests and pastures. The villagers not only graze their own livestock but also rent the forests and pastures to nomads.
- Firewood is removed without restrictions of species and quantity both for domestic use and for sale.
- Medicinal, aromatic, food and other economic plants and animals are harvested both for domestic use and for sale.

- Forests and pastures are encroached upon for agriculture, pasturing and pastoral settlements.

To ameliorate these threats community participation was sought in the management of forests working towards institutionalized Joint Forest Management and Miandam Valley of Swat District was one amongst various sites selected for the interventions.

Miandam Valley

Miandam valley is a discrete watershed of about 6300 hectare of small alluvial flanks with mountainous physiography of moderate to steep slopes with altitude between about 1300m at its mouth near Fatehpur to about 3530m at Gatsar. This is situated at about 50km towards north from Mingora, the district headquarter at latitudes 34^{o}–34' to 35^{o}–07'N and longitudes 72^{o}–34' to 72^{o}–37' E. This watershed borders with Pia valley in the north, Lilonai of Shangla district in the east, Shin in the south and Lalku in the west. The valley is generally narrow and opens only in the upper reaches.

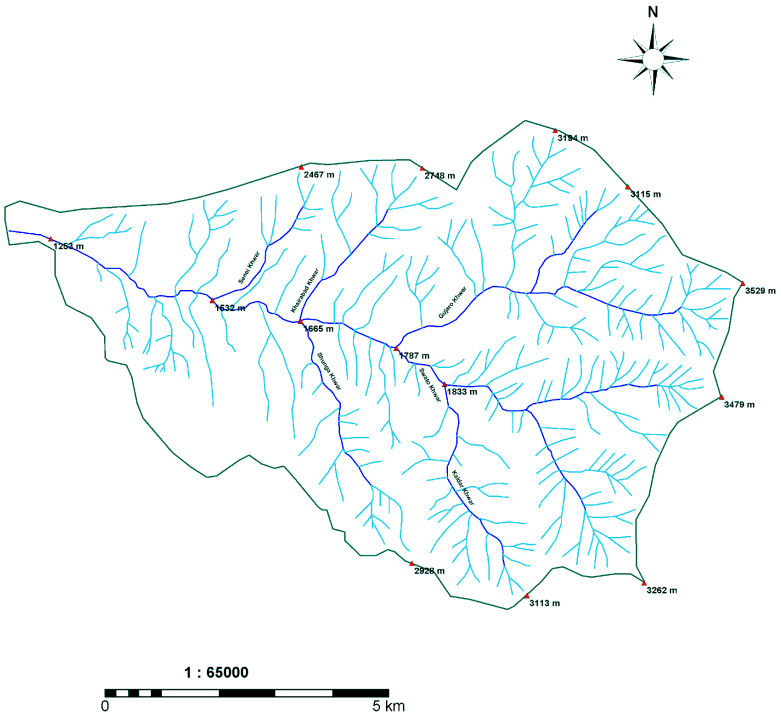
The valley is drained by Miandam stream, which falls directly in River Swat. The stream is formed by two principal perennial tributaries, Swatho Darra Khwar and Gujaro Dara Khwar which join each other at Miandam Village (about 1800m amsl) from which the valley and the stream have derived the name and is the central to the valley.

The area falls into moist-temperate climatic type, with its mean annual precipitation ranging from 1000 – 1200 mm, having profound winter snowfall and monsoon rainfall. The main monthly temperature remains below 10^{o} C for about six months and summer temperature does not rise above 33^{o}C at Miandam. The torrential rains do generate floods of different intensities causing losses to infrastructure.

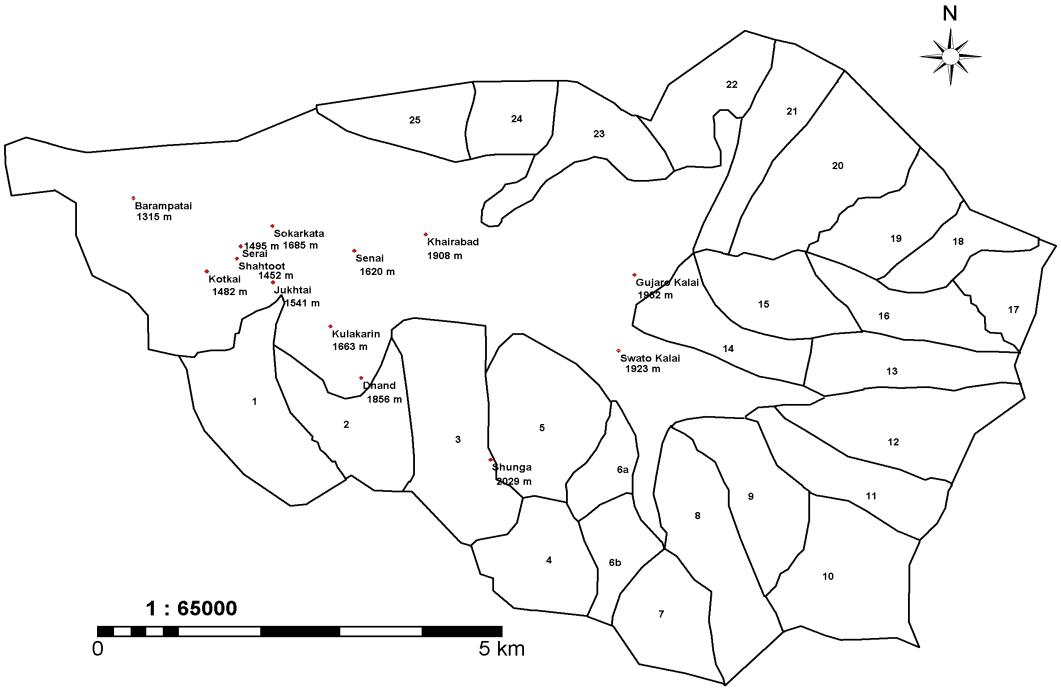
The upper slopes of the valley are covered with forests of low and medium densities. Further higher reaches are sub-alpine pastures and lower slopes are rough grazing grounds and set aside grass lands. The slopes further down are terraced agriculture fields with habitation. The forests are divided into 25 forest compartments. The land use forms in the valley area are roughly 40% forests, 52% range lands, including the sub-alpine pastures and about 08% under cultivation with about one half under irrigation. Miandam valley is amongst the few last remnants of the primary forests of the moist-temperate ecological depiction of the Hindu Kush mountain range. The forest habitats are represented by with three major conifer timber species, kail, fir and spruce, with reasonable constituent of Himalayan yew and having no deodar in the mixture, which reckon the valley as a unique ecosystem, with few parallel in the Hindukush Himalayas.

Although subject to poaching and misuse of various resources, the valley supports significant biological diversity with representation of habitats of key animals and birds' species like Rhesus monkey, Black bear, Common leopard, Musk deer, Grey goral, Koklas pheasant and Himalayan Monal pheasant. All these wildlife species are nationally and internationally endangered and listed protected in the Global Red Data Book. Proximity of the valley to the upstream dry-temperate climatic zone, the effects of the transition for the species richness of various orders of plants and animals also accounts the valley for its higher biological significance. Therefore, the present and envisaged ecosystem services of Miandam valley signify local, national and global benefits of biodiversity conservation.

DRAINAGE OF MIANDAM VALLEY



DESIGNATED FOREST IN MIANDAM VALLEY



Program Activities

Joint Forest Management (JFM) approach was institutionalized after promulgation of new forest Act in Khyber Pakhtunkhwa Province in 2002. This institutionalization was based on the realization that conventional policing and the prevailing complex land tenure and resource tenure syndrome is not working towards the conservation of resources and to the socio-economic contribution for the communities. Some piloting of the concept was also experimented in the reserved forests before giving legal coverage to the implementation of the concept. In reserved forest every public access is prohibited unless authorized, and it was encouraging for the villagers to obtain stake where they had no legal stake previously and unlawful activities was a continuous friction between the communities and the government functionaries or the functionaries would connive in the unlawful extraction of resources for their own gains. The JFM was then made part of the legislation and operating rules of the concept were also framed by the government in 2004. The approach was then also expanded to the protected forests like those of Miandam valley, where the forests were burdened with all types of rights of the villagers.

The forests of Miandam Valley which were managed solely by the department were to try the new approach of Joint Forest management, which was a new concept for villagers as well as the department. A Joint Forest Management Committee (JFMC) was constituted by the stakeholders of seven compartments # 15 to 21 and was registered with Divisional Forest Officer under the rules. Training and capacity building of JFMC to establish a viable organization was much required to fully operationalize the JFMC and achieve the desired goals from its establishment for the conservation of the forests at large. The awareness and capacity building could provide momentum to the assimilation of the JFM approach and in 2006 the JFMC started working as competent and viable local institution for collaborative management of the earmarked forests. This is worthwhile to note that in the wake of large scale floods in the country the government had imposed complete ban on commercial logging in the country in 1992 and that ban still continues. The villagers, therefore, had no incentive of receiving income from the sale of trees and to protect and manage them against the theft.

On the persistent request of forest owners/right holders, the government approved a policy for the salvage of dry and wind fallen trees so that the local communities could get some returns in the shape of sale proceeds, provide job opportunities and keep sense of ownership intact and inculcate the sense of responsibilities in protecting the forest resources. On the request of JFMC, the Forest Department carried out marking of dry/wind fallen trees for salvage. The JFMC was involved not only in the marking of trees for extraction of timber but they were fully executing and supervising the whole operation of conversion of trees, transient stocking of timber, transportation, and marketing of timber to invoke transparency and to avoid wastage and pilferage at any stage. As a result of harvesting of the marked trees, the local community not only found jobs but received Rupees three million as their share of the sale proceeds.

Results / Impacts

With the realization of empowerment, awareness raising through the advocacy of the department and conservation NGOs like WWF, HUJRA and others, the JFMC could well realize the importance of natural resources, the regeneration of trees and other plant and animal species, conservation and protection of forests from indiscriminate uses and protection against illicit cutting. The JFMC and the constituent villagers agreed to abandon the deleterious practices leading to the deterioration of the forest resources after overcoming the initial resistance to the changed paradigm. The JFMC addressed the various threats one by one and was adequately supported by the department and the constituent villagers.

The JFMC by and large stopped the illicit cutting of trees and subsequent smuggling of timber out of the valley. Reportedly more than 90% of this menace has been controlled.

The local community since centuries were leasing out the forest to migratory grazers for grazing on seasonal basis for fee locally called "Qalang" The JFMC as a pilot stopped the receipt of "Qalang"and closed Maindam Compartment No. 15 against all local and nomadic grazing for five years. Due to its close proximity to habitation, the said compartment was also exposed to cutting of trees for domestic use in the shape of timber and fire wood. The JFMC stopped cutting of trees in the compartment. The prohibitions were then covered with the imposition of penalties and earmarking of alternate areas for grazing by the local livestock and for obtaining firewood and timber through a planned utilization. This closure has not only encouraged the establishment of the existing young seedlings but profuse natural regeneration occurred in the said area of new seedlings of the conifer and other associates. About 40 hectare of the forest land which was devoid of forest trees has now covered with natural regeneration.

Inspired from the result of forest compartment No.15, the stakeholders of Compartment No. 16 to-21 replicated the same treatment, gave off the receipt of "Qalang from migratory grazers and closed these forests to grazing. The treatment was then up-scaled to about 250 hectare of forests, adjusting their needs with alternatives.

The villagers were previously cutting green Blue pine trees for fuelwood and they switched over to use broad leave trees and shrubs and dry/wind fallen trees as constructional timber and fuel wood.

The JFMC with the active involvement of the community also imposed restrictions on the pollarding, timber quality damaging, non-productive and unsustainable lopping of the coniferous trees. The villagers were trained in appropriate lopping techniques to generate renewable production, and with this improvement in practice are expected to obtain healthy conifer trees crop and visible signs to this effect have been noted.

Large number of small ruminants brought from down districts used to spread all over Miandam forests for grazing and resting while proceeding to Alpine pastures and caused soil erosion and damaged the young seedlings. The JFMC witnessing the results of compartment No. 15 decided to identify and mark a track for the migratory animals. They engaged watch-men to check and guide the nomads on the route in the forest area of Miandam valley.

JFMC has also imposed complete ban on poaching of wildlife species and has taken the cooperation of all and sundry in the valley to implement this ban. Restoration and coming back of some important wildlife species has been noticed after ending much of the disturbance and poaching.

The bio-mass production in the forests has been increased considerably; local livestock owners are cutting grasses and encourage stall feeding instead of open grazing in the forests.

Medicinal and aromatic plants (MAPs) were inappropriately collected, with few chances of regeneration, and out of season collection and faulty processing of the plant material were fetching very low returns to the collectors. The collectors were made aware of the proper timings and trained in the collection and pre and post collection processing of plant material of various species for obtaining quality products and value added marketing. This has doubled the returns to the community from the harvest of MAPs and more than 10 million rupees yearly returns have been recorded. This changed dimension has possibly saved many species of MAPs from extinction and the compatible returns have reasonably changed the focus of the community from trees to NTFP.

Evaluation/Evidence

Since the collection of baseline data and statistical monitoring of the various parameters of improvement with indicators has not been a part of the intervention therefore the results and impact could not be validated with statistical significance. However, the observations, inspections, discussions and photographs of the targeted sites could amply provide the evidence of viability of both aspects of the intervention of the JFM concept. The evaluation through these sources convincingly evidence that community is proactive and feels empowered and the JFMC is actively functioning according to the terms of reference of its establishment and to the standard of their terms of partnership with the Forest Department. The improvement on the ground is also visible to the satisfaction of the community and the local forest functionaries.

Miandam Swat, joint inspection of forest

Meeting with JFMC GojerKilay

Depleted forest rehabilitated (2013)

Forest & people co-exist (2013)

Head loads of dry fuel wood(2013)

Rehabilitated MAP(2013)

Promotion of natural regeneration

Trillidium Specie (MAP 2013)

References

1. BARZEL, Y. 1989. Economic analysis of property rights. Cambridge: Cambridge
2. NORTH, D.C. 1990. Institutions, institutional change and economic performance. New York. Cambridge University Press.
3. RUNGE C. F. 1984. Strategic independence in the model of property rights. American
4. Journal of Agricultural Economics 66:807-813.Sultan-I-RomeDr., MARC Occasional Papers, No. 14-April 1999.IUED Merger of Swat State with Pakistan Causes and Effects, The University of Geneva, University Press.

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- Divisional Forest Office, Swat Forest Division
- Deputy Director, Planning And Monitoring
- Project Director Ernp(Pak-Ec-) Dir Kohistan Project
- Divisional Forest Officer, Hazara Tribal Battagram
- Senior Technical Advisor/ Cta Environmnet Rehabilitation Project Malakand Division
- Project Coordinator Pak-Swiss Kalam Integrated Development Project Swat, NWFP
- *Worked as National Consultant Range Management for United Nations Food and Agriculture Organizations (FAO)*
- Divisional Forest Officer Kalam Integrated Development Project.
- Divisional Forest Officer Tarbela Watershed Management Project (KFW, WFP, assisted) Buner
- Divisional Forest Officer Dir Forest Division, NWFP.
- Divisional Forest Officer Alpuri Forest Division, NWFP
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- Forest Road Planning and construction in Federal Republic of Germany 1987
- Off- Farm employment in Himalayan region in ICIMOD Nepal 1992.
- Gender sensitization in ADHR 1996
- Monitoring and Evaluation in Planning, Environment and Development Deptt: 1997.
- Integrated Land Use Planning in Jordan, Cyprus and Hungary 1998.

PUBLICATIONS

Impact study of Swat- Dir Watershed Management Project Management Plan for Harripur Reserved Forests
Report on Grazing Land Management for Food and Agriculture Organizations Baluchistan and Dera Ghazi Khan.
Preparation of Project Document for Dir- Kohistan Up- Land Rehabilitation Project.

Resource Management Plan for Matta Tehsil Swat.
Feasibility Study for Fuel Efficient Technology for Kalam
Preparation of Integrated Resource Management Plans for Allai Valley
Developed Village Land Use Plans
Report on Joint Forest Management experiences in Himalaya region of Allai Valley
Developed project proposals for Dir Kohistan, Dir, Swat, Shangla and Buner

"CONCRETE HEAPS TO CARPET GREEN" THROUGH PEOPLE'S PARTICIPATION

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Abstract
This paper reflects on how a stinking and loosely bound heap of "city garbage and concrete mix" was converted into a lush green model of biodiversity conservation in the Himalayan region. Approach was people's participation, involvement of social elites of the area, consensus generation through participatory means and use of a technologically sound methodology to rejuvenate a degraded land mass. The paper discusses the role of jute geo textiles in the control of soil erosion and Mass Wasting. The paper also details upon the importance of participation based conservation approach especially in case of a socially, politically and ecologically sensitive land.

Introduction
The state of Uttarakhand is situated in the northern parts of India and shares international boundaries with China in the North and Nepal in the East. It has an area of 53483 Sq. Km, out of which 34651 Sq. Km (64.79%) is forest area. Physiographically, the state is divided into three zones namely- The Himalayas, the Shivaliks and the Terrai Region. The State has a temperate climate except in the plain areas where the climate is tropical (State of Forest Report, 2011).

Nainital is one amongst the 13 districts of Uttarakhand State with a geographical area of 4251 Sq. Kms, out of which 3093 Sq. Kms (72.76%) is forest area. According to the 2010 Census, Nainital district has a population of 9,55,128 with a population density of 225 per sq.km. It has a sex ratio of 933 females for every 1000 males and a literacy rate of 84.85%.

The work area described in this paper is known as Hanumangarh Hillock which is situated at Manora ridge of Nainital forest division. This place is just 3 kms away from the lake city of Nainital, touching the Haldwani-Nainital National Highway. The altitude of the area is about 2084 mts (6837ft.). Average temperature of the area varies from-4^0C to 21^0C with a total annual rainfall of 253 cms and snow of 53.8 cms(India Meteorological Department, 2011).

Hanumangarh Hillock consist of a famous temple of lord Hanumana, in which the presiding deity is depicted tearing open his chest to reveal Rama and Sita in his heart. This temple is connected with a famous saint Neem Karoli Baba, who established this temple in the year 1950 (Dass, 2011). His numerous disciples look after the day to day affairs of the temple. In front of the temple lies a vast, rugged, rocky but flat area of about 5 acres in the form of a hillock. Since British time, the area was used for mining. Clasts of quartzite, slates and dolomites were embedded in the matrix of green to brownish sand stone or lime stone. Mining of these clasts was primarily done for construction purposes.

With the advent of Forest (Conservation)Act 1980, the mining activity came to a halt and the area was developed into a beautiful park in early 1980's. Because of its very close proximity to the tourist city like Nainital, vastness, flatness and many other topographical qualities, this area remained under a constant watch by various bodies like municipality, revenue department, local villagers, temple committee and lake development authority. All these groups were concerned about its land use pattern to their favor. A series of clashes started in 1990's among various

stakeholders regarding the ownership and the proposed land use of the area. As a result of various uncertainties, this area suffered an unmanned and ownerless status for over a decade.

A misconceived project for construction of group housing and offices in the year 2006-07, which was later abandoned, literally turned the site into a vegetation less, erosion prone, highly fragmented and degraded land mass of Himalayan Region. Since 2007, the area attained a "free to all" type of status and it was illegally being used as a garbage dump of municipality waste for dumping of construction waste of the city and a recreational paradise for antisocial elements (K.C.Suyal, Range Officer, Personal Communication, Nov-Dec, 2010).

From the year 2007 to 2010, this prime piece of land of high ecological importance remained totally neglected because of the following main reasons:
(i) Dispute of ownership.
(ii) Proposed changes in land use pattern.
(iii) Lack of focused vision.
(iv) Vested Interest.
(v) Sensitivity to landslides and erosion.

Work Area:
The work area lies touching the municipal limits of Nainital City. It is situated on the Manora Ridge, on the outskirts of Nainital at a height of 2084 mts. The work area of about 5 acres lies along the stretch of "Balia Nala", which is a very important natural passage for the overflow of Nainital lake. The area was totally devoid of vegetation. It has tropical climate with pleasant summers and cold winters (Shah, 2007).

Area location

The work area is highly fragile and sensitive to mass wasting as a significant underlying geological structure such as a fault is observed showing NNW-SSE trend to traverse throughout it. The area falls under low to high landslide hazard zone. (Gupta & Uniyal, 2013)

Methods and Methodology
Study of the area was initially done through all the available secondary sources available with various agencies. As the ownership of the land was disputed among various stake holders, it was decided to conduct an extensive study of all the records available with the forest department, revenue department, temple committee, municipality and the lake development authority. Nothing concrete could be taken out directly from these records as lots of contradictions were found in the papers. Following important observations were made during the course of the study:
- The area is not a recorded reserve forest.

- The area is not a private property.
- The area is not a property of temple trust.
- Nearby villagers were having some rights and concessions in this area.
- The area was not recorded in the municipality records.
- The area might be a village community land.

Through a process of "eliminating the various possibilities", it was concluded that this area has a strong probability of being a Civil Benap Land (unmeasured land). Being a civil unmeasured land, it has a status of protected forest as per the provisions of Government's order of 1886. With the above established fact, forest department had all legal means to intervene into the area.

With the active intervention of eminent environmentalist, RTI activist and few other likeminded N.G.O.s, spiritual heads, localities, villagers and local leaders, it was unanimously decided to dedicate this price of land to lord Hanumana in the form of a small but an active biodiversity hub of Himalayan floral species. (Rawat. A, Citizen nominee for RTI Awards 2009,Personal Communication, Dec 12, 2010)

Under the above circumstances, it became mandatory to evolve a true participatory model in order to rejuvenate the area. In the participatory methodology of works, following few steps were involved which were taken very systematically right from the start of the work till the end:

Research Stage-

(i) Stakeholders identification
(ii) Discussions with main stakeholders
(iii)Problem identification and analysis Design Stage- Building a shared vision

Implementation Stage- An executable techno-participative work model
Monitoring and Maintenance Stage- Regular consensus for future Strategies.

Involvement of each and every stake holder was ensured right from the planning part to implementation including monitoring and maintenance as well. The whole work was carried out keeping in mind the following three basic strategic approaches of participation:

- Learning-
  (i) Analyzing problems together
  (ii) Finding Solutions
  (iii) Shaping common plans

- Partnership (i) Developing a team of volunteers
- Empowerment (i) Involvement at all levels

Pre-Participative Scenario:

The whole area was totally devoid of any vegetation. In the month of Oct-Nov 2010, a field survey was conducted by the forest personnel and it was shocking to note that there was hardly any plant or shrub species present inside the area. The area was highly fragmented and denuded with an average depth of over 1 meter of broken cement concrete waste lying over the land. This waste was lying since 2007 and in the due course of time the area also became an excellent trenching ground for dumping of the masonry waste as well as the solid municipal waste of Nainital municipality. Being in front of the temple, this area was indiscriminately being used as a vast open dustbin for degradable as well as non degradable religious waste of the various functions conducted by the temple Committee. The serenity of the area served as an ideal workplace for various activities organized by numerous miscreants, who used to operate inside the area after the sunset.

Area during early 2010

The overall scenario of the area was highly unhygienic, depressing, unpleasant and just barren. It was really heart-throbbing and painful to see such an eye sore area, just at the outskirts of a beautiful lake city of Nainital.

Participative Scenario

The area was full with hundreds of tons of cement-concrete waste. It was impossible to remove this mass and to reach up to the soil level. This was a highly cost ineffective method. Process of deciding a cost effective, permanent, solution to this problem went on till Jan 2011, when it was decided to apply "jute geo textiles" method of land restoration. It was a low cost, construction less, basic, natural and vegetative method of area treatment. Jute is a natural fibre popularly known as the golden fibre. It is one of the cheapest and the strongest of all the natural fibres (Ramaswamy, 1989).

Laying of Jute geo textile in early 2011

Jute as a natural fibre has many inherent advantages like high tensile strength, low extensibility. It is fire resistant, bio-degradable and eco-friendly. Jute has a multi cellular structure which helps to get mixed with the soil and strengthen it. Jute fibres can be converted in fabrics for use as geo textiles (Ranganathan, 1994).

Community participation for planting, July 2011

Whole of the area was covered with a complete woven mash of jute in a chess board pattern of 1ft x 1ft size. This jute geo textile was laid over the cement concrete heap after putting a minimum 6 inch layer of oak forest litter. This woven mash was tightened by wooden pegs intermittently. This work was carried out in the month of March-April 2011. This jute geo textile changed the whole face of the area within coming 10-11 months("Jute Matting checked Erosion",2012). Jute geo textile provided nutrients to the soil during decomposition, reduced the surface run off, increased water retention and held oak forest litter from separation. All these properties and processes helped in creation of a very thin layer of humus over the concrete waste within a period of 8 to 10 months. This layer of humus over the barren land gave way for the natural growth of various faunal species in the area.

Completion of the jute geo textiles work was the real evolution of the participatory mode in the area. Jute geo textile gave a complete face lift to the area and a number of villagers, devotees of the temples, N.G.O.'s, media persons, environmentalist and other social elites started approaching the forest department. Though this work was initially started departmentally by the efforts of the forest officers but soon after, the people's participation became the backbone of the whole work (Dhakate, 2012). A number of non-officer entities showed serious interest in the restoration work and extended their unconditional support to the forest department. Immediately after getting the initial positive support from various stakeholders, meetings and focus group discussions were organized by the forest department, at the work site. Such gatherings saw an overwhelming response from the following sides-

1. School children and their parents
2. Temple Committee
3. Various N.G.O.'s
4. Nainital hotel association members
5. Local politicians, ward members and even M.L.A. (Member of the Legislative assembly) of the area
6. Eminent Environmentalists

Participation by local MLA and women groups

All these stakeholders gave useful suggestions for the restoration and maintenance of the area. These stakeholders started participating in the decision making processes and many of them also gave support to the work in kind or commitments.

- Temple trust gave water connection to the area.
- One N.G.O. came forward to develop a mini medicinal plant garden in the area.
- Hotel association group extended their support in the form of supply of various plants.
- One media person committed to develop a small eco museum in the area.
- Local M.L.A. announced funding for development of various park facilities in the area.
- One village panchayat (village level elected body) happily started a medicinal plant product sales counter at one of the corners of the area.
- Lot many other items like organic manure, nursery tools, planting material etc. were also facilitated by the different stakeholders.

Under such an encouraging support of the various stakeholders a true "Greening up the hillock" operation started with the onset of monsoon 2011. Since July 2011 to March 2013, more than a dozen voluntary plantation and restoration activities were organized in the area, in which hundreds of school children, teachers, nature lovers, media personnel, devotees, villagers and local leaders participated with unprecedented enthusiasm. These activities are still continuing in the area. A joint effort of over two year duration changed the area into a lush green, well maintained neat and clean park, full with a variety of faunal species of indigenous as well as of exotic origin. In the month of April 2013, a quick survey of the area was made by the department and it was highly encouraging to see that more than 17 plant species, 23 shrub species and 07 grass species were found in the area. Within a period of March 2011 to March 2012, following other participatory activities were done in this area:

- Fencing of the area.
- Restricted entry to the park.
- Establishment of a mini herbal garden.
- Establishment of a mini herbal product sale counter.
- Start of a eco museum cum awareness centre(Rawat,2013)
- Rain water harvesting pond.
- Park facilities like sunshades, benches and view point.
- Cleaning operations all around the temple premises and year marking the points for religious waste.
- Celebrating various functions like Environment Day, Earth Day, World Forestry Day, Van Mahotsav etc. at the park with various pioneer stakeholders and other localities. (Dhakate,2013)

Post Participative Scenario

Jute geo textile along with oak forest litter did a wonder in the area. On natural decomposition, they gave sufficient nutrients to the soil in order to support the vegetative growth in the area. As the area receives sufficient rainfall all around the year, the vegetation growth could be seen quite fairly.

Present view of the area, July 2013

Once the area is full with grasses, shrubs and various plants of tree species the chances of erosion and mass wasting became minimal. Planting of various bamboo and grass species gave firmness to the soil as the roots of these species worked as an excellent soil binder. An overall panoramic view got created in the area, with the result, it became a true recreational cum biodiversity awareness centre, for not only to the localities but also to the tourists. Proper protection and organic manuring gave way to the growth of various plant species naturally. The area attained the heights of extreme popularity among almost all the sections of the society.

Responsible Government officials of the area are highly instrumental and concerned about the maintenance and up keep of this eco-park on the lines of participatory approaches. Under their guidance, a detailed standard operating procedure is on its way to decide the empowerment participation modalities between various stakeholders. Through this Standard Operating Procedure, a well defined collaborative approach shall be laid down in order to give a permanent and lifelong solution for the maintenance of the area (P.Dhakate, Divisional Forest Officer, Personal Communication, March 21, 2013).

Time line of people's participation

Setting up of a frame work	**Actions and activities**	**empowerment model development**
■■■■■■■■	----------	----------
3/2010 **3/2011**	**3/2012**	**3/2013**

Conclusion:

Participatory development, in this eco-park, has been promoted not only as a way to restore and maintain it, but also to improve the efficiency and effectiveness of the formal developmental programs run by the forest department. It involved local and external actors working together on a unanimously decided project of greening a barren hillock of great ecological importance. Elements of co-determination and power sharing may be clearly seen throughout the program cycle of this work. The participatory work enhanced communication, respect, listening and learning among various stakeholders. Process of endless mutual learning shall remain the key element for the success and sustainability of the restoration work as well as for the up keeping and maintenance of this ecological part in the times to come.

References

1. Forest Survey of India. 2011. India State Of Forest Report 2011. [online]. Available from: http://www.fsi.org.in/sfr_2011.htm. Accessed 2013 March 15.
2. Nainital District census data. 2011. Size, growth rate and distribution of population. [online]. Available from: http://censusindia.gov.in/2011-prov-results/data_files/india/Final_PPT_2011_chapter3.pdf. Accessed 2013 May 15.
3. India Meteorological Department. 2011. Nainital District data 2011. [online]. Available from: http://www.imd.gov.in/section/hydro/distrainfall/webrain/uttarakhand/nainital.txt. Accessed 2013 June 5.
4. Dass, R. Miracle of love. 3rd ed. Nainital: Sri kainchi hanuman mandir & ashram trust; 2011.
5. Shah, R. Management Plan of Nainital Forest Division. Nainital : Councel printers; 2007.
6. Gupta,P, Uniyal, S. 2013. Lhz Mapping of the Area Around Nainital using Bivairiate Statistical Analysis. International Journal of Advanced Technology & Engineering Research 3(1):60-65.
7. Ranganathan, SR.1994. Development and potential of jute geotextiles. Geotextiles and Geomembrances 13: 421-433.
8. Ramaswamy, SD. *et al*. 1989. Proceedings of the International Workshop on Geotextiles, Bangalore ,India, 259-263.
9. Jute Matting Checked Hanuman Garh Erosion. 2012 Feb 22. Dainik Jagran; 6.
10. Dhakate, P. 2012 July 16.Hanuman Garh will Blossom. Dainik Jagran; 8.
11. Rawat, A. 2013 March 22.Historic Museum in Hanuman Garh. Dainik Jagran; 4.

Profile of Mr. Kapil Kumar Joshi

Post graduation in Mechanical Engineering, IIT Roorkee, 1988.

Initially after serving few years in various engineering organizations, selected in Indian Forest Service in the year 1992.

Since 1992 till 2013, worked in various capacities as Deputy Conservator of Forest, Regional Manager - Forest Corporation, Deputy Director, Director -Corbett Tiger Reserve and Conservator of Forests.
During last 20 years, have been actively associated with management of Forest and Wild Life in the state of Uttarakhand, India. During this period I myself implemented various participatory programs like Joint Forest Management, Eco Development and Forest Development Agency Activities in various divisions of Uttarakhand forest department.

In 2002, I have been awarded with diploma in "Training of Trainer" course from University of Manchester, UK. I have visited various countries like China, Finland, UK, USSR and Thailand in order to get deep insight of various commercial and conservation aspects of Forestry.

Since Jan 2013, I am pursuing my research work in Climate Change Financing issues from Department of Management Studies, IIT Roorkee, India.

In the year 2003-2004, 2004-2005 and 2005-2006, I have been awarded by various State Level Forestry awards for my services in the state of Uttarakhand.

Dr VINAY SHARMA

Dr. Vinay Sharma has around 19 years of Experience, in the areas of Strategic Management, Business Opportunity Development, Co-Creation of Value, Market prosperity through Capability Development and Spirituality of Marketers, Marketing, Rural Marketing, Business Opportunity Development, Market Development, Brand Development, IT enabled Services and Teaching for past nine years.

Presently working as Assistant Professor, with the Department of Management Studies at Indian Institute of Technology, Roorkee, Uttarakhand, he has a considerable experience of working with various organizations in the fields of Media, Information Technology and Social Development along with having worked with the largest read newspaper of India. Vinay Sharma teaches Marketing and the allied subjects, wherein he focuses on globe as a unified market, with a Blue Ocean perspective. He has taught marketing and allied subjects at various prestigious institutions. His association with several international bodies gives him a regular exposure to the international business scenario and emergence of the world as an integrated market. His areas of interests also include Poverty Alleviation and Rural Market Development through Business Development, Market Development and Technology wherein he has designed and proposed a specialized model recognized by the name "Affordability for the Poor and Profitability for the Provider" which, has been acknowledged at various platforms and published as a book by VDM publishing house Germany, presently marketed in USA and UK. Further, he has contributed an Appendix on Rural Marketing in the 13th edition of Philip Kotler's Principles of Marketing published by Pearson.
He is an associate and a member of the founding group of the Network of Asia Pacific Schools and Institutes of Public Administration and Governance constituted by Asian Development Bank

in December 2004 and the Member of Editorial Board of the Journal of NAPSIPAG called Journal of Administration and Governance. He was the founding Head of The Department of Management Studies of an Institution at Lucknow and also was the Associate Dean of College of Management and Economic Studies, of University of Petroleum and Energy Studies at Dehradun where he was also the member of the prestigious Academic Council of the University. He has worked with IMT Ghaziabad as Associate Professor and as DEAN Academics at an institution in Lucknow. He has published and presented around 60 papers, Chaired sessions at national and international platforms especially in his areas of interest, which includes a paper presentation at a conference organized by United Nations University – WIDER, Helsinki, Finland. He has edited an internationally circulated journal and is a member of Editorial Board of Chinese Public Administration Review USA and is also the member of academic and advisory councils of prestigious institutions.

4 of the students he has been guiding have been awarded with doctorate and is guiding 8 Ph.Ds and has written papers for reputed journals and conferences and has been actively participating in National and International level projects of which a project supported by Danish Government and conducted by Copenhagen Business School along with FGV, Brazil and IIT Roorkee and Another project of Government of India conducted by IIT consortium called Ganga River Basin Environment Management Plan are prominent.

ROLE OF FODDER BANKS TO CHECK RAPID DEGRADATION OF FORESTS IN HIMALAYAS

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Summary
Forests of Western Himalaya are considered among one of the most diverse patches of moist and dry temperate forests of India. Due to rich floral and faunal diversity of these forests. Western Himalayas are considered biodiversity hotspots of India. The vegetation cover of these forests has been depleting at a very fast rate and a significant portion of such areas is used to meet the growing need of the ever increasing human population. At present, forest management in mountains is facing more challenges than ever due to anthropogenic pressure. Removal of fodder is one practice that is not only reducing regeneration of many important forest tree species but is also leading towards enhanced invasion of exotic species. Based on my in-depth research on impact of natural and man-made pressure on forests of Upper Kedar valley we have worked for developing fodder bank model. More than 6 hectare of fodder Bank model is in Maikhanda village cluster of district Rudraprayag in Upper Kedar Valley. Model lies in the same Kedarnath valley where on June 16th 2013 continuous cloud burst and flood events have caused huge damage. The model was developed during a five year period from the year 2008-2013. This model is developed by using fast growing high biomass yielding and nutritious fodder species both indigenous lesser known based of local people's knowledge and some species were introduced based on expert suggestion of grassland institutes of India. This model was later taken at a better level when we decided to introduce these fodder species on crop land bunds and kitchen garden bunds of the village to enhance fodder availability during lean periods. Model was considered innovative by national and international agencies and is being considered for replication by other villages of the valley where flood has caused major damage. Model has reduced winter fodder shortage for the locals and has helped them to enhance milk yields of their animals. There are also plans to introduce concept of market to earn some alternative livelihood for local women as valley offers huge fodder market every year during Kedarnath Shrine *yatra* period when valley is flooded with more than 10,000 pack animals for tourism purpose.

Key words:Temperate Forests, Kedarnath Valley, Livestock, Fodder, Drudgery,

Situation/Background

Forests meet 40% of the energy needs of India and about 30% of fodder needs of the cattle population. Agriculture along with animal husbandry is the principal occupation and source of livelihood for over 70% of the population of Western Himalaya. Like other high-altitude communities, animal husbandry is practised by the local inhabitants. Collection of fodder is the first step that turns the wheel of agricultural economy in states across the Indian Himalayan Region (IHR) (**Plate 1**). Inaccessibility of the area and deprived socio-economic status of the locals is largely responsible for the total dependence of the local inhabitants on nearby forest areas for fuelwood, fodder and other life-sustaining demands. Fodder obtained from arable land is not sufficient to maintain the livestock in sound health. Therefore, the inhabitants largely depend upon the forest based fodder resource. Major part (62.2%) of the fodder is extracted from forests (tree, shrub, leaves and herbaceous ground flora). The remaining part (37.8%) is derived from agro-forestry systems, low-altitude grasslands, degraded lands, high-altitude grasslands and crop residues. A large variety of tree species, forest floor phyto-mass and agricultural by-products are used as animal fodder in the region. Women in the hill regions spend a lot of time

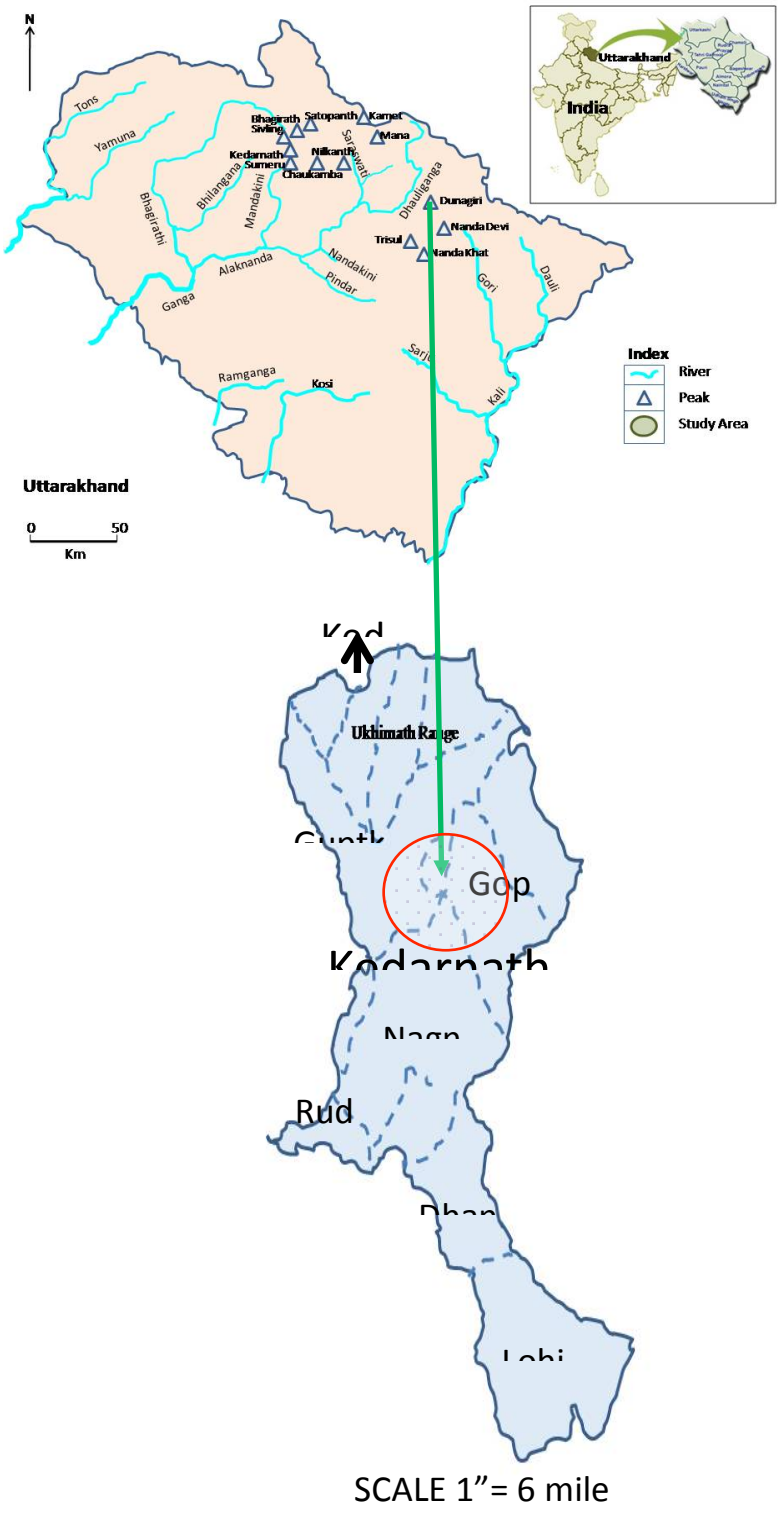
and energy in procuring fodder for their livestock and this greatly adds to their drudgery. Ecological sustainability of biomass extraction has been a controversial issue for a long time because most of the times extraction activities tend to compromise the aims of biodiversity conservation. In the present setting, cattle are generally stall-fed, but buffaloes, sheep and goats are also left for grazing in nearby forests, alpine regions and *kharaks* or pastures. With the introduction of stall-feeding, the demand for fodder has increased greatly with subsequently increased workload on women. This increased workload is also cause of many major and minor accidents in the high altitude villages. The present trend shows a regular increase in human and livestock population. Fodder collection is a frequent household activity and almost one female from each household visits the forests once or sometimes even twice a day to collect fodder. Demand for fodder is uniform throughout the year, though unavailability of green forage during winter has always been a serious issue that has added to the drudgery of women and has also created nutrition deficiency in milching animals. As agricultural and livestock productivity is sustained by inputs derived from forests, continued depletion of forests has started resulting into poor returns from agriculture and dairy farming. During the rainy season the availability of fodder is in excess of demand, but still there is fodder crisis because farmers are unaware and are ill-equipped for scientific conservation of grasses for lean periods. Despite abundant resources with immense potential for producing quality and quantity fodder, the issue remains unsolved. Wastelands, community lands and terraces offer a solution to these problems. Raising fast growing and high yielding nutritious fodder species on farm lands can reduce the drudgery of women in collecting fodder from distant forests and also protect the degrading forests. The information is helpful for developing future policy dialogues regarding fodder and grassland conservation and sustainable strategies in Indian Himalayan Region at large to lessen pressure from forests regarding fodder collection and at the same time also looking into the very important women drudgery issue linked with removal of fodder. In the Draft Grazing and Livestock Management Policy, emphasis has been given to develop large blocks of grass reserves away from human habitation for higher production and as fodder banks for lean periods.

Plate 1. Fodder resources harvested and stored in Upper Kedar Valley, District Rudraprayag, Uttarakhand

Programme Activities

Fodder bank activities were started in the month of September, 2008 after a more than 5 years of in-depth research on natural and man-made pressures on forests of the Upper Kedar valley **(Map).** Most of the pressure on forests was in terms of fodder removal for livestock based livelihood practices along with increasing tourism through pack animals at Kedarnath shrine. Developing fodder bank model was one of the conclusions that could integrate both livelihood

and conservation initiatives and would also benefit community and forests in a longer run hence, we developed this model on a 6 ha. of barren hillock that was earlier was not used for any community purpose. Now the fodder bank is under control of local women of Maikhanda village who also belong to scheduled caste section of the hill society.



Map. Location map of project area showing Upper Kedar valley, district Rudraprayag Uttarakhand, India. *(Map not to scale)*

Plantation of high biomass yielding and fast-growing grasses and shrubs suitable for fodder in these areas not only increases fodder availability, but also reduces erosion and landslides that originate in these areas. These fodder banks can also help in the preservation and storage of surplus fodder, availability of nutritious fodder during the period of fodder scarcity and enhance nutritive value of crop residue and other cellulosic waste for animal feeding by conventional and nonconventional fodder. Author working in Garhwal Unit of G. B. Pant Institute of Himalayan Environment and Development has developed one such Fodder Bank Model in Upper Kedar valley. The objective of the initiative was to relieve the pressure of hill women by reducing their fodder collection time as well as the distance they travel everyday for collection of this resource. It is also meant to create awareness among them about better methods of livestock feeding, and better health improved milk and meat yield by improved quality of fodder. Maikhanda village cluster in Upper Kedarnath Valley of District Rudraprayag with a majority of poor and scheduled people with limited resources was chosen for this model. Willingness of local communities to provide huge village community land for fodder bank and a small piece of agriculture land for nursery helped in setting up the model. Initially MoU between institution and local village governance authorities was been signed. Subsequently, meetings with villagers basically women folk were held before and during execution of each activity *i.e.* fodder plantation, species selection, pits digging, fencing, land preparation *etc*(**Plate 2**). Fodder Bank Model was developed on >6 hectare village wasteland on a hillock using fast growing and high biomass yielding nutritious fodder species (both indigenous as well as introduced). More than eight years (Since, 2005) of author's research on forest ecosystems and people's interaction in Kedarnath area helped in identifying and prioritizing indigenous species for plantation. The indigenous species were selected by people based on their need, their indigenous knowledge about species with regards to enhanced lactation and better nutrition of animals. Indigenous grass species included Ringal Bamboo (C*himnobambusa falcata*, *Thamnocalamus spathiflorus*, *Arundinaria spp.*) indigenous tree species are *Alnus nepalensis*, *Quercus glauca*, *Quercus leucotricophora*, *Ficus nemoralis*, *Ficus auriculata*, *Debregeasia salicifolia*, *Ficus subincisa*. Introduced tree species are *Celtis australis*, *Morus alba*, *Bauhinia variegata* and introduced grass species were Napier grass *Pennisetum purpureum*, Joint star, Makuni, Cox food *etc.*

Plate 2. Showing different field activities to develop Fodder Bank Model in Maikhanda village cluster in district Rudraprayag, Uttarakhand

Locals preferred introduced hybrid Napier grass because of its high biomass yield, fast growing nature and nutritional attributes (**Fig.1**). A large variety of tree species, forest floor, phytomass and agricultural by-products are used as animal fodder in the Himalaya. A total of about 48 prominent and locally preferred fodder species (including trees, shrubs and herbs) were listed based on the preference and their nutritional quality shows that actually preferred species for fodder by locals are also the ones having high crude protein percentage and organic matter digestibility. Though, there are more than 150 fodder yielding plants in entire Himalayan Region, all varieties were introduced based on the altitude, suitable climate conditions, detailed discussions with experts and scientists along with locals and literature review so that benefits obtained can be maximized and none of the species becomes a havoc or danger and can act as a detrimental invasive and threat for local biodiversity. The basic idea behind this was to ensure conservation of biodiversity while, providing nutritious fodder to livestock. Women of the area were trained in growing high biomass yielding fodder species in their cropland bunds and kitchen gardens. Livestock owners and farmers were also trained to construct their animal houses and sheds on scientific lines provided with cost-effective feeding and watering systems and proper ventilation using locally available materials. Plantation was carried out twice a year - once during monsoon and other during spring from 2009 onwards every year till 2012 so that, plant gets increasing temperature conditions that are better suited for adaptation and growth.

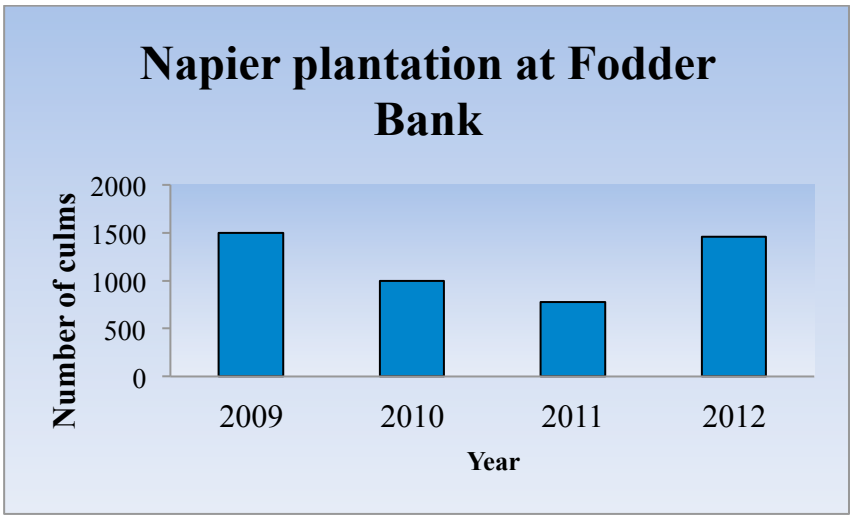


Fig. 1. An overview of Napier grass planted in fodder bank site from 2009-2012.

Trenches were dug in the entire fodder bank site to enhance the percolation of water and survival of fodder seedlings, saplings and grasses. A cost effective Rain water harvesting tank was also constructed using local resources to store the rain water as the area faces shortage of water during summers. This tank was 12X5 ft. dimensions while the depth was 4ft. To protect the fodder bank site from grazing and browsing animals it was covered with barbed wires from all sides. A fodder plant nursery was also developed with an area of 250 sq.m where a poly house (14x10 ft.) and net-house (14x10 ft) was constructed to sow the seeds and germinate them by providing appropriate environment. These structures are also used for vegetative propagation of lesser known underutilized fodder species. Initially in the year 2009 we purchased seedlings of trees and grasses for plantation from forest department nursery and some progressive farmers. But since, 2010 most of the planted material was raised and mass propagated in our own fodder nursery (**Plate 3**). Initiatives were also taken to focus on mass propagation of some lesser known and multipurpose tree species viz. *Debregeasia salicifolia, Ficus nemoralis, Ficus auriculata* which are very much preferred as fodder available from agroforests and degraded areas on road sides. All the seedlings (500 of each *Ficus auriculata* and *Debregeasia salicifolia* and 250 of *Ficus nemoralis*) were mass propagated and successfully planted on fodder bank site (**Plate 4**).

Free of cost seedlings and seeds of fast growing fodder trees and grasses were distributed during the capacity building and training programmes twice a year (**Plate 5**). Distribution clearly reflected the interest of locals towards fast growing Napier grass that they can harvest almost every month or bimonthly based on available water and FYM. Preference was also observed towards indigenous *F. auriculta* that is very much preferred and is an excellent fodder resource and multipurpose tree from agroforestry systems of Indian Himalayan Region.

Plate 3. Showing Nursery set up for Fodder Bank Model site at Maikhanda village cluster, district Rudraprayag

Plate 4. Performance of indigenous fodder seedlings and saplings at Fodder Bank site

Plate 5. Awareness generation, capacity building and training of women participants during fodder problem related capacity building programme in Maikhanda village

Results/Impacts

More than 65 households of Maikhanda village cluster have initially reported 8 times harvesting and stall feeding of Napier grass to their milching animals every 2 months from June, 2010 onwards. During the first phase of this programme these 65 women have not visited forests for 6-8 days of each month to harvest fodder and number of women beneficiaries are increasing every six months who are introducing these fast growing high biomass yielding species in their own cropland bunds and kitchen gardens. This harvesting included mainly local indigenous fodder grass species available in the bank site and benefitted women with green fresh fodder for their livestock and at the same time also helped in weeding of the fodder bank site (**Fig. 2**). Lactation yield of the animals is also improved as it is direct indicator of the nutritional quality of the fodder grown in fodder bank site and fodder nursery. Milk production mainly depends on a number of factors, *viz.* Livestock species, livestock breed, physiological state of animal, nutrition, environmental factors and management. Poor performance of cows is a reflection of under nutrition, particularly during lean winter periods of mountain areas. For women and locals in Maikhanda village of Kedarnath valley, year 2011 and 2012 have brought the discovery that the solution to seasonal fodder deficit, and milk output from, lies not with the cattle, but with growing smart grass, now being promoted by author herself who works with CSIR-National Environmental Engineering Research Institute, Nagpur. The technique is seeing local women farmers growing high-output Napier and other fast growing grasses on crop land and kitchen garden bunds of their village. 16 households among 65 households who were interested in planting Napier grass and other fast growing grasses and trees on their cropland bunds and kitchen gardens were questioned regarding their effect on lactation yield of their mulching animals. People showed their interest preferably in Napier, *Debregeasia salicifolia, Ficus auriculata* and *Morus alba* shoots during our group discussions and personal interviews and informed that most of these species are nutritious, fast growing and high biomass yielding. They also informed that they saw drastic changes in lactation yield of their animals in just 2-3 stall feeds and regular stall feeding can enhance the milk yield continuously (**Fig.3**). Fodder supply has also enhanced in the village and has reduced the fodder deficit by satisfying the fodder demand of locals. Quantity of fodder harvested during summer and winter months in Maikhanda village, Kedarmath valley before taking up the project in 2008 and after the project in the end of the year 2012 reflects the increase in fodder harvest by local women (**Table 1 and Table 2**).

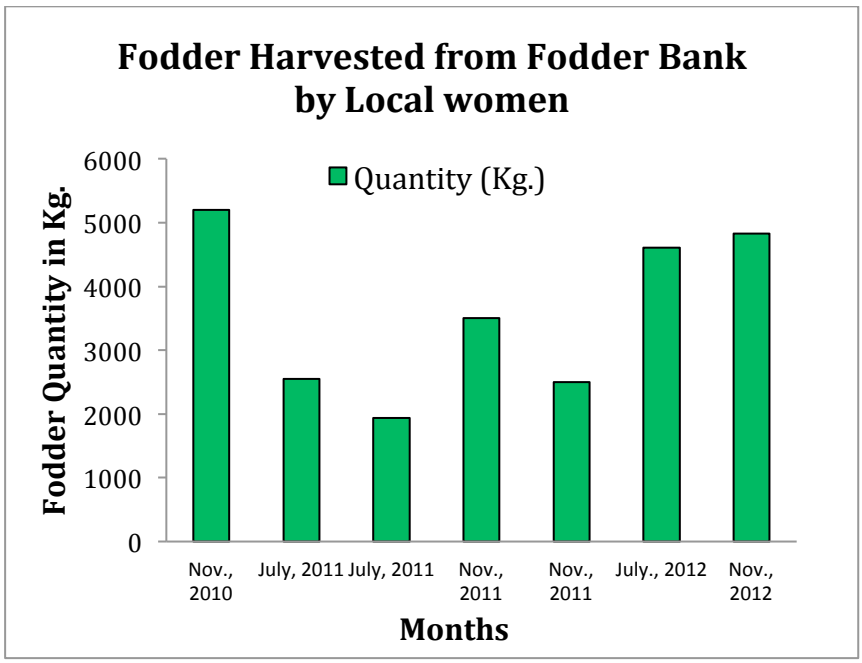


Fig. 2. Fodder quantity harvested from fodder bank by locals 2011-2012

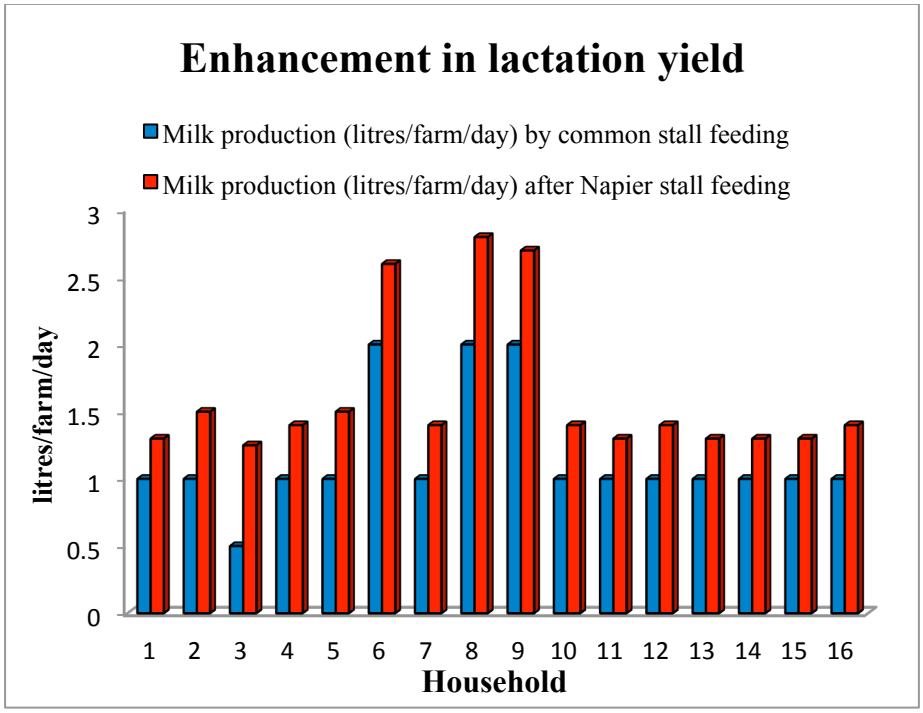


Fig. 3. Comparative assessment of milk yield pre and post stall feeding of high biomass yielding nutritious plants

Table 1. Quantity of fodder[#] harvested during summer and winter months in Maikhanda village, Kedarmath valley before taking up the project in 2008

Season	Number of Backload/HH/ Day	Quantity Kg/HH/day	Quantity Kg/HH/month	Quantity Kg/HH/season
Summer	1.84±0.10	64.4±3.60	1,932±108.10	15,456±864.83
Winter	1.04±0.028	62.4±1.66	1,872±49.84	7,488±199.36

 # Here fodder included both green and dry fodder that was traditional and indigenous collected from forests, agroforests and arable lands.

Table 2. Quantity of fodder harvested during summer and winter months in Maikhanda village, Kedarmath valley after taking up the project in 2012

Season	Number of Backload/HH/ Day	Quantity Kg/HH/day	Quantity Kg/HH/month	Quantity Kg/HH/season
Summer	1.17±0.30	71.82±0.27	2,324±99.10	20,654±647.36
Winter	1.02.±0.07	69.41±0.68	2,076±29.28	11,342±163.23

 # Fodder was not only of traditional variety but also included fast growing high biomass yielding fodder grasses that were growing on cropland bunds and kitchen gardens.

Capacity building and training workshops for women, farmers, school going students and weaker sections were carried out every year at the Fodder Bank site in Maikhanda village. *Mahila Mangal Dal* of the villages actively participated in this capacity building and training workshop. In these programmes correct method of plantation of fodder species was also demonstrated for *eg.* Napier shows better results when planted horizontally not vertically with all nodes under soil except the top one. Usually locals and rural women are unaware about this. A total of 78 women are benefited from these multiple one day workshops. Seedlings of fodder trees, seeds of fast growing grasses are also distributed free of cost during these programmes. Sustainable harvesting of fodder from trees and shrubs was also demonstrated. Women were also demonstrated the importance of FYM on fodder trees and grasses. For the sustainability of this whole idea the model has been transferred to local *Mahila Mangal Dals* though, even at this stage a regular monitoring of the bank is carried out.

Evaluation/Evidence

This fodder bank model along with introduction of fodder in cropland bunds has reduced regular harvesting of fodder from forests and at the same time has also reduced drudgery of local women at a certain extent. There seems no practical alternative to fodder as a source of basic energy until socio-economic condition of people living at subsistence level is improved in Garhwal part of Himalayan region. To lessen the impacts of fodder extraction in villages with ample area under forests still available, a self regulated, rotational approach of harvesting the same patch after 4-5 years based on carrying capacity of forests is suggested as an alternative rotational approach is already regulating the resource extraction in few *Panchayati Vans* or community forests of the area where local level governance is very positive for sustainable harvesting practices. Though, trees may also be protected by damage from lopping by restricting the lopping at the lower one third of the tree canopy and lopping only trees that have a diameter of more than 30 cm. and branches having a girth of less than 5 cm. Feed supplies to livestock in mountain areas could be augmented through rangeland management. The traditional knowledge of the farmers in the mountains is of crucial value towards rangeland conservation and utilization. Compact feed system can also help in utilizing locally available crop residues, agro-industrial by products and non conventional feeds. This is an economical and efficient system where, low cost agro-industrial by-products and low quality crop residues can be included with their efficient utilization. Keeping the bottlenecks of development and usage of complete feed blocks in mind (economy, policy and awareness) complete feed system for livestock of higher Himalayas can be developed by using locally available lesser know but multipurpose, high biomass yielding,

nutritious and indigenous fodder plants and post harvest residue from indigenous crops. These better quality feed for livestock are value added products (leaf meals and complete feed blocks) for dairy and pack animals. The most important part is livelihood if will be linked to the entire fodder bank concept introducing market (local and regional) concept where locals can sell their fodder products for locals it would be better managed and replicated. Author in her new initiative is trying now to link conservation with livelihood by setting up a rural livelihood centre in the village and ensuring market linkage of fodder grown in fodder bank and cropland bunds of the village. Apart, from developing the model almost all women were interested in the concept of using the cropland and kitchen garden bunds along with slopes and cowshed borders for growing high biomass yielding, fast growing and nutritious grasses and trees and their interest was mainly in two species *viz.* Mulberry and Napier grass may be because of its adaptability with the climate, fast growth, high biomass yield and palatability. So, the entire Maikhanda village is now having rich fodder resource in their vicinity with active women involvement and currently model is run by *Mahila Mangal Dal* of the village with active participation of locals and regular monitoring of the Author managing from CSIR-NEERI and the village based Field Assistant every 6 months who also happens to be the native of the same village.

Acknowledgements

Author wishes to thank the Director of the institute and In-Charge Garhwal Unit of G.B. Pant Institute of Himalayan Environment and Development and Development, for providing necessary facilities. We sincerely acknowledge our field Assistant in Maikhanda village Sri. Birulal and all locals of Maikhanda village cluster for their help in developing Fodder Bank Model. Financial support for the work from Department of Science and Technology (under Science and Society scheme) and Rufford Small Grants programme is thankfully acknowledged. Thanks are also due to Dr. D Dhyani, Society for Conserving Planet and Life (COPAL), Uttarakhand for providing his necessary support when and wherever desired.

References

1. Dhyani Shalini. In: Zurba Melanie, editor. Livelihoods in the Western Himalayas Community Voices. Young Professionals' Stories from the Commission on Environmental, Economic, and Social Policy (CEESP) Towards a 'Just World'. For IUCN Congress Jeju; 2012. 4 p.
2. Dhyani Shalini. Innovations. In: Chettri Nakul, Sherchan Ujol, Chaudhary Sunita and Shakya Bandana, editors. Mountain Biodiversity Conservation and Management Selected examples of good practices and lessons learned from the Hindu Kush Himalayan region. International Centre for Integrated Mountain Development GPO Box 3226, Kathmandu, Nepal. (ISBN 978 92 9115 234 6 electronic); 2012. p 52-54.
3. Dhyani Shalini, Maikhuri RK, Dhyani D. Energy budget of fodder harvesting pattern along the altitudinal gradient in Garhwal Himalaya, India. Biomass and Bioenergy. 2011. 35 (5). 1823-1832.
4. Dhyani Shalini and Maikhuri RK. Fodder banks can reduce women drudgery and anthropogenic pressure from forests of Western Himalaya. Current Science. 2012 103, (7). 763 p.
5. Dhyani Shalini, Maikhuri R.K. and Dhyani Deepak. Utility of fodder banks for reducing women drudgery and anthropogenic pressure from forests of Western Himalaya. National Academy Science Letters. 2013. DOI 10.1007/s40009-013-0143-1.
6. Misra S, Maikhuri RK, Dhyani D, Rao KS. Assessment of traditional rights, local interferences and natural resource management issues in Garhwal part of Indian Himalayan Region. International Journal of Sustainable Development and World Ecology. 2009. 16(6): 404-416.

7. Misra S, Maikhuri RK, Dhyani D. Fodder banks: Relieving women from drudgery. LEISA India. 2011. 13(2): 19–21.

Profile

Dr. Shalini Dhyani is working as a Scientist in National Environmental Engineering Research Institute (CSIR-NEERI), Nagpur, Maharashtra India. Dr. Shalini is an ardent ecologist with extensive work experience in Western Himalayas, Deserts, Coasts & mangrove ecosystems of Kachchh, Gujarat and Western Ghats on a varietv of issues.

She is gold medalist from Forest Research Institute Dehradun with a PhD in Forest Ecology and Environment on "Natural and Man-made pressures on forests of Kedarnath WLS, Uttarakhand". She specializes in studies and projects related to Forest Ecology and Environment, Biodiversity Conservation, Conservation Biology, Wasteland Rehabilitation, Developing Economic Initiatives, Climate Change, Environmental Impact and Risk Assessment, Adaptive co-management. She is invited member of specialist group Commission on Spiritual Values of Protected Areas (CSVPA) of Commission on Ecosystem Economic and Social Policy and Commission of Ecosystem Management (CEESP) in IUCN and Core Group of IUCN Commission on Ecosystem Management (CEM) South Asia. She was selected among 100 women for their exceptional work in Asia by Asian Rural Women's Coalition (ARWC), Malaysia for her work on Fodder Bank to reduce drudgery of rural women in Himalayas. She has been LEAD Climate Change Fellow funded by British High Commission and LEAD India. She is also recipient of various financial grants from FAO, UNEP, EU Erasmus Mundus LEANES, InWENT Germany, IUCN (CEESP) and DST, India. She has her 7 research papers in peer reviewed international Journal, 4 in National Journals, 4 book chapters and more than 20 popular articles. She also volunteers for preparing Newsletter of IUCN CEESP, is a frequent blogger and a freelancer for online magazines and websites. Her research interests include studying land use changes and its impact on forest ecosystems and biodiversity in Himalayas, integrating livelihood with conservation, policy analysis and gender aspects of climate change.

LINKING MOUNTAIN ECOSYSTEM IMPROVEMENT WITH COMMUNITY LIVELIHOOD THROUGH CLEAN DEVELOPMENT MECHANISM – ARTIFICIAL REGENERATION PROJECT: A SUCCESSFUL CASE

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Summary

The Clean Development Mechanism (CDM) A/R Project,*' India: Himachal Pradesh Reforestation Project – Improving Livelihoods and Watersheds'* is a pioneering effort; first of its kind in India and most probably in Asia for being implemented on mostly State owned degraded lands by a government Agency viz. State Forest Department. Further, under the umbrella of the larger ongoing World Bank funded Mid-Himalayan Watershed Development Project (MHWDP), it has shown the way how watershed improvement of a mountain ecosystem with focus on enhancing livelihood of the local communities could successfully and efficiently be linked to CDM plantations and how fifty thousand poor people living in the 602 scattered villages around degraded lands spread in the mountainous region (600 to 1800 meters above the mean sea level) falling in 10 districts of Indian Province Himachal Pradesh could receive multiple benefits from improved natural resource management practices. It is estimated that 343 person days/ha of employment and an additional income of INR 3000 per ha per year will be generated through carbon credit during the first crediting period of 20 years and that the Bio-carbon sub project will sequester a total of 8,28,016 tCO_2-e of tCERs at the rate of 10.34 tCO_2-^{e}/ha/year. The Project will make the villagers a strategic seller of carbon credits under Kyoto Protocol, in response to global demand for Certified Emission reduction under Clean Development Mechanism.

Introduction

The Clean Development Mechanism (CDM) A/R Project *'India: Himachal Pradesh Reforestation Project – Improving Livelihoods and Watersheds'*- commonly known as Bio Carbon(BC) Project -is a pioneer effort in India and most probably in Asia for being implemented mostly on public degraded lands by a government Agency viz. State Forest Department and not by private player. It has been developed as a sub Project under the umbrella of the larger on-going (since 2005) World Bank funded Mid Himalayan Watershed Development Project (MHWDP) in the state of Himachal Pradesh and is jointly being implemented by the MHWDP and local Institutions (Gram Panchayats) through community user groups.

The project has been developed through a series of consultations with major stakeholders namely, HP Government, local public institutions(GPs) and the World Bank on four guiding principles viz. (i) Identify native and locally preferred tree species for reforestation in the project areas, (ii) Involve the local GPs and small and marginal farmers in reforestation activities that will bring value addition to the ongoing watershed interventions or activities, (iii) Get technical and financial support to the reforestation activities and also support capacity development and livelihood enhancement from MHWDP; and iv) Give carbon revenue to the village community (GPs and farmers) and provide an incentive to protect watershed and forests. The broad objective of the bio carbon Project (start date July 1, 2008) has been to sequester Green House Gases (GHG) through reforestation on degraded forest, community and private lands. Apart from

creating a carbon sink, it is also envisaged to fulfill global and national environmental objectives. This provides multiple benefits to the poor farmers through meeting their needs of small timber, firewood, minor forest produce along with carbon credits (as cash incentive), besides providing employment opportunity.

Project Area

The BC Project is located in the mid-altitude mountain region of Indian Province Himachal Pradesh at elevations ranging between 600 and 1800 metres above mean sea level. The project area is divided into two Regions namely Dharamshala and Bilaspur, encompassing 11Watershed Divisions. The project location is depicted in Figure I and II. A total of 3220 ha area, spread over 419 discrete parcels (area ranging between 1 ha to 150 ha), has been covered up to August 2013.

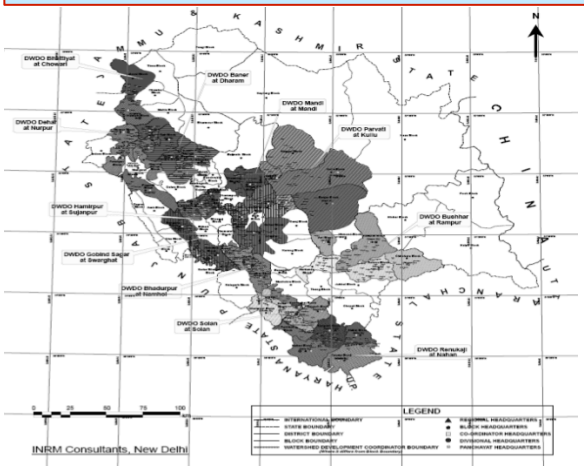


Figure I and II: Himachal Pradesh with watershed divisions and project area

Land eligibility and Criteria for selection of Land Parcels

Since the selected land parcel should not qualify to be called a 'forest' as per Government of India Forest definition under CDM (i.e. minimum area 0.05 ha: minimum crown cover 15%; and minimum tree height at maturity 2 m); crown density in the land parcel to be reforested was to be less than 15% as on December 1989. For this assessment visual survey, PRA and assessment by Forest Survey of India (FSI) using satellite data and Vegetation maps were used. Selection of land categories and multiple discrete land parcels involved the use of remote sensing maps and Participatory Rural Appraisal techniques. The first level of selection was based on the remote sensing maps, which provided the tree crown density information, where GPs with significant land area with crown density <15% were identified. After identifying the GPs using the remote sensing data, Participatory Rural Appraisal (PRA) was conducted by the project authorities involving gram panchayat (village level Institution) members as well as other local community to identify the actual land availability for A/R CDM project activity, considering the land requirement of community for other requirements such as grazing, and other biomass requirements. Based on remote sensing maps and further supported by PRA, the GPs where land was available and where village communities were ready were identified and plotted on a map of the project area. A minimum of 5ha area in a GP was considered because of administrative convenience and cost effectiveness.

In each of the selected GPs, the final selection of plots for project activities was made using the following steps: Cadastral maps with various land uses and land survey number procured, PRA to identify different land categories and their location conducted, Data from Forest Department and revenue authorities on the extent of different land categories obtained, Area of each parcel estimated, based on revenue records as well as GPS readings, GPS survey of all the parcels of land was done to generate boundaries and measure area. Instead of traversing the boundaries of the identified parcels of land, only GPS observation of the co-ordinates of a central point of the parcel were taken. Details of land cover and features around the identified parcel of land were recorded on a form. Next, point locations of the land parcels were downloaded to give point vector coverage. Point coverage showing central points of the parcels were then overlaid on the remote sensing data. Next, details recorded on the field forms were used to delineate the identified parcels of the land on the remote sensing data by on-screen digitization of the polygons. Once the land parcels were delineated on the satellite image, suitable maps of the same on a scale of 1:10,000 showing high resolution satellite image in the background was generated to facilitate demarcation of the land on the ground. Finally, this information was stored on a GIS platform.

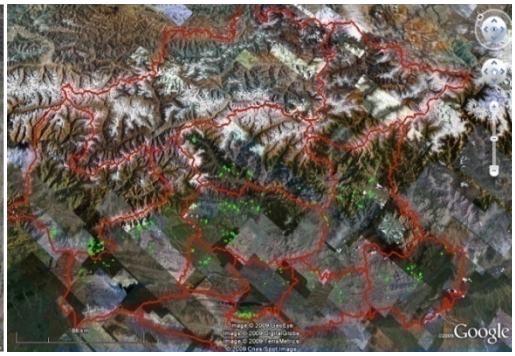


Figure III and IV: demarcation of parcels; on screen digitations

Criteria for selection of Species was based on the suitability for the altitude, slope or topography and site quality. Focus was on native species or species that are highly adapted to the location. Further, among the suitable species, those with high to moderate growth rate of biomass and ability to provide multiple benefits to the community were selected. Approach adopted for selecting the species mix were: Development of separate models for degraded forestland, community land and private land categories; The broad three land categories further divided into high, medium and low altitude strata; Inclusion of multiple species in each model and for each land category and for each altitudinal sub-strata; Selection of species for each parcel, jointly by the local community (including GP members and farmers for private land) and the project authorities from a larger basket of species identified for each land category.

Project Cost

The Project preparation cost, PDD preparation, training and other costs came from the contribution by Bio Carbon Fund of the World Bank which is already available with project preparation team. For establishment of plantations on forest and community lands, entire expenditure of creation and maintenance of plantations have been met through funds available from MHWDP Project (as per norms). Protection is done by user group/ VFDS constituted for the land parcel. As far as expenditure incurred on creation of plantation on private lands is concerned, it has been borne by the private land owners except for fencing material and seedlings which have been provided on site by the Project. The State Government is, therefore not obliged to bear any financial cost for project preparation and implementation except for some administrative support required for regular monitoring. The provisions for such monitoring and supervision are already available under the INHWDP. Therefore, the net fiscal burden on the State Government has been quite insignificant.

Periodicity of Payments to Communities

Implementation of CDM A/R Project will generate CDM revenue termed as CERs. These CERs will be sold generating income periodically. The CER revenue from degraded forest and community lands will be shared with the GPs and in turn with the individual families. CER revenue from the degraded private lands will be fully transferred to the respective farmers. The flow of CER revenue will depend on growth rate of trees and carbon price. The carbon revenue is likely to be significant at approx. INR 200 million for the first crediting period of 20 years. A periodic (every 5 years) verification by DOE will result in payments on the basis of carbon stock increase.

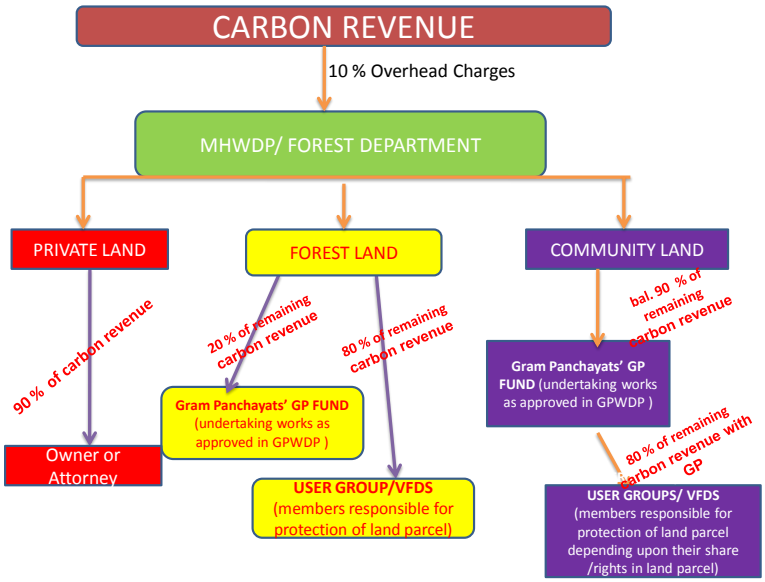
Table-1: Anticipated Carbon revenue generation

	CERs (tCO2-e)	CERs/year (tCO_2-e)	**CER revenue** In INR at #US$ 5/tCO_2
Total for the whole project area	8,28,016	41,979	198.72 million
Average per hectare per year	207	10.34	2481.6

Carbon revenue will go to communities from the plantations done in forest/community land on the strength of Participatory Management Acts and Regulation made there under with slight modification in the regulations, as per approved indexing system. Carbon income will depend on Carbon sequestration of the plantations, which in turn will depend on their growth and survival; this will much depend on the extent of protection afforded by the local communities.

Distribution of Carbon Revenue

The flow diagram given below depicts the distribution mechanism:



Current Status of the Project

A total of 3220 ha area has already been covered under plantation under bio carbon Project up to 2012-13. The survival percentage is being monitored from time to time and also annually. As per the assessment made during 2012-13, the survival percentage ranges from 55 to 88%.The overall survival percentage has been calculated as 72.75%. Steps taken to improve survival and growth include: Strong community groups constituted around each parcel; Part of the maintenance funds transferred to communities to improve their involvement and ownership; Checking of survival and growth on random basis under overall supervision of Head Quarters; Healthy and strong seedlings planted with bigger Polythene bags.

Photographs of a couple of plantations depicting their growth

Revenue for carbon credits has been calculated based on growth and accumulation of carbon in tree biomass (aboveground and belowground biomass). The biomass stock of the first five year monitoring period (2008-2012) were measured from permanent sample plots to estimate the carbon revenue. The total net greenhouse gas (carbon dioxide) removal by trees for the total project area over the first monitoring period of 5 years is calculated as 23,016 tCO_2-e of tCERs. World Bank's Bio Carbon Fund has agreed to purchase the Certified Emission Reductions (CERs) from the project for onward sale to the government of Spain. An agreement called Emission Reductions Purchase Agreement (ERPA) was signed between State of HP and World Bank-Bio Carbon Fund on 22nd May 2011 which is effective since then. World Bank has also agreed to make some interim payments (approximately 6 million INR)) which will be transferred to the community groups (VFDS) as agreed in the Project Design Document (PDD).

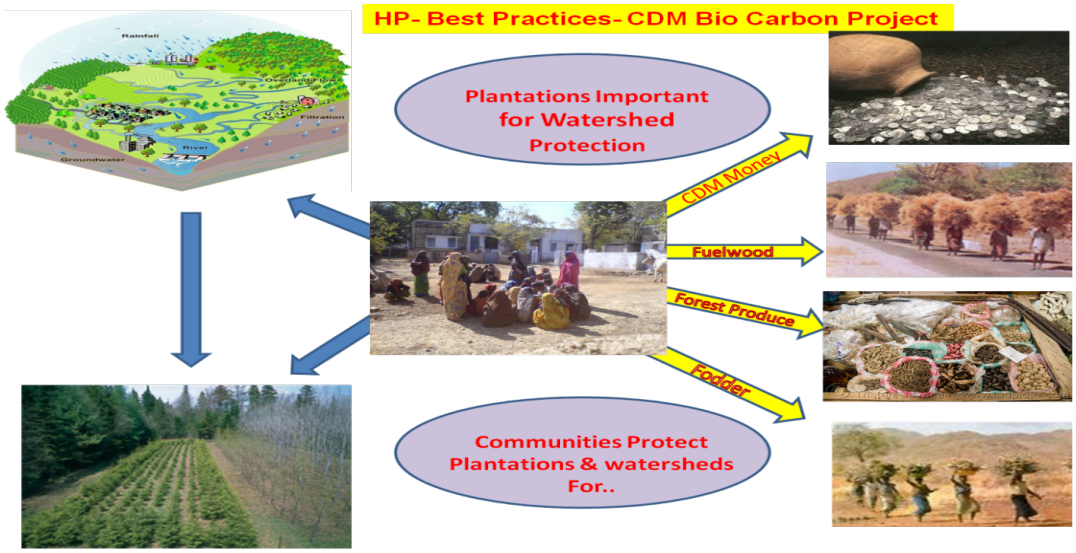
Monitoring

An effective and efficient system has been put in place through which constant checking and periodic (mainly annual) monitoring is carried out. The monitoring is done at 3 levels, viz. Headquarters, Regional and Divisional levels by the Project functionaries working at that level in order to keep a track of various parameters like-area planted, condition of parcels, survival, growth, status of contractual agreements etc. Plantation Journals are being maintained and updated for each parcel with all relevant information. The parameters being monitored include:

Area Planted: A record of the area planted under different strata over the years is maintained to ensure consistency with the PDD .Species Planted: A check of species planted in the different strata is conducted to ensure the species planting on different strata is in conformity with the PDD.
Growth and Survival of seedlings*:* The survival rate of seedlings is accounted for and annual monitoring of survival of seedlings is conducted by the monitoring teams and area is assessed for replanted if the survival rates are low.
Geographical Coordinates: the Geographic coordinates of the project boundary (and stratification inside the boundary) have been established, record and archived. Physically the boundaries have been delineated with fence posts or other important land marks.
Participation of GPs/ User Groups: Regular monitoring is done to check the active participation level of the beneficiaries. Also, to ensure that Joint Forest Management practices are effectively carried out in the field
Natural Hazards: Regular watch by the monitoring teams on the parcels is kept to assess any such danger and take preventive measures and effective steps

Results/Impacts

The Project has strongly emerged as a win-win strategy for forest cover increase, village livelihood; and the watershed development- all rolled into one. Also, the Project has provided several development perspectives (with relevant implementation tools) for the Watershed and NRM sector in general. These include: Development of local level institutional mechanisms for the sale of Certified Emission Reductions (CERs); Testing of carbon purchase transactions and accumulation of experience in practical and technical measures for CDM project activities; Development and testing of local financial arrangements for restoration of degraded lands and identification of resource-poor farmers as the beneficiaries of the project. Being the first of its kind, the Project is also expected to have significant demonstration effect in the country. In fact the addition of Bio-carbon component in watershed project of HP has been a pioneering effort that is coming up successfully as a unique model to showcase how economic gains could be dovetailed with environmental benefits through a single project endeavour.



The BC project has provided livelihood options to the rural poor by making them a strategic seller of carbon credit. The Self Help Groups (SHG) and Water User Groups involved in MHWDP are direct beneficiaries. Moreover, the BC project has direct impact on enhancing household level food security. It has an indirect impact on women's empowerment as most of the SHG group members are women (under the MHWDP).

The BC project has brought several environmental benefits. They include: Increased biodiversity; Suppression of invasive alien species; Hydrology and watershed protection. The A/R activity on degraded lands has improved the vegetation cover and this in turn would improve forest ecosystem services like soil and water conservation. Reduce the current rate of top soil loss (45 -55 t/ha/year) in these degraded lands due to run off; The increased biomass supply of all types: fuelwood, grass, medicinal plants. seeds etc., as a result of the A/R CDM project and increased grass production; Increased soil fertility by increasing soil organic matter; Reduction of vulnerability of mountain forest ecosystem.

Lessons Learned

Any innovative pilot endeavor is subject to result uncertainties, implementation complexities and unforeseen challenges. The BC Project is no exception. There have been many challenges faced and lessons learned during the last six years of its implementation progress that have either been fully or partly addressed or taken note and corrected. Firstly, ex-ante values were estimated on the basis of either available average data for the State or from data supplied by Forest Survey of India. These were the figures arrived at taking into consideration different types of conditions of forest areas. Moreover growth and yield figure for many species were unavailable. Those figures were projected using mathematic tools. The actual growth in the field on the other hand has been found to be lower than projected. It is because of preference in selection of those areas which suffered from adverse climatic and other conditions prevailing. Also a few species such as deodar initially show slower rate of growth in unfavourable conditions, resulting in less carbon stocking. Further, verifying Biomass/ growth/ Survival based on agreed criteria's for each parcel and then distributing money to individual/ groups have been time consuming tasks. Carbon credit has started from 5th year onwards. Payments to the communities can be made after periodic verification (the first one under process); Second cycle(6-10 year) onwards then follows. Many conditionality and very limited flexibility in execution have been other constraints resulting in delays and targets being missed.

There are other lessons learned too: Develop BC Project as a total economic beneficial Model and highlight socio environmental Outcomes; Develop BC Project as sub Project of ongoing/proposed main Project and not as an independent Project in order to exclude plantation and maintenance costs from the sub project; Go for ERPA as soon as possible after Registration; Keep Parameters flexible to accommodate deviations and try to project the Project as a win –win work.

General References

The success story is based on the MHWDP office documents, field records and information available and compiled.Mainly, Project Design Document(PDD); Emission Reduction Purchase Agreement (ERPA), Project Implementation Plan (PIP) and Mid Term Review Reporst have been consulted. In addition UNFCCC web site, FSI compilations and HP government official documents have also been consulted.

Profile

Mr. Ajay Kumar Lal is Chief Conservator of Forests cum Executive Director (Bio carbon) HP Mid Himalayan Watershed Development Project in India. As a member of Indian Forest Service since 1987, he has served in various capacities holding different assignments both at provincial level and at the national level. Also, served SAARC Forestry Centre Head of Mountain Ecology Division he coordinated and harmonized Forestry Policies of South Asian Countries. As an FAO Consultant, he developed Indian Vision 2020 document on Environment and Forestry. He has taught Environmental Economics and Environmental Law to the students of National and International students as Dean and as Director. He has presented numerous Papers during International Conferences