



Impact of climate change on spring water of eastern Himalayas and work done by The State Institute of Rural Development, Sikkim (SIRD) on spring shed development.

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Introduction:

Sikkim is a high altitude mountain state crisscrossed by high mountains and steep river gorges. With the average slope of 45 degree less than 10% of the land is available under agricultural use (SIRD, 2011). The characteristic of farming pattern in Sikkim is that of mixed mountain farming system along with the combination of horticulture and animal husbandry. With the increasing impact of climate change, one of the biggest challenges for the state of Sikkim is reduction of water sources. Water as we know is one of the essential natural resources after air for human survival and because of global warming; its sources have reached a critical stage. Nearly 80% of the rural population in Sikkim depend upon local water resources such as *mahaan*, *simsaar*, *dhara*, *kuha* (Subba.B, SIRD, 2011). All these sources get recharged from the sub surface so because of changing weather pattern and climate change these sources are drying up or becoming seasonal. Even during the lean season where water use to be available at small quantity it has begun to dry up. So because of climate change it has reduced the sponge action of the land and consequently limited rainwater from percolating down, thus creating a hydrological imbalance in some of the watershed area.

The work of the State Institute of Rural Development, Sikkim (SIRD) is to facilitate rural development vigorously through governmental and non-governmental initiatives. SIRD is the states apex body for undertaking training, research and consultancy functions in the rural development sector. Their goal is to enrich the quality of life of the poor by meeting the basic need and generating employment opportunities on a wider scale through decentralized planning. Thus the work of regeneration of spring water has been taken up by the State Institute of Rural Development along with technical support from various NGOs like People Science Institute, Dehradun, ACWADAM Pune, ARGHYAM Bangalore, WWF-India, and TMI- India. With their help SIRD have targeted to cover 2000 springs within two year which will include water discharge quantity and quality data of each spring, its location, catchment status, household dependency upon the spring (Subba.B, SIRD, 2011). So in order to improve, manage and to document the present status of the water sources; the state SIRD under the banner of "DHARA VIKAS" in 2008 along with MGNREGA have implemented the scheme to regenerate springs which are in critical state. The scientific principle on which Dhara Vikas programme is based is to reduce the speed of runing (runoff) water by developing the catchments of the spring by using soil moistures conservation work, social measures and vegetative measures. This scheme includes digging of staggered contour trenches, gully plugging, bonding of terraces, loose boulder check dam. Along with this, the government have also started plantation work which includes low water demanding and shallow rooted grass, shrubs, trees like Oak, Wild Banana, and Napier etc. Active measures have been taken to by the local panchayat with the help of villagers to ban on grazing,

collection of fuel wood and fodder in the catchment area of the springs. Such measures will not only help in the reduction of the surface runoff of rain water in the spring shed area but also more water percolates down which will rejuvenating the catchment without disturbing the water source.

Study Area:

The study area for my field research is located at an average elevation of 1600 m with slope of 30 degrees, the study was conducted in Deythang Gram Panchayat Unit(GPU), Kaluk Block, West Sikkim (SIDR.2011). The word Deythang can be broken into two half *Dey* meaning Edgeworthia chrysantha in Bhutia dialect and *Thang* meaning place also in Bhutia dialect, hence Deythang .The village is mostly inhabited by ethnic community such as Bhutia, Sherpa, Lepcha, Rai, Gurung, Sharma, Chettri, Tamang, Limbo with 578 household. While the average annual rainfall of the State is 250 cm, this village receives only 150 cm, since it is located in the rain shadow of the Darjeeling Himalaya (SIRD, 2011). Also this rainfall is concentrated in the six months from May to Oct, with a long dry season over the next 6 months. The farming systems are characterized by rain fed subsistence farming. Of the total area of 1053 ha, only 9 ha is irrigated, with the farmers mostly dependent on dry land farming. As a result, 49% of the households fall in the BPL category. (SIRD,2011)

Like rest of the rural Sikkim village, 80% villagers of Deythang GPU depend upon spring water, but over the past few years perennial springs have become seasonal. The problem of drying up of spring water has now emerging as the single biggest challenge before the Gram Panchayat.

Deythang comprises of six wards with total of 53 perennial and seasonal springs. Three critical springs namely Nunthaley Dhara in saurani(ward number 2), Aitbarey Dhara in saurani(ward number 2) and Kharkharey Dhara in manadara(ward number3) which were becoming seasonal were taken up for Dhara Vikas programme.

Let us now look at these three dharas(springs) in detail, Aitabarey dhara derives its name from Aitabarey Dauta(deity) who is the protector of cattle and grants good harvest. A total area of 8 hectares of spring shed development work was taken up in the catchment area of this spring along with 315 trenches with 300 percolation pits, 300 hedgerows and 60 loose boulder checkdam. Different variety of trees and plants that retain water have also been planted like Oak, wild banana, *Phunchey*(*Machilus edulis*), Napier grass, *Gogun*(*Saurauia nepaulensis*).

Nunthalay dhara also can be broken into two words, nun meaning salt in nepali language and thal meaning plate also in nepali language. This dhara was an area where the villagers

would bring their cattle fed them with salt, thus gain the name of Nunthalay dhara. As compared to Aitabarey dhara the total area for springshed development is small with only an area of 3 hectare. This spring has 121 trenches, 70 percolation pits, 150 hedgerows and 30 loose boulder check dams. Plantation work has also been done in this spring with the same variety of plants and trees like the ones in aitabarey dhara. Unlike aitabarey dhara and kharkhare dhara, this area is under the private ownership of Mr. Gurung who has willingly allowed the Government to implement Dhara Vikas scheme in his land.

The catchment area of Kharkharay dhara is 4 hectares, with 145 trenches, 165 percolation pits, and 160 hedgerows and does not have any check dams. This area is covered with big stones and gravels thus the name of this dhara is derived from the sound that it creates. Thus the word *kharkhar* is an expression to describe the flow and the sound of dhara in Nepali language.

Objectives:

The objective of my research work in Deythang is to test questions regarding the condition of spring discharge before and after implementation of dhara vikas. My research also includes the study of how changing climatic pattern is affecting vegetation pattern and the overall negative impact of it. Thus my other objectives of this research are as follows:

1. Analyzing the response of waterusers of the three dhara, towards the work done by dhara vikas and also whether the spring discharge has increased or not.
2. Identify the impact of climate change on spring discharge and on vegetation pattern.
3. Cultural and religious aspect related to spring and how it has helped to conserve it.
4. Views of young generation towards the cultural and religious aspect related with springs. And also if they would abide by those customs laid by their ancestors.

Methods:

For data collection I have used qualitative methods along with other research tools. Besides these I began my research with field visit to the three springs to collect infrastructure data and also to attain information as to how many Devithan(devi temple)and *Nagthan*(Snake Temple)are located in spring catchment area. With this data, I drew social map for every ward which include every household, temples, schools and water source. This enabled me to get acquainted with the village infrastructure and the resources available. Other tools used for data collection are as follows:

❖ Questionnaire:

There are 60 household in total who depend upon Aitabaray (29 household), Nunthalay (6 household) and Kharkharay dhara(25 household) for their water supply. Majority of the villagers depend upon farming for their livelihood so, keeping in mind the objective of my research I build up questionnaire for household survey that focused on:

1. Condition of spring discharge before and after work done by Dhara Vikas ,
2. Has the spring water discharge increased or not.
3. Are perennial springs drying up during the lean season or do they have sufficient water for the waterusers.
4. Impact of water crisis in their lives and livelihood.
5. Change in cultivation pattern because of warmer climate.
6. Increase in crop failure and rise of pest and diseases.

Household survey was conducted door to door with the help of Barefoot Engineer (BFE), Mr.H.C.Chettri of the ward. Along with conducting the questioner, I could also observe activity of the villagers.

❖ Focus Group Discussion:

Two focus group discussions were conducted for male and female group. The discussion was on issues central to the objectives and participants of these discussions were mainly younger generation. Female group had total participants of 6 and the male group had 5 participants. These two discussions were conducted separately at different times so that they could voices their opinions with any hesitation. The main topic of this focus group discussion was changing cultural customs and conservation of spring water through the concept of devithans.

Other than these informal interview and discussions were also conducted, which gave more inside information about the community activities.

Results:

As mentioned earlier Deythang is inhabited by various ethnic communities of which 40%are tribal people (SIRD,2011). Like other rural villages of Sikkim majority of the people are agriculturalist who are dependent upon spring water for their day to day activities. The results of the questioners give us a positive feedback about Dhara Vikas programme. Under the MGNERAGA scheme the wateruser have also worked in building infrastructure for dhara vikas scheme. Despite the co operation from the local villagers and the local panchayat, they were apprehensive about its success. During the initial stage of the project in early 2009 when percolation pits, trenches and loose boulder check dams were being constructed, the water discharge had reduced creating doubt about its success. Within the span of a year

time, the quantity of spring water discharge had increased even during lean season and the springs which had reached critical stage had also revived.

Aitabaray Dhara which is the largest area has six divisions; all water users' households of this dhara gave us positive response. Nuntalay dhara water users household also gave us similar results, thus because of the increase in water discharge the number of household depending upon this dhara has increased. Kharkharay dhara also has similar success story about their water discharge. Like Aitabaray Dhara, Kharkharay Dhara is also has 3 divisions. Despite increase in the spring water discharge, household of Subba Goan(Manadara ward no 3) who are dependent on Kharkharay Dhara have complained about the absence of water storage facility. The cause of this problem is because the dhara has changed its course and have started flowing from lower end of the hill, this has occurred only after the implementation of Dhara Vikas.

Not all villagers are familiar with the concept of climate change, so during informal discussion session villagers complain about long summer months and extreme climatic condition. Cardamom which is one of the most important cash crops of Sikkim has failed for many years; this has had major negative impact on the livelihood of the villagers. Increasing temperature has made vegetation more vulnerable to pests and diseases; not only do the village farmers complain of crop failure and pests, some elderly farmers discuss about ripening of maize, peach prior to its time and absence of winter birds that could be seen earlier. Ginger cultivation which was not possible earlier because of cold weather, now has become the major source of income for the villagers, thus this change in cultivation pattern also indicates climate change. When questioned as to why the perennial springs are drying, Aitabaray Dhara wateruser like Bhimlal Sharma, Pasang Tshering Subba point out at deforestation of the catchment area of Aitabaray Dhara for Cardamom plantation. Most of the villagers spoke of deforestation and change in the rainfall pattern as the main cause for drying of perennial spring.

Almost every dhara is dedicated to a deity; one can see small temples here and there. Once a year villagers get together and perform puja which is conducted by priest of ethnic community and also hindu priest. This has been a tradition of the village and is followed till date. Springs with *Devithans* are considered to be scared and its is forbidden to litter the spring area and collecting of fuel, fodder is also prohibited. Through this cultural and religious connection some spring in the village still have good water discharge results. Our focus group discussion was based on similar line, with western culture, education I was curious to know what the younger generation had to say about the myths and culture related with springs. The result of the discussion tell us that the younger generation will carry forward the tradition of spring worship as is it one way by which spring can be conserved.

Villagers strongly believe in supernatural forces and despite a dispensary in the village, they still depend upon witch doctors and tradition healers for cure.

Personal Experience:

This research gave me an opportunity to increase knowledge about my home state. Being a Sikkimese, I had never visited a proper village of Sikkim nor did I have any experience of any rural area so far. When one visits Sikkim, they visit only the urbanised Sikkim but true heart and soul of this Himalayan state lies in the rural area. One major reason for the success of Dhara Vikas in Deythang is because of the consciousness among the villagers and the co operation they gave to the programme. The villagers are warm and friendly, always willing to help you and guide you. Almost 49% of the household fall under BPL category but despite their poverty they willing welcome you. Overall this one month internship research has been a wonderful experience where I got an opportunity to learn about my culture, tradition and my state.

Conclusion:

Mountain springs are the main source of drinking water and over the last few years, the discharge of these springs was reducing and many of these perennial springs have becoming seasonal. 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 causing floods. Dhara Vikas project on three critical springs in Deythang is a pilot water shed development project of the state, which is in process of being nominated for national award. Household survey of the waterusers had not been done prior to this research. Thus with the final results of the research, we can conclude by saying that DharaVikas has successfully managed to regenerate the drying springs. Despite climatic changes and the threat that it caused for spring water, SIRD has managed to overcome it along with adaptation skills of the villagers during water crisis.

References:

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2. SIRD (2011).