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Indigenous water conservation systems—A rich tradition of rural Himachal Pradesh

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Water is an essential commodity for survival and development. But the ever-increasing human population, technological modernization, changing life patterns and erratic monsoons are likely to lead to water crisis in this millennium. In the study, indigenous water conservation systems of Himachal Pradesh have been studied. The villagers had developed different indigenous techniques/structures in such a way so that the groundwater as well as the rainwater could be utilized properly.Various water conservation systems found in the state, *baudi, nawn, chhrudu, khatri, khad, nala*, etc. have been described.

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Water, an essential resource forms the basis for life on earth. The ever-increasing human population, technological modernization and changing life patterns have invited calamities in the form of declining water quantity[1]. Water scarcity is becoming a serious cause for human society to worry. As the days pass water is becoming scarce even in the areas, where it was thought to be in plenty. It is important to learn what our ancestors and elders were doing in the past. Throughout India, several ingenious ways have been devised to conserve water. They are known as traditional water conservation systems. The residents of Himachal Pradesh have also developed their own set up and indigenous techniques to store water. One can find hundreds and thousands natural water resources in the state, which include *baudis, nawns, khads, kuhls, khatris, chhrudus*, wells, rivers, *nalas*, etc. Since earlier times, people used to utilize these resources for their daily domestic/agricultural activities but for drinking purposes only *baudis, nawns, chhrudus*, wells and *khatris* are preferred.

Observations

Himachal Pradesh is blessed with different types of natural water resources, which are used to fulfill the daily water needs. The names of these resources/ structures might vary but the objective of using them is same i.e. conservation of water. The variation among different resources varies with the purpose of use, type and size of the structure. Thus, the technology and engineering of traditional water resources differs depending on whether they have to provide drinking water or used for other purposes also. Those meant for drinking water are generally smaller, sometimes covered and with steps leading down to the water. Irrigation systems on the other hand spread over large open areas have network of channels for distribution of water. Different water conservation systems prevalent in the state are:

Baudi

Baudi is a deep stoned pit, which is dug where water percolates naturally from the earth surface (Figs 1 & 2). It is circular/square in shape, which gently slopes towards the pit in the centre. While constructing *baudis*, the masons place stones in a particular sequence to have continuous percolation of water from the ground. *Baudi* is sometimes provided with an outlet and is covered with roof to protect the water. It is smaller in size thus water is used only for drinking purposes. Mostly, the *baudis* are located at an approachable distance from residential area. One of the characteristic features of *baudi* is that it narrows down to the bottom. At about every 20 cm

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interval from top to bottom ladders by stones are constructed in a way that one could get down in the *baudi* to collect the water, whenever, the water level become low in it due to overuse of water and seasonal effects.

Nawn

Nawn is a type of water storing structure with a huge capacity to store water. On locating the water source, a tank like structure is constructed by stones (Fig. 4). A special channel is segregated from the tank for the users to wash clothes (Fig. 5) or take bath without polluting the main water source. There is a provision of roof as well as walls on three sides of the tank with sluices on front side to check falling of dust or any other unwanted things into its water. With a view to prevent immersing of container in the water, *nawn* has outlets also. It is interesting to note that when a groundwater source is surrounded by a small tank, it becomes a *baudi* and when the size is increased and use expands to numerous purposes it is called as *nawn*. Usually, a village has only one *nawn*, while the *baudis* may be many in number.

Khatris

Khatris are rectangular, deep pits made on the hill slopes in hard rocks, where rain water is collected through seepage from rocks. These traditional water storage structures are mostly found in Hamirpur, Kangra and Mandi districts of Himachal Pradesh. The basic purpose of *khatri* is not to harvest the surface run off but the rainwater that flows through the rocks and soils of hilly regions. Specially skilled masons construct the *khatri* and they have the idea that whether the *khatri* will have water round the year or only during the monsoon season. Depending on terrain, a *khatri* costs around Rs10,000-20,000[2]. This structure is generally located at the foothills by digging a horizontal tunnel of 3-4 m length, followed by a vertical basin at the inner end. The tunnel is provided with steps going down the basin (Fig. 6). Usually the capacity of a *khatri* varies between 30,000-50,000 L. Different *khatris* can be dug on a particular hill but at the same level. A new *khatri* cannot be dug at a level below the existing ones because the water leaches down to the lowest available *khatri* from the one that is situated above. There are two types of *khatris,* one for human consumption in which rainwater is collected by seepage through rocks.The another type of *khatris* are used for animals and washing purposes in which rainwater is collected from the roof through pipes. It is necessary to mention here that *baudi/nawns* were either restricted to a particular caste or they may be secular structures from which everyone could draw water but interestingly, the *khatris* are owned by individual families and maintained by community as well. From this, one can estimate that in earlier times the number of *khatris* would have been almost equivalent to the number of families in the village. Once the individual *khatri*s are carved out they may be provided with gates and are locked while *khatri*s owned by community are seldom locked (Fig. 7).

Chhrudu

Chhrudu is a type of traditional water resource where water is channelised directly from the groundwater source with the help of a pipe (Fig. 8). Earlier, people used to prepare these pipes from a locally available tree, *maggar* or bamboo (*Bambusa arundinacea*) and the pipe was called as *maggaru*. But now with the advancement in technology, bamboo pipes/magggaru have been replaced by iron or plastic pipes.

Kuhls

Kuhls are a traditional irrigation system in the lower belts of the state like Kangra, Mandi and Hamirpur. *Kuhl* system is prevalent since British colonial rule in India. These surface channels divert water from natural flowing streams called *Khuds* and run at a higher elevation than the stream, to irrigate more upstream land than the *khud* itself. A community *kuhl* can serve 6-30 farmers, irrigating an area of about 20 ha. This irrigation system consists of a temporary headwall of boulders across a ravine to divert the flow through a canal to the fields. The water flows from the field to field and surplus water drains back to the *khud*. Besides irrigating the fields, *kuhls* and *khuds* carry water to run the flour mills, *gharaat*. Villagers use home made wooden wheels as turbines to run the mills. Thus these water mills are powered through *kuhl* water only without electric or any other complex machine systems. The knowledge and ability to build, maintain and operate the *kuhls* is rested entirely and securely in the hands of the communities whose life sprang from these waters[3].The construction, operation, maintenance and distribution of water are managed by the *kohli* with the support from the whole community. The *kohlis* of Himachal Pradesh are a caste, whose traditional occupation is the management of *kuhl* system. So, before the

Fig.1 *Baudi*

Fig.2 An abandoned *baudi*

Fig.3 *Moore* placed on the sides of a *baudi*

Fig.4 *Nawn*

Fig.5 Woman washing clothes in *nawn*

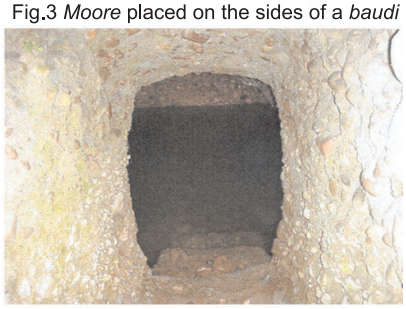

Fig.6 Steps leading down to *khatri*

Fig.7 Iron door and lock guard water in *khatri*

Fig.8 *Chhrudu*

beginning of sowing season, the *kohli* repairs the temporary bunds of the boulder and the *kuhl* with the help of irrigators so as to make the *kuhl* system functional. The person, who refuses to participate in these activities is denied of water for that season.

Most of the traditional water resources like *baudi, nawn, chhrudu, khatri* have been used as potable water source since times immemorial. It is a general belief that ground water is pure. Among the various traditional water resources, the sources which have been transformed into structures like *baudi, nawn* harbour variety of vegetation like *Ficus benghalensis, Mangifera indica, Ficus religiosa*, etc. which keep the surrounding moist and cool. Different types of medicinal plants viz. *Syzygium cumini, Celtis australis, Bombax ceiba, Emblica officinales, Terminalia bellirica, Terminalia chebula*, etc. are sheltered in the vicinity of the structured water resources. Local residents are of the opinion that the medicinal contents of these plants gets mixed with the water of *baudi/ nawn/ chhrudu* through their roots and make the water tasty and aids in digestion also. Various water resources not only serve the water needs but they are also used as a cool place for gatherings. Earlier, when these resources were in frequent use, the ladies of the village while visiting *baudis/ nawns/ chhrudus* used to share their daily experiences which tends to be a strong base for social interaction. In the state of Himachal Pradesh, some of the communities have a customary practice of placing the stone carved structures on the sides of the *nawn/ baudi* in the memory of their ancestors. These structures are locally called as *moore* (Fig. 3). Thus in the morning, when one visits the *baudi/ nawn* they offer prayers and give bath to their ancestors (*moore*) with the *baudi/ nawn* water. The tradition of

establishing a temple 'especially of Lord *Shiva'* near these structures prevails in the villages. The water of the traditional resources hold significant importance in ritualistic practices also as people use their water for ritual bath of the deity in the temple. This practice is reported in Kerala also where every village has at least one temple and there is a sacred tank of water associated with each temple[4].

As already discussed, the water resources like *kuhls* and *khuds* are used to carry water to the fields for irrigation. People pay regards to the water resources used for drinking purposes and they make efforts to keep them clean and unpolluted. Different rules have been set aside by village elders in this regard. They do not allow anyone to immerse the container inside water or wash clothes near the main water source. Besides this, no-one can enter the *baudi/ nawn* area with shoes. The responsibility of cleaning these structures is rested entirely and securely in the hands of community people. The villagers clean them after a regular interval either by draining out whole amount of water or using chemical agents. With a view to restrict the growth of insects and fungi, a special breed of small fish locally called, *donka* is dropped in water structures. The local residents mentioned that the movement of fish in water prevents formation of fungi in the *baudi/nawn* and keeps it clean. Besides this, another indigenous method used to clean the *baudi/nawn* includes scratching the fungi on internal sides of the structure with leaves of *banna* (*Vitex negundo*) or with coconut peels.

Conclusion

In spite of having number of advantages/ benefits of these traditional water resources, these are being openly discouraged. In earlier times, people used to walk miles and mils to fetch water but today due to technological advancements the use of these resources is diminishing day by day. Facilities like hand pump and taps have made people lethargic to walk a distance to these resources. Besides this, due to modernization, people feel awkward to carry water containers. Due to construction of houses near drinking water resources their water is exposed to sewage pollution leading to disuse. Thus, the development of piped water supply, changed life style, technological advancements have made the society apathetic towards conservation of water. On one side the government is launching a number of schemes for rainwater harvesting and on the other side, we are ignoring the traditional water resources, which are dying a natural death. Sincere efforts are needed to revive these resources through their proper maintenance and use. It is for the society to come forward and take a lead in conserving water, using a mixture of traditional and modern techniques.

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