

Traditional water management practices of Maharashtra

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The water management traditions in the state of Maharashtra have developed over centuries in an ecologically sound manner. These were decentralized systems, where the local communities played an active role in their development and management. Rain was considered as main source of water, most of which falls in not more than 100 hours in a year. Traditional water harvesting systems have passed the test of time and are suited to specific environment in which they have evolved. They functioned efficiently in different social, economic and political environment. The dependence of agriculture on rainfall renders cultivation precarious and there have been very serious droughts in the country in the past too. One finds a number of evidences which support the contention that various dynasties which ruled the region were very much particular in developing various types of devices for development and management of water resources for the well being of the state.

The excavations at Inamgaon from district Ahamadnagar in Bhima river basin have brought to the fore some evidences which throw light on the then prevailing agricultural practices contemporary to the Indus valley civilization. Agriculture in India is dependent on the vagaries of monsoon. In order to overcome its ill impacts large number of water supply schemes had been in operation since the time immemorial. A weir across the river to facilitate diversion of water to agriculture was found during excavations at Inamgaon. In Vedas and Smritis we come across references of canals and dams. The composers of Smritis have appealed that human beings should routinely undertake ishtapoori karya (Philanthropic work) which are of public utility like digging wells, creating lakes, drawing canals etc. They had also given an extraordinary importance to the repairs of old dams and constructions of new ones. It was stated that, noble men in the state should undertake such meritorious works on their own. Dhammapad, well known treatise on Buddhism dates back to the Mouryan period described various irrigation systems in vogue during those days. The provincial representatives of Chandragupta Mourya constructed a beautiful lake named Sudarshan at Girnar in Gujrat. Chandragupta Mourya had a department of irrigation to look after construction of canals and dams and irrigation management. There was an independent secretariat to take care of the development of pasture lands and animal husbandry for promotion of dairy industry. It is learnt that he ruled the country for almost 25 years and out of that 13 years suffered from scarcity of rains. In spite of this Historians described the period of Mourya as golden era and therefore the credit goes to the wisdom in water management practices.

Koutilya, the mentor of Chandragupta was of the firm opinion that, agriculture cannot be made solely dependent on rains as it amounts to gambling with the nature. It must have support of manmade water i.e. irrigation. Koutilya went on saying that, the state which remains increasingly dependent on irrigation instead of vagaries of rains for agricultural production is more prone to prosperity. Water was used to be lifted from rivers, lakes etc. by means of wind mills, bullock power and also water wheels. He advocated construction of distribution network with people's participation. There was a penalty on those who would entail loss of water by causing damage to the canal network. In his great treatise named Koutilya's Arthshastra he laid different tax structure for building tanks and canals, levying water charges, protecting irrigation network, deciding cropping pattern, developing pastures, keeping rainfall records, desilting tanks etc. Those who lift water from his own tank for farming should pay 1/5th of the produce as water charges and who lift with the water wheel to pay 1/3rd of the produce and so on. The water charges were linked up with the gross produce from the land irrigated. He was thus the first economist of the world to define water as an economic commodity too. This happened long back during the period of Mouryas that was 3rd century B.C. or so. In the today's world we (erroneously) try to relate this event to the international conference on water of 1992 or so. Koutilaya was very critical and sensitive towards the cropping pattern to be nurtured in the river basins. It was commented by him that, growing of food grains is the noble practice of all, and then follows vegetables and horticulture and lastly the sugarcane which was described as the most inferior practice. The crop sugarcane consumes more water and damages the soil fertility. He advised vehemently to put restriction on the area under sugarcane to eliminate disparity in use of water.

The concept of water wheel was put forth by Rishi Parashar. It has a Indian origin and such water lifting devices were used in Maharashtra since time immemorial. In course of time it was migrated to Persia and again arrived in India under the name 'Persian wheel'. Many more Persian wheels can

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be seen in town Wai, district satara. There is almost 20 m high Persian wheel which was in use till 1960 or so in the Moti bag of Wai. The device was supplying water to the multi storied residence of Raste, a close relative of Peshwa, prime minister of Maratha dynasty. The maxim of achieving prosperity through adoption of assured irrigation than relying on vagaries of monsoon was in acceptance. The caves and the forts of all types in Maharashtra and elsewhere project different types of water management practices in the form cisterns, Kunds, tanks and so on. The images of Ganga, Yamuna, Sindhu, Saraswati are found to be engraved in the vicinity of such water devices. An earthen dam was constructed across a small river in the vicinity of Washim town of Vidharbha. A broken embankment and tank bed cultivation could be witnessed even today. In an inscription however, there is a mention of having built up a lake named Sudarshan during 5th century A.D. for the well being of all people till the time the sun, the moon and the earth exist. Kandhar was army capital of Rashtrakuta dynasty. In one inscription there has been a mention of five water bodies in the vicinity of Kandhar town. The lake named as Jagatung lake is still there serving the people around since last 1500 years or so. The earthen embankment houses, three masonry outlets of ancient times and supply water for irrigation and drinking purposes. One of the outlets feeds the moat of the ground fort located just downstream.

The civil history of state of Maharashtra commences from the satvahan period. i.e. from 230 B.C. to 230 A.D. The 500 caves carved out during that period is the testimony of their prosperity. The vakatakas ruled up to 550 A.D. Their prosperous life was reflected in the coloured paintings of Ajanta caves. The period is regarded as Golden Age. There are references of wells, lakes, tanks, gardens etc. in the inscriptions found in the vicinity. The Satvahanas had constructed a huge reservoir named as Raj Tadag in the vicinity of city of Aurangabad for the utility of public at large. The lake in its small and shrunk form is still functional. It is named as a Harsul Tank. The tank of Aam Khas was a part of large reservoir of Raj Tadag. The entire Maharashtra was under the rule of Chalukya of Badami in post Vakataka period. They also created tanks as well as Baravas. A Barav is a step well meant to supply water perennially for irrigation. The operation and maintenance of irrigation governed by tanks and baravas was taken care of by the panchyats, formed by the users' group. The successive dynasty was of Yadavas. They popularized baravas like temples on large scale. The stone quarry where from rubble was used for the construction of temple was converted into a barav for storing water further. It was also seen that the fortification walls of the forts served as dam lines. The structures were created for multipurpose use. The kings and the local heads had accomplished the construction of baravas for the benefit of people and there was participation of the users in operation and maintenance of the system. Large number of such step wells are still in use across the state and they are in good condition over last 1000 years or so. The beautiful barav at village Limb from Satara district irrigates around 40 ha of land perennially. It has 12 lifting wheels to be operated by animal power. The baravas are more beautiful than the queen's palaces. Their love and respect for water was exemplary.

The Yadavas ruled the southern part of India from fort of Devgiri. It was supposed to be the most difficult fort of that age. It was subsequently acquired by the Khilaji dynasty and thereafter, by Mohamad Tughlak. The fort is located in the arid zone of Marathwada and the rainfall was around 500 mm or so. The fort is a combination of ground and hill top fort. The area around the fort mountains was covered by series of tanks and weirs large in numbers. The moat of the hill top fort was fed by two earthen pipe lines embedded in lime masonry by tapping water from the adjacent hillock (Mousala) by rain water harvesting technique. Around one meter high wall and roughly two km long was constructed along the foot of the hillock for harvesting the rains. The pipe lines followed the steep profile of the ground and crossed a stream around 20 m deep (inverted siphon) before the delivery of water into the moat. It was a gravity flow. The moat of the fort all around the circumference of the fort was used as a storage reservoir. The size of the moat which was chiselled cut in hard compact basalt was around 20 m. wide and 20 m deep. There were diaphragms for isolating the storages meant for drinking and other domestic purposes. The water was delivered from the moat to the various buildings, palaces with animal power. There were large tanks (Hathi tank meaning large as elephant) and step wells inside the fortification walls for secondary storages. There were Jal Mahals carved in the hillocks for relaxation and entertainment. One can witness almost all the basic laws of water engineering and also of rock mechanics while touring the premises of Devgiri fort. The area could be termed as a treasury of various types of hydraulic devices. Similar type of schemes appear to have been implemented at the fort of Naldurga, Dharur, Ausa and several others.

The historical city of Aurangabad is famous for its underground water channels 52 in numbers drawing ground water from the adjoining hills. All these channels are cut in rocks and lined in lime masonry. The size of the channel called as Nahar was around 1.2 m x 2.0 m. There were manholes /

distribution towers for maintenance and delivery of water. Evidences corroborating this are still extant. A few of the Nahars (Thatte, Baijipura, Kiradpura, Shahanurmiya, Panchakki, Shahaganj, Cantonment and many others) are still functional though in a dilapidated state. Use of water brought from a distance through a pipe line appears to have been made to run a wheel for running a flour mill in Aurangabad city. It is a panchakki. Use of water had thus not been made only for drinking and irrigation but also for generating mechanical energy. Similar type of Nahar system could be witnessed at Junner, Tisgaon, Sinner, Pune, Sangli, Ahamadanagar and so on. The water palace constructed in the body of masonry dam under overflow section of Naldurga fort is an engineering marvel of those period. The river Bori was diverted partly to feed the moat of fort of Naldurga. The river was diverted safely by safeguarding the laws of environment.

The city of Aurangabad is located on a ridge of river Sukhana, a tributary of river Purna and river Khamb, a tributary of river Godavari. There were around 52 colonies established during those days for housing the city of Aurangabad. Each colony had a underground channel for drinking water supply. One gentleman Mr. Thatte who was famous for his money lending business constructed an independent and dedicated channel known as Thatte Nahar for his own private establishment. The channel, on way very close to the Dr. Babasaheb Ambedkar Marathwada University surmounts a high hillock (around 25 m) through cut and cover technology. The lady Baijabai was mayor of Baijapura. She dug a channel in the hard rock over a distance of about 8 km and brought water from river basin of Sukhana to river basin of Khamb. This was a river linking / inter basin transfer project executed several centuries ago.

The Phad system of irrigation has been famous since ages together for its equitable distribution of water amongst the farmers large in numbers from the service area. The system envisages construction of masonry weir across the river and divert the water so impounded for irrigation through canals. These rivers (Panzara, Girna, Mosam, Burai and so on) originate from sahyandri and join the west flowing river Tapi. The peculiar feature of the geology causes the rocks to percolate and makes these rivers to flow perennially. The area under irrigation used to be divided into four parts and each one was recognized as to be a Phad. Several beneficiaries belonged to a single Phad. None the less only one type of crop used to be harvested in a Phad. The farmers were allowed to cultivate perennial crops in first Phad, two seasonal in the second, seasonal in the third and no water was assured to the fourth Phad excepting during the surplus year. In other words the fourth Phad was rainfed one. This was the system of distribution of water which was practiced every year through peoples participation. During the second year, the first Phad remains as rainfed, second harvests perennial crops, third eight monthly and fourth one harvests seasonal crops. There was no ratoon crop even for sugarcane. The cycle of change in cropping pattern, Phad wise repeats after every four years. Over a period of four years every farmer availed an opportunity to grow perennial crops once and remained devoid of irrigation once. No soils in that part had ever been rendered saline or waterlogged in Phad system of irrigation. The farmers shared both prosperity and distress equitably.

The history tells us that, by the mid sixteenth century this part of the Tapi basin had reached its climax of abundance in growing cotton and rice. It is surmised that the existence of Phad irrigation system has been in practice since the Mouryas period (300 B.C.). The history testifies that the Phad system received patronage in the tenure of Kings of Yadavas and Devi Ahilyabai Holkar. The irrigation management was taken care of by the panch committees selected from the member farmers. The day to day irrigation was handled by three workers who were paid in the form of grains. They were havaldar, patkari and barekari. There was a democracy and cooperation in the functioning of this irrigation system. The system is still surviving at some places (around 100 weirs) . Sir Vishwesharaya had tried to enforce block system of irrigation based on the principles of Phad irrigation on Nira, Pravara, Godavari, Girna projects in Maharashtra during the British period. An irrigation system fares well only if it be implemented collectively and with a participatory and democratic approach. We can very well claim that the system of democracy was born in Tapi basin of India much earlier to 1861 (through a three minute speech of Great Abraham Linkon).

The tenure of Gond Kings saw the creation of series of tanks in Vidarbha. It is given to understand that nearly 40 thousand tanks were constructed about 400 years ago in Vainganga basin through the entirely private enterprise of the Kohali community i.e. by deploying their own money and efforts. Private tanks were small in size and they were named as Bodis. The technique of using the water from a tank again and again by making it to flow from one tank into another and from there to the next one without entailing any wastage of water was employed. These tanks were constructed for

cultivation of sugarcane and paddy crops in addition to pisciculture. The patronage received during the tenure of Gond king played an important role in development of irrigation facilities in the tribal region.

The irrigation management including the maintenance and repairs were taken care of by the users committee. Patkaries were appointed for day to day functioning. During the British period the right of recovering water charges was entrusted to a few reputed citizens and they were recognized as Malgujars. A definite share irrespective of the water availability was used to be collected from the farmers for remittance to the British Govt. The maintenance and repairs remained with the farmers and the ownership was transferred to the Malgujars. The participation of the farmers was thus diminished. As on today there are around 10000 tanks which are in operation. After independence the government took over these tanks for irrigation management. The cooperative and participatory approach was taken away and the system has become government centered. The perennial crops are not grown and the system is surviving for giving support of protective irrigation to the paddy crops alone. A similar network of tanks is existing in other parts of Marathwada and irrigation management there on is still being practiced through cooperative approach.

One excellent system of irrigation in the form of Khajana well near city of Beed in Marathwada, still functional could be cited as an ideal example of irrigation on groundwater / well. It is a well circular in shape of 20 m dia and 10 m deep and taps water from the Balaghat ranges through two percolating channels from upstream. The well is situated on right bank of river Bindusara. Water is collected continuously in the well and same is taken out again through an underground channel by crossing the large river course of Bindusara for irrigating around 500 ha on left bank in the vicinity of city of Beed. Over the years the city boundaries have encroached into the command area of the Khajana well and the scope of the well irrigation is shrunk. This was again an ideal example of participatory irrigation maintained and managed by the beneficiaries only of their own. The distributaries were named after the days of week i.e. Monday, Tuesday etc. It is given to understand that each distributary used to run on a certain day of the week. The government has taken over this system and a good system implemented through farmers participation came to a halt.

There are two tanks by the names Moti tank and Chandani tank at Sindhkehdraja in Buldhana district. It is learnt that these tanks and many other water devices in the form of Baravas, underground channels, percolating tanks were created at the instance of Jadhav dynasty. The place is famous as birth place of Jijau, mother of Chatrapati Shivaji Maharaj. The village harvests minimum of two crops every year with the support of watershed development works taken up during historical periods.

Kokan region of Maharashtra is characterized by high rainfall and extremely steep gradients. The percolating streams through the mountains of Sahyadri were the main sources of water. Water was used to be made available to crops by taping the streams and chanalizing the same through pat (water courses) along contours. The porous lateritic rock found in this part is the main base of these streams. All such systems were used to be practiced by the farmers on a cooperative basis. The water turns were used to be decided by the farmers with mutual consent. There were large number of tanks small and big for storing the seasonal rainfall in Konkan and unfortunately these appear to have now been deserted, out of sheer neglect. The drinking water wells were seen to have been located right in the tank and for most part of the year, the well was made inaccessible. It was only during the summer of bad year the well water was made available to the people. Thus they had a safe deposit of water to be used during the period of acute scarcity only. Such arrangement can be witnessed at places even today.

The Chatrapati Shau Maharaj of the princely state of Kolhapur constructed the Radhanagari Dam across the river Bhogavati, a tributary of Panchganga during the early part of 20th century and released water into the river course downstream. A series of weirs were constructed across the river by the beneficiaries for impounding water and lifting the same through animal power to irrigate the areas at high altitudes. This was a collective action with peoples participation based on the principle of Phad system of irrigation borrowed from Tapi basin. This made the people of Kolhapur to attain peaks of prosperity. This could be cited as an ideal example of PPP (Public Private Partnership) model in water sector. The animal power has now been replaced by electric water pumps. The weirs have been popularized as Kolhapur type weirs.

The most ideal and judicious rehabilitation could be seen in the service area of Navegaon Bandh in Vainganga basin. The farmers who lost their lands were given irrigated lands in the head reaches of the canals and the PAP was made the first beneficiary of the project. Land was also given

to the landless people i.e. Balutedars. This was beyond land to land approach. In the Asolamendha irrigation project it was seen that, the displaced people were provided irrigation facilities by constructing minor irrigation projects in the relocated areas. This could be the only example of social justice in the entire history of water resources development of this country. There is an old tank named as Khindshi near Nagpur which has rarely overflowed since its inception. The dependability is as low as 30%. Over the years it has become an attractive tourist place.

The temples and the palaces were used as roof water harvesting devices. The famous temple of Tryambakeshwar at the origin of river Godavari could be cited as a prominent evidence. There are many more examples across the state where the technique of roof water harvesting was practiced. The five storied palacial building owned by Saradar Jadhavrao from Purandhar near Pune also depicts an excellent example of roof water harvesting. There are beautiful aqueducts constructed for transportation of water from the source to the urban center. The remnants of Karvir aqueduct of Kolahpur city could be seen even today.

Aad (small dia, deep well) is the gift of the Indus valley civilization. Over the years we neglected this tiny device and landed into trouble. An aad in a house takes care of the domestic water needs of the family. It is a symbol of justice to woman. The aad was supported by village tank for recharging the ground water. One never finds a device like aad, well, barav without the support of recharging device in the days of history. The moat of ground fort was primarily made for recharging the ground water in and around the fort. The hill top and water forts harvested rain water and same was used through wells, rock cut tanks and so on. One such tank by name Dev taki on the top of Sinhagad fort near Pune quenches the thirst of around 15 lac tourists over the year. This is the strength of ground water if harnessed properly.

There are large number of evidences of transportation of water to the difficult terrain through open as well as closed channels. The city of Satara, capital of Maratha kingdom was supplied water from Kas reservoir through a serpentine contour open channel over a distance of 22 km or so. There is a tunnel made in soft soil at Saikheda Phad system in Tapi basin, is another example which establishes a zenith in civil engineering. The urban centers were located in the uncultivable terrain and the productive agricultural land was protected from the vagaries of non agricultural activities. The entire urban water supply was made through underground channels and pipe lines. This was designed with zero control and zero maintenance. The purity of water was also maintained. Water was made to remain pure through the blending of religious faith and the need of the human beings. Water belongs to God and therefore its purity was to be maintained, was the message radiating through the temple located near the water body. In the early part of the 20th century, city of Pune was provided with piped water supply from the dam at Khadakwasala on river Mutha. As usual people neglected the use of ground water available at door step and the excess consumption of tap water was a cause for generation of waste water in excess which finally damaged the river water flowing the city area. A sewage treatment plant was brought in operation in the eastern part of the city and the city sewage was given the necessary treatment so as to make it suitable for irrigation after dilution with fresh water of canal. This happened in the year 1929. Unfortunately this experiment was not pursued further.

The county has a water policy made in 1987. The state of Maharashtra has its own water policy made in 2003. One will wonder to know that Chatrapati Shahu Maharaj drafted the first water policy in the year 1908.

The concluding years of the 19th century saw a horrible famine. The situation forced the then British Government to undertake at least protective irrigation schemes, though out of reluctance. The first such irrigation work was of Krishna canal off taking from a weir at Khodashi across river Krishna (1870). Thereafter Khadakwasala dam across river Mutha along with canals taking off there from was completed in 1875. Vihar (1860), Powai and Tulshi (1876) and Tansa (1883) lakes were completed for drinking and industrial water needs of Mumbai. The Nira canal was commissioned by completing Bhatgahar dam in 1885. Few diversion weirs and canals on rivers Nira, Prawara, Godavari, Girna were completed and irrigation facility was made available to the people at large during the early part of 20th century. During the same period TATA's, a private enterprise were allowed to construct five reservoirs on east flowing rivers of Krishna basin and divert about 45 TMC of water on westward for generation of hydro electric power. This could be cited as first example of privatization of water in the country.

The state has created a large network of dams and canals ranging from small to large and the area brought under irrigation in respect of potential created is around 6.5 million ha. The storage capacity is around 40 BCM. This is exclusive of development on ground water resource. Of late state has enacted four water laws viz. I) Water policy of 2003. II) Participatory irrigation management 2005, III) Maharashtra Water Resources Regulatory Authority 2005 and IV) Groundwater development and management Act 2013.

A close look at the traditional water management practices reveals that, all the marvelous water devices, most beautiful in their physical appearance were created through local wisdom. There were no engineers with formal engineering degrees with them. There is no evidence to prove that the universities of Nalanda and Taxashila produced such skilled persons in those days.

The traditional water harvesting systems declined when the Government took over the role of the main provider of the water and replaced decentralized system with centralized ones. This marked the end of a glorious tradition. Heavy and unsustainable dependence was given on surface and ground water sources. Piped water supply became the first enemy of the rural masses. It made to have gross neglect towards the primary source of water i.e. rain, aad and well supported with recharging devices. There is an urgent need to rethink about the same.

The longevity of the traditional water harvesting structures is a proof that they are sustainable technologies. This makes it clear that what has sustained them is not just their engineering, but “sanskar”, “sanskriti”, and “niti”. Individual dharma and social custom were the necessary conditions, but the autonomy of local communities to manage their own resources was the critical sufficient condition for the sustenance of the traditions of resources management.

There are umpteen number of water devices across the country which were deployed by the communities with local wisdom during historical periods for handling the scarce water resource with utmost care to reap maximum benefits with optimum utilization. Unfortunately the modern era saw its rapid decline due to sheer negligence. The water heritage of the country is inspiring and there is a lot to learn. The knowledge and wisdom never die.