

Traditional Village-based Hydraulic Culture

Introduction

Great King Parakramabahu stated "let not even a drop of water obtained by rain go to the sea without benefiting man". This implies the importance of water to the sustenance of the human civilisation and how the ancient culture appreciated the precious natural resources. Sri Lanka had a tank-based agrarian culture. It is well defined in the ancient food production system as "agrarian cultural system" than an "agricultural system". The reason for this is ancient, or more appropriately traditional food production, was not targeted at food production only, but also as an integrated system in which culture and the society were integral components. Therefore, the concept of "village-tank-field-temple" was evolved. Due to this culture, none of these components operated independently.

In the traditional food production system or agrarian system, the "tank" or the "man-made reservoirs" played a vital role to food production and to the society, and hence, the tanks were considered in a divine manner. The society showed great respect to the tanks, and some kings even considered the tanks as the most important treasure or the wealth (King Dathusena in 461-478 A.D.).

This article attempts to present historical evidences on how the Sri Lankan traditional agrarian societies respected, utilised and conserved water and lessons that the present generation can learn from them to sustain water resources and the environment.

History of Water Culture

The author of Mahawansa has indicated that the hydraulic culture in Sri Lanka was initiated after the advent of King Vijeya and his group in the 6th century B.C. However, when King Vijeya lost his group, he found that they have gone

to a lake (may be tank) but never left it, while a (royal?) woman Kawanna or Kuweni, was knitting cotton on the dam (*wekanda*) of the tank. Sri Lanka is a country where there was no inland natural water bodies located, and this lake or tank has to be a man-made (at least some influence of man in constructing) water body. Therefore, this statement indicates that there had been a tank-based culture even prior to the arrival of King Vijeya.

The Kashmir text of history "Rajatharangani" by Kalhanayan, written in the 12th century A.D., clearly explains how the King of Kashmir invited Sri Lankan Irrigation technologist to Kashmir in the 8th century A.D. to construct irrigation channels to develop irrigation facilities. In addition, construction of a dam across the "Kaveri river" to divert water to a 'Shiva' temple, by using Sri Lankan irrigation technology and technicians is mentioned in the ancient Indian text written during the "Mauola" dynasty.

Another marvel construction in the local irrigation system is the sluice or the "Bisokotuwa". In nowhere in the world, this type of sluice system is found. Henry Parker in 1870 stated, that "Sinhalese have the great strength and the power in irrigation, because they possessed the technology in constructing the unique sluice system called Bisokotuwa". The "diyaketa pahana" is a vertically erected stone pillar with graduation to show the level of the water in the tank.

The rainwater reservoirs developed in the ancient kingdom of Anuradhapura (437 B.C.-845 A.D.) and Polonnaruwa (846 A.D.-1302 A.D.), Dry Zone of Central lowlands provided sufficient irrigation water to cultivate rice in two seasons, while the Wet Zone remained sparsely populated and covered by thick forests. Today, around 12,000

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ancient small dams and 320 ancient large dams, together with thousands of man-made tanks dot the lowlands, with over 10,000 reservoirs in the Northern Province alone.

Another marvel construction by the ancient irrigation technologist is the "Yodha ela" or "Jaya ganga" with a gradient of 6 inches to a mile, which carries water along 54 miles, from a lower elevated "Kalawewa" to highly elevated "Tissawewa".

Earlier many believed that this is only a water conveying canal. By looking up the surrounding agrarian culture both sides of the canal; it is very evident that this has served the purpose more than a canal. This collected spill water as reservoir from the village tanks and stored, then supplied the water to the other village tanks as required while flowing down.

A Sri Lankan historian R.L. Broheir stated "many are the instances where the modern engineer has frequently found himself anticipated by an unnamed predecessor".

Management of Village Tank Culture

In Jethawana rock inscription, the following three types of tanks are mentioned during the reign of King Maluthissa (167 - 186 A.D.):

- Small tanks - (*Danavavi*) - a tank built by constructing a dam across a small stream. Usually such tanks are

privately owned, and the water is offered at a reasonable charge (fee).

- Large tanks - (*Mahavavi*) - due to its capacity and extents, individuals cannot afford to build; therefore, the state patronage is given and managed by officers / authorities appointed by the king.
- Village tanks - (*gamikavavi*) - village tanks are an integral part of the village system and satisfies the irrigation requirement of the village. Each village has a small tank. The control is by an appointed officer known as "*gamarala*" or *vidane*".

The tanks were owned by the king, the temples, village institutions or individuals. Among them, the large tanks and major canals were owned by the king. During the 3rd B.C. in a Brahmi rock inscriptions, it was noted that there were individuals with the ownership of private tanks and known as "*Vapihamika*". In addition, there are many ancient inscriptions such as "*Thimbiriwewa*" and "*Kahabiliyawa*" rock inscription which clearly mentioned about the ownership of the tanks either by individuals or families.

"*Samanthapasadika*" an ancient text of Sri Lanka, have described the rules and regulations in managing large and small tanks and also tanks owned by the private individuals.

For agricultural purposes, irrigation water was not offered free of charge. Therefore, when water was obtained from a tank, a charge was made. Until the 6th century B.C. this payment was known as "*Dakapathi*" and "*Bojiyapathi*". During the latter part of the Anuradhapura and Polonnaruwa era, they were known as "*Diyabedum*" and "*Diyadada*", respectively. Because of the payment have to be made for the water, traditional farmers realised the value of water, and they treated it as precious. The society, therefore, abides by the traditions, and laws and regulations imposed on water to collect, conserve

and respect, and utilise optimally to minimise waste and pollution.

In the traditional agrarian system, for every tank, there was a management system and management officials appointed by the king, regional ruler or the society. This is a paid position, and more than the payment, it is a social status. According to Paranavithana (1970), the words found in two very ancient Brahmi inscriptions, "*Ananika*" and "*Adikaya*" may be referring to an irrigation engineer and an officer-in-charge of canals, respectively. Another rock inscription by the King Sena II (853 - 887 A.D.) described of a supervising officer of tanks as "*Vevajeruma*" and in the 10th century A.D., an authorised organisation to take care of tanks as "*Dolos maha ve thena*". In Aththani inscriptions, the officers are mentioned as "*Viyavadaranuvan*" meaning the executive. However, "*Maha gamarala*" and "*Vidana*" are the common official persons existed until recent times.

Water and Agriculture

Cultivation, especially the lowland rice cultivation was done two seasons per year. This was mainly determined by the availability of water. This was found in the Thonigala second rock inscription as; "*Pitadadahas*" (*maha* season or north-east monsoonal season) where the rice cultivation is entirely done by rain water. The other "*Akalahasa*" (*yala* season or south-east monsoonal rains) where the rainfall is not sufficient to cultivate the total extent of land. During the "*yala*" or South-eastern monsoon season, cultivation is done by the collected water in the tanks during the rainy seasons. Often due to the insufficiency of water to cultivate the total extent of land, limited irrigation water is released to all rice farmers in the village to cultivate only a part of their fields and this system is called "*Bethma*" system. In certain part of the country where sufficient rainfall is available, an additional short season can be cultivated between the two main

seasons and known as "*Madehasa*" (mid season).

Irrigation water was supplied to the fields systematically. To organise irrigation facility, initially meetings were held between the authority and the farmers. Often the authority (*gamarala* or *vidane*) is also a farmer accepted by the society. Thereafter, the plan of cultivation and system of supply is discussed. With everybody's consensus, the available water is distributed on a given schedule and order.

The water to irrigate rice fields were obtained from irrigation tanks if not from direct rain. The traditional land use and the settlement system was organised that each village-based rice cultivation land lot (*yaya*) is fed with a small tank called "*village tank*" (*gam wewa*), and the villages were known as "*tank village*" (*wewugam*). Once the rice fields were filled with the irrigation water, the excess water was wasted. This excess water was then diverted to the next village tank through another type of small canal (*pahuela*) to replenish the water level and further use. This shows the concepts followed by the traditional agriculture in recycling and conservation of natural resources. Therefore, in traditional water management system, the irrigation system was designed not only to distribute water, but also to collect excess water and direct them for storage and conservation. The waste water that was recycled to the tank, if carries any deleterious chemical substance from the previous field, will be purified naturally through the action of "*natural phyto-remediation*". This has been a long-practised phenomenon in ancient tank culture. Natural perennial plants which are capable of absorbing such chemicals through their root system were grown in the bunds of the tank (*Kubuk*, *Wetakeya*, *Maranda*, *Mee*, etc). Traditional people knew about these plants and their different abilities.

Tank and Local Traditions

Tank is the most important asset to the agrarian culture, because it provides many services other than supplying water for irrigation. It provided water for irrigation, livestock, drinking, washing and bathing and even for recreation. In addition, it was the source of fish, other food types (lotus root, seeds, stems, kekatiya and other edible aquatic plants), flowers for ornamental use, etc. Therefore, the tank was considered as a treasure to the village. Thus, it was everybody's responsibility to sustain this asset. Complete authority of the tank was given to the "maha gamarala" or the "wel vidane". Every individual in the village had to follow the set rules and regulations imposed on tanks. Anybody who violated such rules was penalised with heavy penalties despite his social status. The bans imposed on tanks by the *wel vidane* was called "ana bol bedeema". For this, he plant a long stick upright in the tank with few plant twigs tied on to it. When the villagers seeing this will understand that some ban has imposed for certain uses of the tank (fishing, letting livestock, irrigation, etc.).

When a tank is filled with water, entering the water is prohibited from, as they wish for any purpose. This is to conserve the tank and maintains the purity of the water. There are identified places for different uses of water. The place where bathing is allowed is known as "bathing port" (*nana mankada*), but separately for males (*pirimi mankada*) and females (*gehenu mankada*). Similarly, water to fetch for drinking is drawn at "*diya mankada*", for cattle bathing and drinking at "*gon mankada*" or "*bora mankada*", for washing "*redi* or "*radha mankada*". These social disciplines were maintained not for the restriction of water, but to maintain the high utility of water.

Water and Worship

Water was venerated as a sacred element. This natural resource was

highly respected among the traditional agrarian society. Among the four ancient local tribes "*Sivuhelayo*", the "*Naga*" was considered to be more associated with water as they were known to be the ancient navigators, whereas the "*Yakksa*" as the "*Irrigation specialists*". In the tank-based culture "*the cobra*" had become an identical symbol in water-related culture. The three or five hooded cobra was regarded as the guardian of water resource. The "*multi-hooded cobra*" stone carvings found in ancient cultural sites can be assumed as the ancient belief of the "*king cobra*" (*Naa raju*) as the guardian of "water and wealth".

In the ancient culture, water was considered so precious, and the kings who have made large reservoirs, developed irrigation culture and done much service to hydraulic civilisation, were worshipped at the state of divines or gods (King Mahasen as "*Mahasen Deviya*", "*Minneri Deviya*", etc.). In ancient hydraulic culture, they found a place on the bund of the tank or its vicinity to perform offerings to the deities responsible for or guardians of water and agriculture (crop and livestock). Usually, they selected a very old wide spread perennial tree (*vanaspathy*), especially a *Ficus* species (*nuga, asatu*) or any other perennial (*mee, kumbuk, palu, weera, kon* etc.). This is called the "*place of worship*" (*sanhinda*), where they perform services, chanting, offerings, alms and make vows (*yaga homa*) for asking the blessings or thanksgiving.

Gods or deities for agriculture and water differ from place to place. It was believed that these gods guard the tanks and their fields and stocks. The genesis or the birth of some gods was also from the same area or related to the tank. Some were mythical and some were individuals in the society who were venerated as gods or devils after their death due to some heroism, behaviour or the service rendered to the society when they were alive or otherwise

(Kadawara, Mangara, Aiyanyaka, Gambara, Pulleyar, Kataragama, Saman, etc).

Lessons from the Past

Sri Lanka ancient hydraulic culture and the agrarian civilisation around it are unique to this country. It cannot match with any other ancient technology or agrarian civilisation in the world. Irrigation technology adopted was far superior to what the present-day irrigation experts know and have performed. The technology used then was still a mystery. The type of equipment used was, though we thought primitive, more accurate than what we used today. Source of knowledge is still unknown to us. The accuracy, concepts and mythology are astonishing. Therefore, it is very essential for our present-day irrigation technologist to understand the concepts and systems used in the ancient hydraulic culture, when designing the future irrigation development activities in the country. Classic examples to this effect can be cited as the Samanala wewa sluice, Yoda Ela gradient, *relapanawa* concept on bank erosion, etc.

On the other hand, the culture that harmonised the society with traditions, norms and values were originated through the concepts of tank-based village civilisation and culture. It kept the community together and promoted collective frame of mind in their agrarian activities such as land preparation (*aththama*), weeding (*neluma*), and harvesting (*kaiya*). This sharing of labour was done without considering their wealth or social status. These collective activities kept the society together to sustain the harmony of the society. The leadership was given by the village leaders such as the priest of the temple (*loku hamuduruwo*), village headman (*muledeni/arachchila/gamarala*), village doctor (*veda aththa*), village school head teacher (*loku iskola mahaththaya*) and a village committee (*variga sabhawa*) led

by few respected elders of the village. Presently, the society is divided because there are no activities that are performed collectively; everything is hired or mechanised. The social norms and values are besmirched, culture is drained as a result of so called modernisation.

Finally, the value of this precious natural resource, water, is just not water alone; it is the origin of human civilisation, and the sustenance of human culture and life. Therefore, let's understand the future threat on this natural resource due to its scarcity, pollution, and learn to use it respectfully and resourcefully. Therefore, national programmes should be implemented among the Sri Lankans at all levels to educate them on the value of water and how we enjoy it now

because of our forefathers understood and conserved for future generations. It is our responsibility to conserve for the future generations.

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- There are 396 million episodes of malaria every year, most of the disease burden is in Africa south of the Sahara.
- An estimated 160 million people are infected with schistosomiasis
- 500 million people are at risk from trachoma.
- 133 million people suffer from high intensity intestinal helminth infections, which often lead to severe consequences such as cognitive impairment, massive dysentery, or anaemia.
- Over 26 million people in China suffer from dental fluorosis due to elevated fluoride in their drinking water.

Pipe-borne water systems in Sri Lanka are still confined to the main cities. The majority of the population (approx. 70%) still depend on groundwater and surface water for their domestic requirements, the garden well being the commonest water source. Even though industrial contamination of

these rural water wells is very rare, some natural causes often render the water unsuitable for drinking. From among these, salinity, excess fluorides, excess total dissolved solids are the most important (Dissanayake and Weerasooriya, 1989). In the Jaffna Peninsula, excessive use of fresh water for irrigation causes an influx of brackish water thereby rendering the water unsuitable for drinking. Table 1 shows the types of diseases and problems caused by organisms and chemical substances in water to humans.

Conclusion

Water, due to its unique chemical and physical properties, dissolves many inorganic and organic substances, thereby, making it a 'Universal solvent'. It is, therefore, very easily contaminated. Due to the nature of planet earth, with its dynamic equilibrium between various spheres, water encompasses almost all disciplines. From among these, geology, chemistry, agriculture, medical science, industry, public health, town and country planning,

sociology, irrigation and power generation, engineering, microbiology, parasitology deal with various aspects of water. A multidisciplinary approach is, therefore, clearly required, and all stakeholders need to contribute their fair share of work aimed at keeping the environment clean and providing one of the most essential of all substance - pure water.

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