

Indigenous Irrigation Practices

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Our irrigation heritage extends over a period of more than 5000 years. Best practices of agriculture, land use, irrigation, and watershed management are still in existence showing great evidence for the technical wisdom that we had in this golden era. Pre-Mahwansa historical documents bring to our notice the initial setting of the hydraulic civilization.

It is believed that before Vijaya arrived in the island, our ancestors had built up large reservoirs and canals, which provided water for agriculture. When arrangements were being made to construct a new sluice gate during 1981 for the southern bank of the Maduru Oya reservoir, an ancient sluice gate was found at

the same location selected for the sluice. According to Mahawansa this reservoir had been built by King Mahasen (273 AC), and subsequently repaired by King Wijayabahu (1055 – 1110 AC), and King Parakramabahu (1153 – 1186 AC). However, according to a popular belief, the yakshas who lived prior to the arrival of King Vijaya (6th century BC), had initiated the original design of the sluice gate (Fig. 1).



Fig. 1. Ancient sluice gate of Maduru Reservoir

Many ancient structures had been initially built by a certain king, and subsequently various other kings had repaired these for their use. The history sometimes tend to record one of these subsequent kings as the pioneer. One such example is the Fortress of Sigiriya which was claimed to have been built by the King Kashyapa, although it has a past history dating back to 3,000 BC. According to a chronicle *Warga puranaya* (one of five volumes of *Pancha Rakhkhamali*), a prince named Singhamukha had reigned even before King Ravana built this Kingdom with the support of Vishwakarma brought from India. Whoever was the King who constructed pleasure gardens of the Sigiriya kingdom, must have been in need of water to be collected at a relatively higher elevation for irrigating

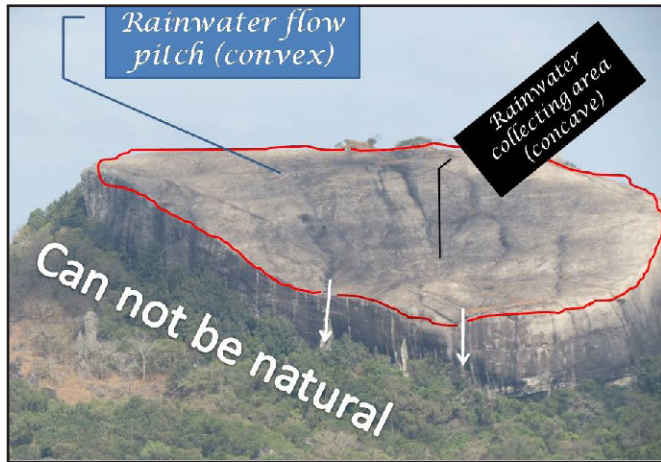


Fig. 2. Pidurangala Rock – Ancient Rainwater Harvesting

the gardens and providing water to ponds and fountains. This need must have been fulfilled by constructing a rainwater harvesting system close by. The top face of the Pidurangala rock breaking the natural shape and converting to a runoff flow pitch, can be believed to be the source of water to the Sigiriya kingdom (Fig. 2).

The platform area of Pidurangala rock is about 2 ha in extent. If it is assumed that 80% of monthly rainfall could be collected from this flow pitch, the volume which could be stored monthly would be as given below. For this calculation it is assumed that the present rainfall at 75 % probability in DL 1b AE region, where the Pidurangala rock is located. According to calculations, at least 10,000 m³ of water can be collected from this system. What does this mean?

are presently threatened with the chronic renal disease with unknown aetiology.

Even before Vijaya arrived in the Island, the management of water resources for irrigation had been given utmost attention by our ancestors. This can be described at various levels of water management as mentioned below.

Inter-river basin management

There are 103 river basins in Sri Lanka, but some of them are very small in size. The basin area is over 1,000 km² only in 17 river basins. Rivers of these basins are: Kelani Ganga, Kalu Ganga, Walawe Ganga, Kirindi Oya, Menik Ganga, Kumbukkan Oya,

This historical perception can be rejected as a myth. However, if this system can be rehabilitated, it will be able to store annually a volume of 10,000 m³ of water for the people living around the area, who

Gal Oya, Munden Aru, Maduru Oya, Mahaweli Ganga, Yan Oya, Ma Oya, Malwathu Oya, Kala Oya, Mee Oya, Deduru Oya and Maha Oya. Most of these basins had come under the 10 ancient administrative divisions during Ravana Era . Some of these rivers are poor in water flow. Therefore the Kings had to create inter-river diversions through ‘giant canals’. Examples for such giant canals are: Dambulu Oya–Malwathu Oya diversion canal (860 AD); the Malwathu Oya–Kanadara Oya diversion canal (860 AD); and the Yoda Ela–Nachchduwa feeder canal (540 AD). Remnants of these giant canal can be seen even today (Fig. 3).

Inter reservoir water management

They found that some reservoirs could not be fed by their own catchments, but they still required them for a particular purpose. Thisawewa was built to irrigate paddy tracts of Ancient Anuradhapura Kingdom, and also to replenish the groundwater reservoir under the city. They also build Basawkkulama and Nuwara wewa for the same purpose. However, catchments

| Months | Jan. | Feb. | Mar. | Apr. | May | Jun. | Jul. | Aug. | Sep. | Oct. | Nov. | Dec. | Total |
|---|------|------|------|-------|------|------|------|------|------|-------|-------|-------|--------|
| Rainfall (mm) at 75% probability | 30.3 | 12.6 | 26.0 | 87.7 | 31.8 | 3.1 | 3.4 | 4.4 | 25.9 | 132.0 | 168.3 | 105.7 | 631.2 |
| Runoff (m3) | 485 | 202 | 416 | 1,403 | 509 | 50 | 54 | 70 | 414 | 2,112 | 2,693 | 1,691 | 10,099 |

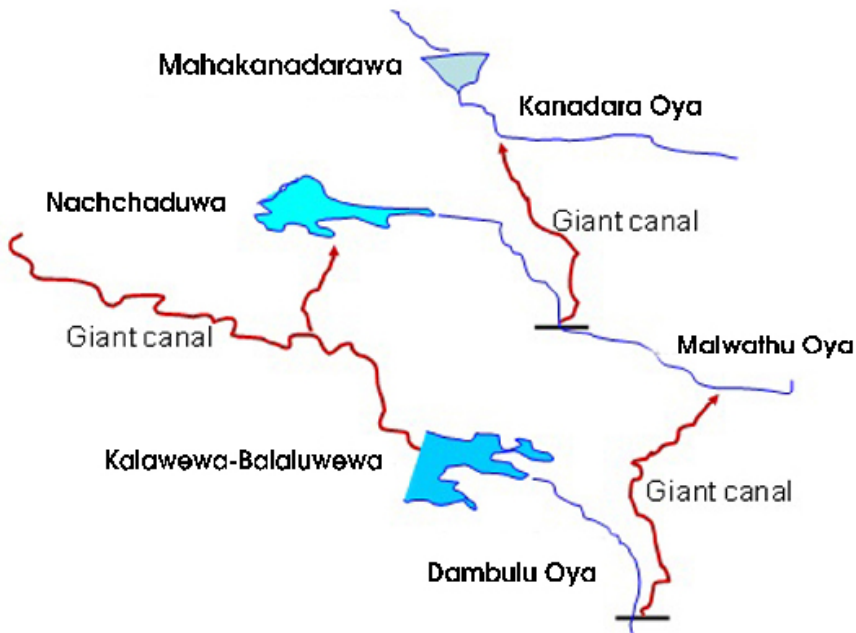


Fig. 3. Inter river basin Giant canals (Source: Brohier, 1934)

of these reservoirs were found to be inadequate to supply the required volume of water. Hence they transported water from other reservoirs such as Kalawewa, Nachchaduwa etc. through giant canals. These giant canals are the feeder canals of : Kalawewa – Thisawewa, Yodha Ela (470 AD); Nachchaduwa – Nuwarawewa (290 AD), Balaluwewa – Siyambalangamuwa (290 AD); and Basawakkulama – MahaVilachchiya (470 AD). Fig. 4 illustrates this further.

Water management among small tanks

The recurrent shortages of water for agriculture, animal husbandry and for domestic use, caused by droughts and dry spells had always been a serious natural and economic setback to the rural communities in the dry zone areas of Sri Lanka since ancient times. This is indicated by

many references to the drought hazard frequently found in the historical chronicles such as Mahawansa, Chulawansa etc. The ancient irrigation reservoirs and the hydraulic society that once flourished in these areas exhibited a remarkable human adaptation to the problems created by droughts, floods and seasonal water shortages.

There are about 14,200 small tanks and 13,000 anicuts found in Sri Lanka, feeding an extent of about 246,000 ha. This is 39 percent of the total irrigable area in the country. It contributes to the national rice production by 191,000 mt (20%).

Irrigation planning between and in the tank cascade systems was another example showing the wisdom and skills of our ancient irrigation engineers. The drainage pattern formed in the undulating topographic formation in the dry zone landscape can be classified as dendritic drainage pattern.

This ramifying nature of the drainage system has led to the formation of clusters of small tanks arranged in series, which are connected to form a system known as ‘tank cascades’.

Existence of small tanks in a cascade pattern is an advantageous feature in many ways. Surface water bodies spread over an area can maintain the groundwater level closer to the land surface at least in lower portions of the



Fig. 4. Inter-reservoir giant canals

minor basins. It can be postulated that the absence of such a branched system of tanks could have led to a rapid depletion of groundwater due to the effect of the natural gradient of the drainage system. Therefore, if there were no tank cascade systems, the natural vegetation that could be seen today would not have been in existence in that same composition with deep-rooted large tree species appearing in various positions along the catenary slope.

Upper tanks in a tank cascade system act as buffer reservoirs to absorb flood-generating rainfall, which would otherwise cause the breaching of lower tanks. Similarly, these upper tanks are buffer reservoirs to supply water to the lower tanks when they are short of water to save the crop. Since these tanks exist not in isolation but as clusters, and are hydrologically inter-related, high level of water resource management and planning skills of individual tanks would be necessary to avoid conflicts in resource management among them.

Sustainability of the traditional tank cascade systems had been maintained in the past not only in relation to structural maintenance. Each and every component of the eco-system was given due consideration. The attention was paid not only to sustain macro-land uses such as paddy land, settlement area, chena lands, tank bed etc. but also to micro-land uses such as *godamala*, *ismetiya*,

gasgommana, *perabana*, *kattakaduwa*, *tisbambe*, *kiul-ela* etc.

Water management in paddy fields

Use of groundwater for irrigation was not a practice in ancient times. Their entire effort had been to innovate techniques for irrigation through surface water. Groundwater had been kept to maintain the vegetation around them and abstract water



in a very critical situation caused by drought. In responding to a drought situation people found water on river beds and in natural depressions, when digging down to a certain depth. These were temporary works. Once the drought was over, they neglected these water holes. However, they have used groundwater efficiently to protect their environment and in paddy farming. The people in the past retained a certain volume of water in the tank, which was not used for irrigation. The area called '*mada kaluwa*' (presently known as dead storage) stored water below the irrigation sluice sill level to be available during the dry season of the year for several purposes. They wanted to allow

the fish population to continue their life cycle, trees around to survive, cattle to drink and people to use for washing clothes and sometimes for bathing.

The argument that can rise that our ancestors had never used groundwater for paddy cultivation, is not acceptable. They used groundwater for paddy farming without exploiting it. In the past farmers cultivated paddy only in poorly drained lands, where the groundwater table was very shallow during many months of the year. This type of field is known as *purana wela* (old field).

If the groundwater table is less than 50 cm in depth, the surface soil is moist enough to raise the paddy crop. They provided irrigation water only when they experienced a very dry maha season. This is one of the reasons why they could cultivate paddy in yala season from the tank water remaining after maha season.

Bethma govithena:

After maha cultivation the community had to decide whether to go for a yala cultivation or abandon the paddy tract without cultivation due to shortage of water in the tank. In some yala seasons water is available but not adequate to cultivate the entire paddy field. In such circumstances people take a decision to cultivate a portion of the area, temporarily redistributing among farmers a part of the command area. This cultivation method of dividing the land is known as *bethma*.

Thavulu govithena

Sometimes when people realize that the forthcoming maha season is anticipated to be very poor, and the tank has no water, they decide to cultivate the upper part of the tank bed called *thavula* or *thavalla*. Farmers fenced the *thavula* area and constructed a bund along the lower boundary of the *thavula* called *maha niyara* (master bund). This bund was meant to collect and retain the limited rainwater or runoff received and to prevent sediment moving to the tank bed. Usually farmers commenced this cultivation in early November targeting the harvest to be available before the New Year ceremony in April. The tank bed soil is very fertile with high organic matter content.

'Kekulama'

Farmers had various indicators for foreseeing the forthcoming maha season rainfall. One was the '*binara kaluva*', coming in mid September. If *binara kaluva* brought a good shower, they start dry sowing their paddy fields with the residual moisture. This is because they knew that the maha season would not provide much rains to fill the tanks. This indicator was found to be true when we analyzed Maha Illuppallama rainfall data. Figure below illustrates the variation of maha rainfall with September rainfall.

'Karahana'

This water distributing device is said to be the oldest in the world used for controlling field level irrigation water. The device was made of a wood log which had two weir shape cuts of different sizes in depth and width. It diverted the flow in two directions with different discharges to feed two different extents of paddy fields. The *Gamarala* or *Wel Vidane* had the control on it.

'Daha Ana'

The ten orders of indigenous villagers
People had ten orders to obey in the village called '*daha ana*'. It covered aspects such as water security, environmental protection, food security etc. The ten orders of the villages enforced by the village headman are as follows.

- i. *Diya paththayam thahanchiya* – The order is enforced in times of water shortages to prohibit water use for cultivation or pollute through other means (water security)
- ii. *Niyama kanneta goithen bath* – Farmers should follow the cultivation times declared by the '*wel vidane*' (head of water management) and '*gamarala*' (village headman) and '*nekethrala*' (astrologer) to avoid cultivation risks (risk evading farming)
- iii. *Gaba kola satha seepawa - Binkare wathurai aibowa* – Protect the

environment (forest and wild animals) to ensure water security (environmental protection)

iv. *Hithe ispasuwata dan-pin karannata - Petipas parane hadapan madapan* – Raise and look after well the five pets (child, calve, dog, cat, chick) to make your mind free to attend to religious activities (simple life style).

v. *Akabe webi keten - Wev amunu puropan* – Fill tanks and anicuts from rainwater (rainwater harvesting)

vi. *Ekathu pada nowi - Hari haman wedak nokaran* – Any work should be done as a group (small group concept)

vii. *Wee kuraban sambhare - Atu kotu purawan rale* – Natural disasters can cause crop failures. Thus, they should store grains for future use (food security).

viii. *Thel peni aththan - Kevum the pangngan* – To took care of being independent without waiting for external support (Self dependence)

ix. *Kem paban dena gan - Sanuhare rekagan* – The knowledge they have gained should be practiced to ensure the sustainability (Protection of knowledge)

x. *Kavi sindu ragan - Hitbata kawaddapan* – They should continue to practice their cultural traditions (Protection of culture)

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