An examination about the technology and the techniques considered on the sluice construction in the tank building of ancient Sri Lanka

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Introduction

It is an important subject to distribute the water that were collected in a tank, for the farm lands under a proper management. Water management in the sense is to distribute collecting water for needed place, in the needed quantity at proper time. For this, there could have been activated a ruling code for each tank in the ancient time. Rules about issuing of water of Tisa wewa that are shown in the Wessagiri stone inscription of King Mihindu-IV, is an example for this (*Ez*.Vol. 1:36).

An improved technique system, used for issuing of water from a tank can be seen in the tanks of Sri Lanka. This is named as "sluice" had been introduced as "*Pranalika*" in the old days (Gyger.1969:129). It is mentioned that, by King Parakramabahu, a *Pranalika*, made of stone had made in the *Parakrama Samudraya* (*Mv*..lxxix:27-8). In addition to this, in a large number of tanks, about 300 this type of *Pranalika* have been made by *King Parakramabahu* (do: 30-2). In the ancient time, in large tanks, there were two kings of sluices such as up sluice and clay sluice (*Goda Sorowwa* and *Mada Sorowwa*) and for small tanks, there were small type sluices named block sluices (*Keta Sorowwa*). In addition to this there had been some kind of sluices named "*Rajmohal*" mentioned in the Wamsakata(Literary sources) but no evidences to identify that (*Ez*.Vol.1:36).

By this research report, attention is paid for the sluice building technology and those techniques of the ancient Sri Lanka.

Research problem

The research problem of this study could be identified as to realize what is the intentional factor about technology and techniques paid attention for sluice making in the tank building of ancient societies of Sri Lanka.

Methodology

The study method was prepared, based on the evidences about ancient sluices, came across by the researches done in the dry zone and allied zones of Sri Lanka, the physical findings, identified by Archaeological excavations, done in such places and the news included in the researches.

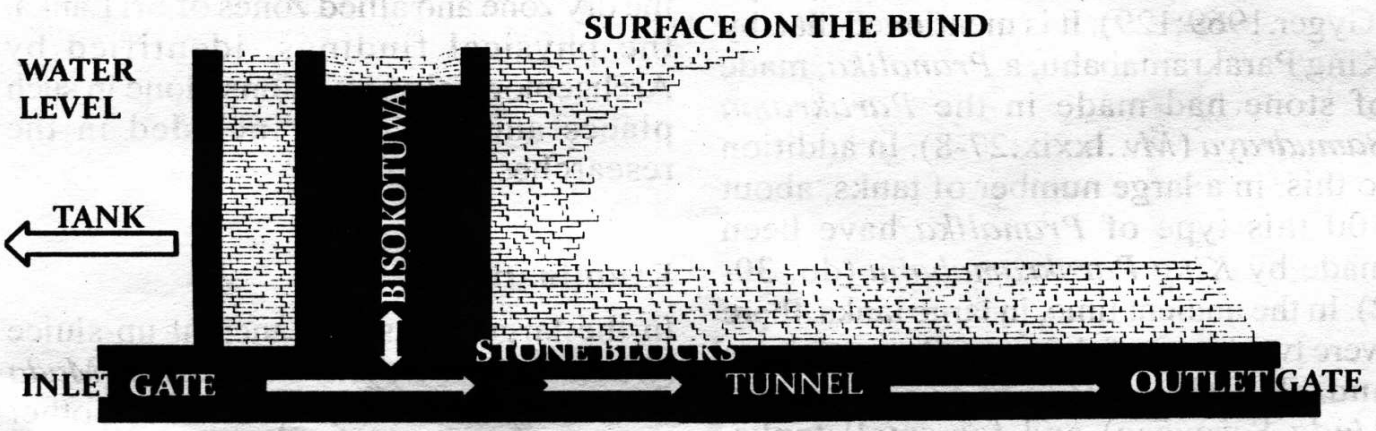
Examination

In the large tanks, the ancient up sluice (*Goda Sorowwa*) and clay sluice (*Mada Sorowwa*) are mostly equal to each other and the only difference is the clay sluice is situated very close to the tank bottom in a low part of the bund and the up sluice is situated at a central point of the bund. From these two sluices, water was released in to the farm lands of different

elevations in to each other. For the more distance and high level paddy lands by up sluice and for the paddy lands close to the tank and lower the tank by clay sluice, water could have been released. Evidences are found for having two up sluices and one clay sluice in the *Panda wewa* -a large tank of Deduru oya valley. There are evidences that the *Parakrama Samudraya* had many such sluices. It can be thought that one up sluice and a clay sluice had placed per *Talagalla* and *Hatigammana* wewas of Deduru oya valley.

According to the evidences, collected by the researches, a many of special parts of a sluice in the large tanks could be identified as follows.

1. The stone bed constructed for preventing washing out, near the sluice.
2. The inlet tunnel, bringing tank water in to the *Bisokotuwa* (A device, fixed in to the inlet gate to slow down the water pressure and release it in to the out let gate).
3. The stone cover fixed for preventing the erosion of the part of inside the tank of sluice.
4. The brick cover, made so as to resist the water pressure.
5. *Bisokotuwa*.
6. The brick cover, applied for resisting the water pressure and for preventing water leak in to the bund.
7. The brick cover, that is made to resist the pressure of outlet tunnel from which the water carries out from the *Bisokotuwa*.
8. Tank bund.
9. Outlet tunnel that tanks out the water of *Bisokotuwa*.
10. The stone layer made for preventing wash out near the outlet gate.
11. Outlet gate.
12. Stone blocks fixed to the floor.



SECTION OF THE SLUICE

All these parts are protected well in the old sluice, taken out after excavation of the *Bhu wewa* of Polonnaruwa. Of the sluices relating Panda wewa also are similar to these but, some parts are likely destroyed. It is clear that because these two tanks are belonged to the Parakramabahu ruling period, they are in equal features.

"*Bisokotuwa*" is the main technological part of a sluice which was very important for a best water management of the ancient irrigation. When the water capacity of a tank becomes high, a great pressure becomes to the tank bund through that. When opening the gate to take off this water, it makes a great pressure in the sluice tunnel. To control this situation, the technical device entered to the tunnel way is the *Bisokotuwa*. First the tank water in a normal pressure enters in to the *Bisokotuwa* through inlet tunnel. Because of the space inside the *Bisokotuwa*, water goes up spreading and then the pressure becomes low. Finally the water, comes out from the *Bisokotuwa* is a low pressure water. Hence, having a control of outlet water, the tank bund and the sluice are protected.

Bisokotuwa is a creation like a deep box, in the shape of square or rectangular. It proves that the *Bisokotuwa* of Anuradhapura period was like a box in a rectangular shape, from the ruined old *Bisokotuwa* that were placed at *Magama wewa* (Urusitu wewa) near Embilipitiya of Ruhuna, *Yoda wewa* of Tissamaharama, *Katagamuwa wewa* of Yala sactuary and *Wahalkada wewa* near Padaviya. This shape seems square in the Polonnaruwa *Bhu wewa, Parakrama Samudraya and Panduwasnuwara Panda wewa.*

Three parts of *Bisokotuwa* is fixed in to the tank bund and only a one part is built so as to face the tank water. For constructing *Bisokotuwa*, well made stone (boards) flanks have been used. *Bisokotuwa* is not been direct fixed in to the tank bund and around that a brick cover is created. The purpose of this is to stop *Bisokotuwa* water leaking in to the bund and to minimize the damage from the Bisokotuwa water pressure to the tank bund and *Bisokotuwa* itself. Only for the side facing water, the stone boards are used but for the space between stone slab and the *Bisokotuwa*, a brick cover has been made. This method is very clear from the *Bhu wewa Bisokotuwa.*

When examine the up sluice (*Goda Sorowwa*) of the south bank of Panda wewa it clears well that the out stone cover if *Bisokotuwa* is well fixed. It can be identified from the *Bisokotuwas* of Bhu wewa and up sluice of Panda wewa that, to prevent removing the stones each other, the deep cuts have been cut in the stone boards and the other stones are fixed in to the cuts. The tunnel, through which the water incoming and out going is completely made by joining flat stone boards each other. The tunnel way from the tank in to *Bisokotuwa* is not so long but the out let tunnel way from the *Bisokotuwa* is more long. The out let tunnel way of Panda wewa up sluice is in a length of 26.45 meters. That tunnel is completely laid under the tank bund. The brick cover, that has covered tunnel ways of Maduru oya and Bhu wewa, could have been put up for the other old sluices also. This brick cover controls the leaking of tunnel water in to the bund and some other pressures of water.

Every sluice could have had a gate to open and close it when needed. But there is no any evidence for this so that this gate may have made of wood completely, can be thought. This gate could have set near the hole of the out let tunnel way in the *Bisokotuwa*. The reason for this can be,

controlling the out let water is more successful than controlling inlet water. Because of this, when the gate has been closed, even from the water of *Bisokotuwa*, an extra power can be received to fix the gate. Evidences for putting the sluice gate in to the drains, cut on the stone, are clearly found from the *Bisokotuwa* of Bisokotuwa wewa situated near Godakawela. But such evidences are found only here. So, it can be thought that in the other tanks, inside of the *Bisokotuwa*, a wooden frame have been used to fix the gate. Inserting the wooden gate in to a drain, that is cut from up to down through two tall pillars relating the frame, placed on the both ideas of the cross cut with the hole, that takes out the water through those drains, by lifting and putting down the gate, opening or closing can be done. Any device should have been kept to open the gate and to kept it so. This gate could have been made so as to open and close being on the surface of the *Bisokotuwa*.

With the pressure, while entering and releasing water of the sluice, the land near by the gate can be erosed. To control this condition, a stone layer has been put up on the places where, water enters and goes out, of the sluice. Such creations present in the *Kalawewa* and *Ruhunu Magama wewa* clears that this is a technique method came from the Anuradhapura period itself. Such creations, were in the *Bhu wewa* sluice, belonged to Polonnaruwa period, and could be opened by the excavations. According to the scattering stone boards near the out let door of the up sluice of *Panda wewa*, it can be guessed that such stone layer had been present in this place also.

Review

When inquiring the technology and the techniques of ancient irrigation, it is clear that more improved creative methods have been used for that. By this study, it became very clear that, the technology used for building sluices, was in a very improved condition. And also attention was paid for the row - materials and the methodology, used for making each sluice. Through this, it cleared that for every build, no any similar building method and also the shape of that has been changed timely. Here, an idea about the building structure of a *Bisokotuwa* and the creating system of it's gate, has been presented.

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