

REVIEW

Ancient irrigation system of dry and intermediate zones as revealed from ancient canals

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Abstract

The ancient irrigation system was a result of experiences. Irrigation systems meet its maximum level effectively and efficiently through this experience based establishment. Role of the canal was more centric by the means of connecting people with the tanks and dams. The reason for that was the water of the tanks and dams influxes in to fields by the canals.

Many evidences about canals can found from literary sources and the inscriptions. In addition to this, records on ruined canals are available as well. When examining these data it is clear that there had been a unified irrigation system linked by canals in the dry zone of Sri Lanka. In the operational level canals behaved as veins transmitting water from one end to another end or to many ends. It was not an isolated structure that existed on earth surface, but a main part of complex system. Especially it has a inter and intra role in cultural systems - ecological systems. Operational system of canals was formed considering these same roles. In this research it is expected to do an examination about the ancient canals and their operation in the dry zone.

Key words: Water management, Irrigation, Agriculture

Introduction

When studying the origin of the canals of ancient Sri Lanka, evidence could be unearthed through inscriptions and literary sources. In the inscriptions, the canals are introduced as *Adi*^{1,2}, *Ala*³, *Alā*³ and *Ali*³. Additionally, archaeological evidence can be found through ruined canals of ancient irrigation system of the Island. Some of these canals had been reconstructed and re used and many objectives can be identified for their use. Priority had been given to, issuing of water

from a tank, turning water from a dam, carrying water through inter valleys, irrigation for agriculture, urban water supply, micro water supply, carrying water for distant places and additional water supply.

There is evidence on the use of special techniques for construction of these canals. Of them, carefulness about the topography is a very important factor. It is clear that they had paid special attention on the fields like elevation, contour system, slope, methods of getting water,

how and where to irrigate, condition of the canal and protection etc. Environment friendliness can be counted as a characteristic feature of the ancient canals system. It can be identified that these canals have given a great support, to keep the dry zone environment cool.

Theoretical Framework

Irrigation is an application in the total systems of 'settlements>subsistence strategy>technology> resource use'¹ of people. Environmental conditions become a crucial factor in defining the effectiveness and efficiency of any type of irrigation work. In the case of settlements of dry zone, supply and storage of water was highly applicable and also highly relied on. Agricultural subsistence of people is frequently vulnerable to the shortage of water supply. Ancient people employed the regional topography to store, transport and distribute water in order to avoid collapses in the subsistence. The development of the technology and use of materials for irrigation was dependent on the availability of resources.

Due to gradual development of the irrigation work, some individual roles such as village leaders, elites or royal family members emerged. With the passage of time the irrigation system became the force of cultural development in the dry zone where several systems emerged in its association. For an instance the taxation system of irrigation not only linked with agrarian system but at the other end it dealt with the administration system (including religious administration, health administration, etc.), monarchy system and social welfare systems. This background is comparable with the system theory, forwarded by Ludwig Von, in 1940. According to his theory, social activities had activated as joint systems, by connecting with each

other⁴. Emergence and development of the Sri Lankan dry zone irrigation can be studied and explained with this scenario of interconnection between its systems.

Collapse of the irrigation systems can be a possible result of the collapse of the other linked systems that existed up to the flourish of water based civilization. The main systems that joined together are Buddhist cultural system, Sinhala tradition, Irrigation system, Agrarian system, Social administration system, Monopoly system and Trade system (local - foreign). The destruction or the jungle tide came after the collapse of the Polonnaruwa civilization where, one by one, of these systems inclusive of irrigation system got faded.

Research Methodology

This study is based on data collected from field surveys. However, historic sources, modern research studies and articles on ancient irrigation technology and personal communication with resource persons who are engaged in with relevant fields referred to, formed the research background.

Geographical and Environmental Background

Sri Lanka is situated in the Indian Ocean between northern latitude 6 and 10, and eastern longitude 80 and 82⁵. Its extent is 65,610 square kilo meters and the length of the island from north to south is 432 km and the width from east to west is 224 km.

The geographical condition of the island, has directly affected to form different climatic zones. Average annual rainfall varies from 900mm. to 6000 mm. The country is mainly divided into two geographical areas as dry zone and wet zone, depending on the rainfall received. North-east monsoon is between

December and February and it brings a rainfall of about 250 mm - 500mm. to the dry zone of the country. In the wet Zone, where annual rainfall is higher than 1500 mm, reddish brown soil can be seen. This soil, which is very suitable for agriculture, has directly affected the establishment of settlements in this zone. There are 103 river valleys in the island and out of them 83 valleys are found in the Dry Zone^{5,6}.

Investigation of Ancient canals

When giving attention to the ancient canals in the dry zone, it seems preferable to investigate the origin of these canals. But according to their usage, some of them seem to be connected inter valleys. In this research, attention was paid on the ancient canals relating to Mahaweli Ganga, Kala Oya, Malwatu Oya, Deduru Oya and Yan Oya.

Canals relating to Mahaweli ganga and its tributaries

The canal, starting from Elahera dam, historically a very old dam of Sri Lanka, was the main source of irrigation for agriculture, that was needed in the mid portion of North central and Eastern provinces. It is mentioned in the Mahawamsa, that the water tax of this canal, which was collected first by King Wasabha (67-111AD), had been offered to the Muchela vihara of Tiswadaman⁷. It is proved that this Elahera canal was constructed to a length of about 48 Km in the period itself of King Wasabha, because this viharaya (temple) is situated in the present Kawudulla area. It is clear that, by this Elahera canal water would have been issued up to Kawudulla area, for many centuries, prior to the construction of tanks like Minneriya and Kawudulla. Nicholas⁸ also has put forward an idea that the Alisara canal must have been constructed before Minneri and Giritale tanks.

King Mahasen (274-301AD) who built Minneri tank, used the Elahera canal for additional water supply for irrigation. According to Rajawaliya, the King constructed Talawatu oya making dams for carrying water to the Minneriya tank through Kara ganga⁹. Nicholas¹⁰ also reported that this canal can be identified as the Talawatura oya, that runs towards the Minneriya tank through Elahera canal. It seems that this oya had been made, as a canal to join with *Elahera* canal so that needed water was issued to the Minneri tank. It is mentioned that, the Rantisa Wewa or present Kawudulla tank was done by King Mahasen⁹. Water supply for this tank, may have started from Elahera dam and reconstructed in the period of King Wasabha. Adams, Churchhil and Baily¹¹ have pointed that the water for Kawudulla tank was taken from the canal, that started from the stone spillway, placed from the east, between two stone spillways in the north part of the Minneri tank. So, the canal of the west part can be identified as the second part of Elahera canal.

Elahera canal, had been used to construct Gangatala vapi or Kantale tank and Giritata vapi or Giritale tank⁷ by King Aggabodhi II, because the main water ways of both these tanks had been based from Elahera canal. A separate water way from Elahera canal, had been pointed to the Giritale tank and this point at present is identified as the Diya Beduma. For the Kantale tank, water is supplied through the Minneri tank. Accordingly, the total length of Elahera canal can be identified as about 87.7 kilometers. Also King Wijayabahu I (1055-1110AD) and King Parakramabahu I (1153-1186AD) have reconstructed this canal.

The water of Elahera dam was issued to large tanks, as well as agricultural lands, situated in the related areas. Going through ancient investigation reports,¹¹

Brohier¹² has mentioned that, there had been many of stone water gates of sub canals, in several places of Elahera canal. Perhaps, getting water of Elahera canal for several needs, the water sent from the dam, may not have been sufficient and even at present the problem, relating to Elahera canal remain same. But to overcome this problem in the past, irrigation technicians had followed two methods. One was, to collect the water of number of natural water ways, into the lower part of the canal. According to that, the water of Kongettha oya, Heerati oya and Kottapitiya oya had been collected for the Elahera canal. To control the speed of such collecting water, large stone bunds were built, blocking the water ways near the canal. Adams *et-al*¹¹, have mentioned about many stone spillways relating to such places¹¹. The purpose of such spillways was to control the collecting water during flooding and to send it out. Though the remnants of stone spillways can't be seen at present in such places, the shape of such spillways point to that. (Figure 1)

In the other method the water collected by a dam built in the Hatthota area, blocking Kalu Ganga, the main branch river that joins the Amban ganga, just below the Elahera dam was taken through a canal and joined to Amban ganga, just above the Elahera dam. This matter had been proved by Adams *et-al*¹¹ Going through folk tales¹². Our studies too showed these folktales are true. This canal is identified as Yodhiya Bendi Ela in general use. The water of Hatthota dam, has been brought up to Elahera dam through a canal, made through hillocks. This canal is completely ruined now but parts of the canal can be identified, in the forest, relating to Kalu ganga and in Wasgamuwa forest. There is evidence that the last part of that canal joined Amban ganga. So, it is clear that water of Kalu ganga, had been taken to improve the efficiency of Elahera dam.

The main purpose of constructing the canal, starting from Angammedilla dam, the second dam built across Amban ganga, was to supply water to the Parakrama Samudra and the near by tanks. Earlier, this canal had been introduced as Akasa ganga⁷. This canal is made through the natural slope, below the Sudukanda mountain range. Brohier¹², going through the survey reports of Bleyar of 1878, explained that one purpose of making Angammedilla canal, was to supply water to Minneri tank. Accordingly, it is clear that the length of this canal is about 36.6 km. This canal has provided water to the tanks - Anavulandewa and Nikawewa on the way.

However the length of the part which provides water to the Parakrama Samudra is about 5.5 km. So it appears that the main purpose of making Angammedilla canal or Akasaganga, was to supply water to feed the distant corner of the left bank of Amban ganga. It may have been felt in the dry period and the methodology, followed by King Parakramabahu I. to overcome this challenge, was to extend the canal that started from Minipe dam of Mahaweli Ganga, up to Angammedilla dam and then join it to Amban ganga. Brohier¹² is of opinion that this can be proved, going through the hereditary facts. Observation in the Wasgamuwa forest on the right bank of Amban ganga, above Angammedilla dam, reveal facts about a canal of this type. It had been joined to Amban ganga, about half a kilometer above to the dam. But the canal is completely ruined at present.

The *Minipe* dam, is considered as a construction done by King Dhatusena, considering the natural structure of Mahaweli ganga⁷. It seems that the canal starting from this dam had mainly fed a limited area of the left bank of Mahaweli ganga in the first period. There is an opinion that the pabbtta canal^{17,8} made by

King Mahasen can be this canal itself⁵. This canal could have been reconstructed by the Kings, Aggabodhi I (511-604AD) and King Sena II (893-887AD) for irrigating the area, between Mahaweli ganga and Amban ganga, like present Wilgamuwa and Hettipola, that are proved by archaeological facts that they were land settlements by the mid part of the Anuradhapura period¹². But according to Fernando¹³ this canal had been extended up to Angammedilla. He mentions that Angammedilla dam may have been constructed to send water to that by King Upatissa (365-406AD) who built Thopawewa⁹. Fernando¹³ further says that King Aggabodhi II and King Sena II, had extended the Minipe canal up to that¹³. But initially when this canal was built it may not have extended up to Angammedilla. It is difficult to believe that the large tank like Angammedilla had been built for getting water to a small tank like Thopawewa by King Upatissa.

But there are facts that Minipe canal could be extended up to Angammedilla, under the progress of irrigation, during the period of King Parakramabahu I. By this time, the water of Amban ganga has been turned by Elahera dam and directed to Minneri, Giritale and Kawudulla irrigation scheme. So, the water could not have been received from Angammedilla dam. Hence, it seems that Minipe canal had been further extended and joined to Amban ganga, just above the Angammedilla dam and by this, the additional water may have been supplied. It is clear the elevation of Minipe areas of Mahaweli ganga and the elevation relating to Angammedilla dam had been used for that. Accordingly the Minipe dam also could have been a part of the irrigation system of Parakrama Samudra, in the period of King Parakramabahu I.

There are identified facts, to prove that the Minipe canal had been extended up to Angammedilla dam. Governor, Sir Henri Ward¹⁴ had mentioned that Minipe canal proceeded, up to Polonnaruwa. Brohier¹² had noted in his report that, this ancient canal's structure had been first examined by the surveyors Adams and Brode in 1858¹². Through the facts, obtained they have said that the Angammedilla canal is a part of the Minipe canal itself. It can be identified that this canal had been brought through the upper parts of Mandamune Oya, Heen Ganga, Dodangolle canal, Pala Oya and Wasgamu Oya. There is very clear evidence about some places of this canal but, many places have been rubbed out¹². Today, only the upper part of this canal has been reconstructed and is identified as Yakabendi Ela¹².

A dam had been constructed across Mahaweli ganga at a place called Dastota and by this water had been supplied to both banks. King Parakkramabhhu I constructed canals from this and the canal of right bank was named Gomathi while the left was known as Achirawathi⁷.

Goamathi ela, directed to East has turned up to Maduru oya area through Dimbulagala and then, up to Verugul Aru area according to evidence seen. Going through the reports of Survey General 1898, Brohier¹² explains that, this canal was a creation according to the type of land. It is mentioned that the canal spill was not more than 8 feet in height. This canal had provided water to the tanks like Yakkurewewa and Horiwila wewa¹². It is clear that this canal was constructed across natural Willu (dry grazing lands) area situated up to Verugul Aru. It can be thought that this canal way may have been constructed for controlling the water scarcity of the land, between Mahaweli ganga and Maduru oya.

According to Brohier¹², Achirawathi canal, that starts from the left bank of Mahaweli Ganga, had been introduced as Kalinga Ela, by Hue Nevil¹² and even at present, this canal is known as Kalinga Ela. When examining the usage of this canal, it becomes clear, that it had been constructed, to feed water for the area, between Mahaweli ganga and the lower part of the feeding land in to which water is given from the Parakrama Samudra and Minneri tank. On the available facts, Brohier says, this could be a canal, that went up to Trincomalee¹². The speciality of this canal is, that it lies across the Amban ganga. Because the water of Amban Ganga is completely sent at Angammedilla dam, only a small water way may have fallen to this place in the dry period. So, it can be assumed that this canal could have been taken forward, crossing Amban ganga. It seems that the extra water of Amban ganga in the rainy period, had been arranged to run over the dam spill, that is made in the canal, across the river.

This canal is made with a large bank and it's part could be seen, at Sungawila area below the Minneri oya. Residuals of this canal way, show, that a large water density would have flowed in this canal. Brohier¹² points out an idea about a large tank, that was Northward to the Amban ganga⁷. The Chulawansa had pointed out that this canal had been made, to overcome the long time famine⁷. Perhaps, it can be thought that, this canal may have been made, to supply water to the tanks, named Parakrama thadaga or Parakrama sagara, that are not clearly identified. The reason to think so is, the water density of the canal could be borne, only by such a large tank. As a result of the present settlements, this canal has been completely destroyed.

Canal ways related to Kala oya

These canal ways had been constructed to get water from the tanks and dams related

to Kala Oya, for different purposes. King Mahinda II had developed Kala wewa scheme (777-797AD)⁷ and as a solution for the insufficiency of it's water, has made a dam, at Demada oya that joins the Nalanda oya, a branch river of Amban ganga, and water of this dam had been joined to the Dambulu oya the upper part of Kala oya, According to the report of Jhon Dickson the Government Agent of Central Province, who examined the folklores on such canals, this canal way is about 6 miles in length. At present, this canal way is completely destroyed. This can be also identified as a canal, that supplied water inter valley based in the ancient times.

According to folklore, the water of Amban ganga had been released through a tunnel to Mirisgoniya oya, to increase water limit of the Kala oya. There is another story that the King Mahasen has made a canal to take the water of Amban ganga to Kala wewa, due to insufficiency of its water. Mostly it can be the canal, that was made from Demada oya a branch of Amban ganga, to Dambulu oya.

Water from Yakābemma dam, situated below the Kala wewa, was taken to the left bank of Kala oya. This canal was about 20 miles long and proceeded through an area with ancient ruins, called Sarakkugala¹². It can be thought that, water was given by this canal to the tanks Kalankuttiya and Midellawa and even at present, there are facts left to identify some places of this canal.

This canal which starts from the left bank, about 200 meters above the Alubedda old dam built in Kala oya, irrigates a large area. The breadth at the bottom of the canal is almost 5 meters. It is in folklore that, this canal, runs westward and had been constructed up to Puttalama, via present Parakramapura and Rajanganaya.

However, according to the structure of this canal, it can be assumed that water had been supplied to the tanks, Siyambalewa, Wadu wewa and Usgala Siyambalan gamuwa. As for giving water to the Siyambalangamuwa tanks, its water could be joined to the upper part of Siyambalan gamuwa oya. However, from a canal starting from Balalu wewa, water had also been supplied to the Siyambalangamuwa tank. There is a belief that in the old days, for Wannihatpatthuwa of Galgamuwa province, water had been supplied from the Siyambalangamuwa tank. The facts of a large canal found from Nanneriya area could be that. Water from the old dam, found at the place named Palangala of Kala oya, was also taken to the right bank area of Kala oya. Ruins of that canal made for, could be found at several places. It is the Raja Ela in usage. This canal is a good example of systematic canal, made in the ancient times. (Figures 2,3)

There is evidence that water had been supplied to areas surrounding the river. According to Brohier¹² the canal way had been constructed following the contours of the land (Figure 4). Water from these canals was taken to the neighboring tanks, by the sub canals, joined to the mother canal. Facts about many of such canals can be identified in the Wilpattu sanctuary. Here the right bank canal can be identified as having gone to Pomparippu side through the Wilpattu sanctuary. There is evidence to show that, the Pomparippu province had settlements, before Anuradhapura period itself¹⁴. Irrigation for those settlements may have been from this canal. Brohier has mentioned that the left bank canal way runs to a distance of about 14 miles¹². Currently, this canal way is reconstructed and it gives water to the Neelabemma dam, which is reconstructed for Neelabemma scheme.

Canals, related to Malwatu oya

There is evidence that water of Nalanda oya, a branch of Amban ganga, had been used to feed Malwathu oya and the tanks of it's valley. This water had been collected, through a canal into the Mirisgoniya oya a feeding branch of Kala oya from its upper part. Then, this water had been turned by a dam, built at Mirisgoniya oya, close, to a place nearby Madatugama and directed into a large canal, starting from the right bank. This is an inter valley canal and it is known as Yoda Ela in use. Though the dam built in Mirisgoniya oya, is no more, the canal started from that, can be identified clearly. This canal is joined into the upper part of Malwatu oya, through the tanks, Elagamuwa, Korasagalla and Maminiyawa. By a canal that starts from a dam across Malwatu oya, the water is directed to the Eru Wewa and then joined into the upper part of Kanadara oya.

The purpose of this, would have been to supply additional water, to Mahakanadara Wewa built across Kanadara oya and to Mahagalkadawala tank. In addition to that, for tanks like Kattimuruchchana, Meewellewa, Pallankulama and Nochchikulama that are situated between them, water may have been supplied through this canal. There is a belief, that Yoda Ela, supplied water up to the northern area of Malwatu oya. This could be accepted as true since Kanadara oya, situated below Mahagalkadawala tank, received water from this canal. The founder of several tanks of Malwatu oya valley, including the tanks Mahakanadarawa and Mahagalkadawala was King Mahasen (270-301AD) and it could be accepted that the founder of these canals was also the same king.

It is clear that the main purpose of collecting the water of Nalanda oya to Mirisgoniya oya, had been to increase it's

water density and through that to increase the amount of water to the Malwatu oya. Additionally water supply needed to Kala oya also could have been given. So as Kala Wewa gets additional water, large amount of water could have been supplied to Anuradhapura through old Jaya Ganga from Kala Wewa. It can be identified that the river valleys of Mahaweli, Kala and Malwatu had been joined each other by this canal system. But it is sad that, this great canal system had been completely destroyed, because of the present Mahaweli scheme and the settlements.

Water supply to the ancient city of Anuradhapura had been from Malwatu oya through canal constructed. At the starting point of present Halpana ela evidence of the ancient canals could be seen. Of these the left canal which is visible even now had been constructed through Mahaweli and Jethwanaramaya. (Figure 5)

It can be thought that the additional water, needed to Anuradhapura main city could be received from the Malwatu oya, with the help of this canal. In addition to this, two dams have been built to supplying Malwatu oya water to the Yodha wewa and Aakattimuruppu tank, situated near Mannar. Of them, the canal starting from Pilmadu dam to the Akattimuruppu tank is named as Yodha Ela and the canal, beginning from Thekkam dam for carrying water to the old Yodha wewa, is named as Aalawakka ela⁵.

Canals, relating to Deduru oya

Evidence for existence of many canals connected to Deduru oya could be seen. These canals had originated from Deduru oya owing to the constructions of many dams and these canals had supplied water for irrigation in these areas.

Water had been received from Alawala ancient dam, built by blocking the Kospotu

Oya, a main feeding waterway of Deduru oya, for the South area of Kospotu oya. Evidence could be identified that, the water turned from the Kimbulwana dam, had been issued for the south and left bank itself. A little of this canal way can be identified but, at many places the canal way, have been turned into paddy fields and at other places have been destroyed due to natural and human activities. Even of the tank, named Gal wewa, only the large tank bund is seen at present. Because the water gate built between two stone rocks was destroyed, this tank has been ruined.

A big volume of water, collecting in this dam, had been carried through the canals of its right bank. Through this canal, water of Kimbulwana oya had been taken into the ancient Tilagullaka vapi, (Thalagalla tank) situated beyond 10 kilometers. This tank, built in the Anuradhapura period is a large one but, currently it is completely destroyed. According to that, at the time this dam was created., the water of Kimbulwana oya first flowed into Talagalla Wewa and the spilled water when through the canal, named Talagalla ela again to Deduru oya.

The dam constructed across Hakwatuna oya had supplied water only to the left tanks. The canal known as Yodhaya Pital had been constructed in a special way to supply water only for one bank.

This canal runs through Wanduressa, Galketiya and Thammennagama and after the Magama paddy land joined the natural water way, named Balla ela. The residents say that even in 1950, this canal was seen well and even the stone pavement, constructed to stop the washing out of the canal bund, had been present. But due to settlements, this canal too had been greatly destroyed. Another view is that, the ancient Tilagullakavapi or Talagalle ela had been irrigated by this canal.

The canal that took the water of old Dooradattika dam is, now named as Kap ela. This canal starts from right bank, and proceeds about 300 meters North wards and then runs turning to North west a little. Kap ela had been connected to Palugas ela. The former was connected to Deduru oya and was nearly 6m in depth at the starting point.

The main objective of building the dam Sukara Nijjara or old Ridibendi ella was to provide water to the Magalla wewa, which was made by King Mahasen and later reconstructed by King Parakrambahu I.

There is evidence that, water had been received for both valleys of Deduru Oya from the canals, believed to have situated relating Polonthalawa, Deduru oya right bank and Wilagama left bank, about 10 kilometers from Nikaweratiya. At present, this is known as Yodha ela. There are evidences that the water, taken from Yodha ela was carried first to Kollandaluwa tank and then that water was sent, to Pallama tank through the canal.

Because of this canal, the small tanks also could have been filled and the cultivation in the area, would have been successful as a result of rising underground water level. It can be decided that while this canal was proceeding up to Pallama tank, it had provided water for the old settlements situated at present in Polonthalawa, Kadigawa, Welikela, Magurankadawala, Teiyādalawa, Kollandaluwa, Pankuliya, Watupola, Thorawatawana and Maduwakkulama. Kadigawa had been fed by old Yodha ela, and it runs through this area at a distance of about 1.2 km away from Deduru oya. In this area, the top width of the canal is about 10 meters and bottom width is about 4 meters. So it can be assumed that a large capacity of water, had gone in this canal. There is clear

evidence of field channels in which the water had been taken from the main canal, for cultivating the farm lands. Three such field channels could be identified, in the left and right bank. The top width of a field channel is about 3 meters and the bottom width is about 1 meter.

At present, the canal of left bank is introduced as Thammenna ela. Though the starting point of this canal is covered with forest, still it can be identified clearly up to Wilagama Wewa. Two banks of the canal appear well in form and the bottom seems flat in shape. The distance between the two banks at the top is about 6.50 meters and the bottom about 3.20 meters. According to the type of canal, it is clear that this is an artificial one. The water obtained from this canal, may be less in capacity, according to the size and the type of it. This water, first flowed into Wilagama tank and then to several other tanks below that. Evidence is found that Upakela Wewa, Geekiyan agedara wewa, Talanpola Mahawewa and Getulawa Wewa had taken water from this canal.

Canals related to Yan oya

The development activities in the Yan oya valley had benefited much from canals. Ilukwewa dam that was situated below Huruluwewa supplied water through canals to the left bank of Yan oya.

The present canals also are lying through that. According to folklore water from the dam, built in Yan oya at Habagama area, was given to a large pond, situated about one mile apart from the south area of the oya. This pond was situated near a land named Brahmanaya kanda which is now known as Makarayavila.

The ancient Yan oya dam is situated about 4km above the Horowpothana-Trincomlee road.

The canal, starting about 35 meters above the dam, runs to the jungle, being aside from the oya, can be identified. Clear facts could be identified to prove that there had been ancient settlements in this jungle. Ruins of old temples, land areas with broken pieces of pots and tanks that are ruined could be seen. The object of this old dam could have been to supply water for such settlements.

By the ancient dam of Yan oya found at the end of Wile wewa, water had been supplied to the left bank area. Remnants of this canal are still seen and is known as Yodha ela among residents. This canal has provided water for a number of large tanks situated at the left bank of Yan oya. Wara wewa, Pothanegama wewa, Hambaregama wewa and Maha wewa are among them. The main object of building this dam could be identified as to supply water to a large tank, situated at the Mekichchawakatuwa, an ancient village, adjacent to Habagama. It is the last one of above mentioned tanks.

By the ancient dam, built by blocking the Yan oya at an area close to Wahalkada tank, water had been taken only for its left bank. Evidence for the canal can be seen about 20 meters above the wall. But, according to, Vikcvor, there was a canal in the right bank of the oya, about 14 chains above to the dam and it again joined the Yan oya, about 10 chains below the dam. He says that, no any other canal was found, joining to that and perhaps it may be covered with soil¹⁵. But no facts were found in this study, to prove the idea of Vikcvor. So, it can be thought that he has questioned, that a part formed by erosion of the oya was the canal. It is clear that by the canal, identified in this study, water had issued to a large land of the left bank, which was unable to get water from the Wahalkada tank.

Canals, related to Ma oya

This canal that originated about 100m away from the dam had supplied water to an agricultural area that was known as Makandura paddy lands. Cultivation of these lands had been initiated during the reign of King Parakkramabhahu I.

Technical devices

When examining the ancient canal ways, the character that could be mainly by identified is, that canals were designed to match the environment. Even though at the start of the canal it takes an artificial look, after it runs a little distance begins to resemble a natural canal. This is because the ancient canals were constructed following the natural slope and the contour system of the land. Natural bends, islands, rocks and falls were created on the way of these ancient canal ways and these could be identified when looking through the canals like Elahera and Angammedilla

In many places, the dam of the canal is built only on one side, so as to protect the lower side of the land. This dam in some places is about 9-10.5 meters high and when the slope of the land is more, the height of the dam too had gone up. In some lands, where even both sides of the canal had been raised up and by that spreading of the water from both sides at unnecessary places had been controlled. It can be seen in ancient canal ways, in several places, water spreading lands (*Pitiya*) and spillways made of stones. The purpose of this, had been, to protect the canal walls from pressure and erosion, owing to extra water, that could be collected into the canal during the rainy time and through that to protect the farm lands and settlements below that. Brohier says that the length of an ancient stone spillway, built in the Elahera canal way,

was about 15.2 meters¹². He further states that strong stone bunds had been put up to stop the damages from water that flowed from the upper areas to the canal.

Conclusion

When studying ancient canals, it became clear that the main objective of making them was not only to supply water to a tank, but also to feed water, direct to the farm lands. While examining the relationship among the tanks that were mentioned earlier in the paper, it became clear that the tank was always kept creative, due to support of canals and the dam. According to the sizes of many tanks and the number of farm lands that were fed by them, it appears that there would have been insufficiency of water capacity to irrigate farm lands. As such a constant water supply had been given to those tanks to overcome this deficiency. Because of the ability to issue the full requirement of water, needed for farm lands, there may not have been bare lands in ancient times due to scarcity of water like now. The large tanks fed by dams could have been needed as water stores and because of the ability of supplying water from them to the neighboring small tanks through the canals, the farm lands under those small tanks may have been cultivated successfully.

Due to constant water circulation among the dams, canals, tanks and farm lands during the period in which the irrigation systems were creative and coupled with absorption and transpiration of water the areas would have been cold. Further, because of water absorption, the underground water level was also at a higher level, than now. This situation helped to create jungles and to grow long time crops and at this time may have experienced a suitable climate and environment for the people to live in the

dry zone than at present. As a result the economy of the country was good and also had created a self sufficient life style for the people.

Some canals, relating to ancient tanks and dams have been reconstructed so as to protect the ancient structure. These canals made according to the new engineering methods could resemble the ancient canal ways that have been destroyed. The new canal ways, relating to the dams like Elahera, Angammedilla and Halpanu of Malwatu oya can be identified, made again through the old canal ways. But damages have occurred because of present canal way, for the Yodha Ela, starting from Kala Wewa, and the Yodha Ela that carries water from Thekkam dam of Malwatu Oya and also at some places in the ancient canal that carried the water of Deduru Oya to Magalle Wewa. This study has shown that many tanks, dams and canals had been destroyed mainly due to settlements. An example for this is the destruction of ancient Kalinga Ela that is starting from a dam of Ambanganga.

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Figure 1. Part of ancient canal beginning from Elahara dam



Figure 4. Right bank of canal that commence from Neelabamma dam of Kala Oya



Figure 2.
Canal from Kala Oya at its starting point



Figure 5. Ancient Halpana Ela that commenced from Malwatu Oya



Figure 3. Ancient canal that commenced from Kala Oya.