Small Tanks Cascades as Development Units in the Dry Zone

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[A nation's history is there, not for memorizing dates and events; it is there to interpret past events and their consequences to draw useful lessons to complete on-going work better and to project future activities still better.]

As defined by the Irrigation Department, small tanks are those, which irrigate land extents of 80 hectares or less. Systematic studies so far undertaken, among others, Tennakoon (1974, 1986) and Panabokke (1999) have revealed that there is a tank for every 1.5 sq. km. in the Rajarata. Panabokke's study (1999) further reveals that there is a similar density of tanks in the northern part of the Kurunegala District as well. According to the same study, there are about 15,500 small tanks in the Dry Zone and approximately half that number of tanks remain either dilapidated or abandoned.

Small Tank Cascades

The north central Dry Zone lowland is not so flat as it is generally believed to be. Starting from the Matale Foothills, its ridge-and-valley topography extends northeast, north and northwestwards in a fanlike formation. With increasing distance from the above mentioned foothills, the ridges of this topography become narrower and narrower at their bases, low in elevation, increasing frequency of dissection and forming into small hillocks and finally making themselves in to low earth mounds before they disappear in the northeastern, northern and northwestern littoral belts. With the declining stature of these ranges away from the Matale Foothills, they hardly deserve to be called ranges or ridges. In fact in common parlance on the north central region they are identified as 'heennas'(earth mounds), except in places where they have prominently projecting peaks (e.g. Gommalewa Kanda. Mihintala Kanda, Labunoruwa Kanda etc)

The valleys in between them, near the Matale Foothills are narrow and deep, but in their outward movement in between the ridges, they become shallower and shallower as well as wider and wider to end up in the undulating landscape in the central zone of the great north central plain. Near the Matale Foothills, these narrow valleys offer relatively a few places for the construction of tanks. The few tanks constructed there, are significantly deep containing large volumes of water but downstream command areas of them are highly restricted by the terrain.

When these valleys reach the undulating land with innumerable seasonal streams that join them offer many suitable locations to block them and construct tanks. These seasonal tributaries falling in to these shallow valleys take their rises in the summits of the ***'heennas'***.

An ephemeral stream taking its rise from a 'heenna' finds its way through the bottom of the valley that it occupies and flows downstream until it reaches a major water course (stream) of a subwatershed. In to this ephemeral stream, there flow many small ephemeral streams, taking their rise from the nearby slopes of the two 'heennas' which run parallel to the valley separating it from the other parallel valleys. These side-slope streamlets are highly seasonal. They are so short-lived, that they disappear almost with the cessation of rain.

For easy exposition, let us call the larger ephemeral stream that passes from an upstream point to a downstream destination such as an **oya** or a large reservoir, the **main axis stream**. Those, which join it in the course of its downstream travel, are the **side-slope tributaries** or the **elas**. These streams offer suitable points to construct earth dams across them and form tanks, **main axis tanks** and **side-slope tanks** respectively. The former type of tanks are larger than the latter types. **The main axis tanks** are also referred to as **village tanks** because invariably there are permanent houses in their vicinity. Thus, the general picture is that there is a chain of tanks in the main axis valley with the side slope tanks on either side of that valley. These side slope tanks are generally in clusters around village tanks in the main valley. The side slope tanks belong to the residents in an around the village tanks. The whole catchment area in which all these tanks – main axis tanks (village tanks) and the side-slope tanks are located – is a cascade. Thus, during a rainy season one would see, that, while water is cascading down from the uppermost tank in the main valley from one to another, water also cascade from those side–slope tanks either in to the nearby village tanks if gravity permit so to happen or on to the main axis stream at the bottom of the main axis stream. The uppermost tank in the main axis valley often bearing any one of these names – **Udagama, Udugama, Ihalawewa, Ihalagama, Udangawa, Kandegama or Galkandegama** – denoting its location.

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All these cascading tanks from the head-end of the main axis stream to its final destination and those side-slope tanks gathering their supply of water from the water divides of 'heennas' and downwards, constitute a single network of flows in the entire cascade. These cascades are of varying length and breadth in keeping with the local topography. A small cascade can be a one, which is, 3 to 5 miles in length and 2 to 3 mils in width. Relatively large cascades vary from 10 to 15 miles in length along the main axis stream and 4 or 5 or 6 miles across the valley at its widest point. The Rajarata alone has 457 cascades (Panabokke 1999). The number of village settlements in a cascade can vary from 5 to 10 or even more.

Generally there are two types of side-slope tanks associated with a main axis tank (village tank). The first category comprised of those very small tanks constructed upstream of a main axis tank, but on side slopes, only a few hundred yards away from, and upstream of, the upper shore-line of those main axis tanks. They are not very many. At most, there can be 2 to 3 of them upstream of a main axis tank and some upstream tanks may have none at all. They were constructed as silt-trapping tank, which, in the local parlance are ***kulu wew*** so that silt brought down in solution, suspension and dragging consequent to sheet or gully erosion following torrential down pours is deposited in them as sediments and relatively clean water is allowed to escape leisurely to the downstream main axis tank.
The second category of side-slope tanks are located on the side-slopes of the valley, but at some distance downstream of a main axis tank. When the main axis tank is full, excess water can be guided from its spill(s) to these side-slope tanks. While a main axis tank impounds these side-slope tanks with water, they in turn, become feeder-tanks, for irrigating in some field stretches down stream the main axis tank, in situations where the main axis tank runs short of water for irrigation of its own fields. When the main axis tank is unable to meet the domestic water needs of the village community in association with the main village tank it is these side slope tanks which meet at least some of the villagers' domestic water needs such as drinking, bathing and washing.

It is to be noted, that, while many upstream tanks release water to a main axis tank down stream, that main axis tank too releases water to chains of side slope tanks, down stream of that main axis tank on the land sloping to the axis stream in the valley bottom. This particular network of tank to tank irrigation, in keeping with the gravity guided water flows in a small basin, that is, in a cascade, does not appear to be purely an accidental occurrence but an outcome of careful tank construction based on proper hydrological observations and planning a gravity-guided flow from tank to tank, fostering a frugal system of water and land-use together with the necessary environmental considerations.

The ancient irrigation engineers appear to have realized the importance of tank networking for frugal use of water to get the maximum possible use of water received from highly seasonal and limited rainfall. This statement can be substantiated with references to many historical records. However, this important consideration remained side tracked from the early 19th century to the present day.

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Maintenance of Tank Network Ignored

Ignoring network development of cascading tanks is a disease that commenced almost with the British occupation of this country. Our irrigation policy makers and planners have not been able to fully, get rid of this paralytic disease. There is ample evidence that can be fished out of the British administrative records themselves to reinforce this argument. A case in point is, **Manual of the North Central Province** written in 1899 by **R. W. Levers** a veteran Government Agent of the same province, who held that position for 6 years in 3 spells during the last two decades of the 19th century.

It could be seen in this publication at least three reasons for ignoring the restoration of cascade-based tanks in their network entirety. First is the systematic and careful efforts launched by the British administrators to make the villagers believe that tanks are meant for irrigated paddy cultivation only and that all energies should be directed to reach that end. As profits were uppermost in the minds of the British administrators coming from a region of trading nations, they found that among all crops grown, paddy is the easily taxable commodity. During the early period of British administration in the Rajarata, the administrators were aware that a grain tax collected from paddy cultivated largely for subsistence was inadequate to meet administrative cost incurred in the district. Still, they wanted to collect whatever possible revenue to reduce administrative costs. At times the grain tax imposed on paddy was as high as 1/10th of the harvest. There also have been changes in the tax collection in grain to cash collection and then back to grain collection stating that villagers found difficult to pay tax in cash. This may be partially correct, as the villagers were not accustomed to a cash economy. But the untold part of the fact was that the British desired to revert back from a cash tax to a grain tax, as large quantities of rice were required to feed their local military recruits for defence and power consolidation.

Not that the British administrators were not interested in taxing other dry grains widely cultivated in this province, but they were cultivated in forest clad isolated *chenas* in which monitoring systematic tax collection from such crops was found to be extremely difficult. Even an effort was made to collect taxes from such crops, the monitoring costs would not have been comfortably lower than the tax returns. Hence, the choice opened to the British administrators was discouraging *chena* cultivation and encouraging irrigated paddy cultivation, the monitoring of which was easier than that of the *chena* cultivation at the times of tax collection

Considering all these, the British administrators followed a policy of : (a)

discouraging *chena* cultivation under a controlling system introduced with the issue of *chena* permits, which, in any case, was procedure-wise not easy for the ordinary villagers to follow successfully; and (b) encouragement of villagers to use every available drop of tank water for irrigated paddy cultivation expected to be of least cost to the administration.

The villagers were required each to work for a minimum number of days (30 days per year), to do all earth work in tank mending while the government was expected to provide the ordinary types of sluices to be fixed to the village tanks by the villagers themselves.

In placing sluices in the tank embankments, the need for a 'dead storage' of water in them was ignored particularly during the 19th century and the British administrators saw to it, that, the sluices are replaced or newly constructed to facilitate the complete draining out of tank water for irrigation. Either ignorantly or unintentionally, the inter-relationship of cascades had not received due consideration and each small tank came to be considered an individual entity with water in it irrigating a certain extent of paddy land downstream of tank. There is no convincing evidence of British administrators' concern about the use of tank water for several social, cultural and environmental development considerations.

Secondly, the British administrators propagated the idea that if some water is to remain in the tank as a '*dead storage*', that it is of no economic use to the village. It was Robert Knox, the English prisoner in the Kandyan kingdom from 1657 to 1679 who expresses this view as follows:

> *These ponds in dry weather dry up quite. If they should dig these ponds deep; it would not be so convenient for them. It would indeed contain the water well, but would not so well nor in such plenty empty out itself into their grounds.*
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> (Knox, 1681 : 135-136)

This gained acceptance of the British administrators in the 19th century. '*dead storage*' itself is a derogatory term that the colonial rulers appeared to have deliberately used to a much treasured '*live storage*' of water in a tank during the dry season and without that water human and all forms of other lives in the dry zone would have been impossible. This is simply telling the farmers that it is useless for you to have stored water in your village tanks and that you should release all available water in tanks to irrigate paddy fields downstream and secure good harvests to pay grain taxes in full as government dues.. Thus, during the period of early British administration, sluices were repaired but no effort made to desilt tanks to hold water as *dead storage*.

The third reason which lead to the way in which the colonial rulers went about 'improving' small tanks, repair and maintenance was a complex one. It resulted from the abolition of **Rajakariya** – the system of providing free labour during a certain number of days (about 30 days in a year) or a certain measurable volume of work for construction or repair of village roads, reservoirs, canals etc. The immediate consequence of the abolition of **Rajakariya** was the discontinuation of annual silt removal carried out in village tanks. Under this service system, the volume of earth to be removed from a tank and heap on tank embankment was determined in advance every year. Then, the individual volume of earth to be removed by the individual villages was determined in proportion to the extent of irrigated land that each individual held in the old field (mahawela) downstream of that tank. Each farmer removed due volume of earth from the tank bed and used that to mend the tank embankment damaged either due to frequent hoofing of the village cattle or due to the other agents of erosion and damage. The possible loss of a fraction of water due to siltation of a tank was regained by this process of regular earth removal from the tank bed before the next monsoon rains arrived. The villagers viewed this particular activity as one of their bounden duties to the 'tank and field' *(Wew ta wela ta rajakariya)*.

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It was the **gamarala**, an accepted village elder who organized and monitored the **rajakariya** from immemorial times in the past. His moral obligation was to his fellow villagers and not to any government, and as a responsible person in the village, he worked together with the fellow-villagers. The villagers were spontaneously willing to follow him as he worked for the community without any dictation but in consultation with each other. His actions were not profit-motivated; but service-oriented. The colonial administrators replaced him with a new appointee, the **vel vidane**. As he was a government appointee, naturally, his obligations were to the government and not so much to the community. He was to order the villagers, on behalf of the government, on what they should and should not do. He was not a fellow worker with the other villagers in the village. He was not a leader in the community sense of the word, but a commander of the community for the state. His orders were always there to be carried out, not to be ignored. Unlike the **gamarala**, the **vel vidane** was paid for his role played in the village, not by the state; but by the villagers in the form of a grain tax which he collected as **'salaris' or 'divel'** from each individual farmer. This change of office for what ever the good reason may be, lead to the eventual disintegration of the village community life paving way for the emergence of individualism.

However, **vidane** being the pinnacle of power in agriculture in the village, had not conducive but, an imposed leadership, and at least the people were compelled to get around him as children unwilling to school. Even this leadership disappeared from the village with the introduction of the cultivation committee system during the mid-20th century. The intention was to set up a democratic form of irrigation management. This institution did not take much time to be a heavily top-down, bureaucracy where the Divisional Officer (*DO Mahattaya*) was the 'king' behind the curtain. It is ex-

tremely doubtful whether the intended democratic form of management was achieved. It has done more damage than good to the farmer-psychology.

Though the policy intention was to democratize village irrigation management, top-down directives and guidance provided, became too bureaucratic. Officials occupied the center-stage, pushing the beneficiaries to the periphery. This is not to say that all cultivation committees failed. However, those successfully long lasted ones were exceptions rather than the rule. People have started to think that 'all tanks belong to the state; it seems that government is taking the responsibility of providing irrigation water; the officials are interested in doing' so. Thus, the people have come to be in a new dependency syndrome.

Finally, there was a complete break down of tank network maintenance where the government efforts were directed to modernize small tanks as individual entities, notably during the mid-20th century and afterwards. This has not only isolated each small tank, which throughout the past centuries remained in a highly connected network of reservoirs maintained in a cascade, but also paved the ways for the appearance of a plethora of irrigation and land management problems anew. These include : (a) excessive water storage in some tanks upstream thereby starving some tanks downstream; (b) sudden release of excessive water in upstream tanks, notably at the height of the monsoon rain, placing severe stresses on embankments of downstream tanks; (c) delaying seasonal cultivation of land immediately down stream of those starved tanks ;(d) unduly increased water in a downstream tank pushing its upper shore-line further upstream causing the lower parts of the paddy fields cultivated downstream of the tank immediately upstream of that excessively water impounded tank ; and (e) accelerating the siltation of tanks. All these caused inter- and intra-village disputes associated with land and water management.

How the small tanks are viewed today?

Different people in government and in villages perceive small tanks differently, when these small tanks are to be taken up for improvement/renovation. According to one school of thoughts these are very small reservoirs with very limited storage capacities and are capable of irrigating only a few hectares of paddy lands. As government allocation of funds for irrigation development is being limited, a choice has to be made between expenditure on renovation or these small tanks and those relatively large village tanks with greater prospects of irrigating more paddy extents. Naturally, the tilt of the scale will be placed in favour of the latter where the return to investment will be greater than that of the former.

There is a second school of thoughts, which is somewhat a continuation of the first school of thoughts, in which the broad conscience is, that, often the cultivated field stretches downstream of these small tanks, there is no assured harvest every year. Owing to the limited storage capacity of these small tanks and the high rates of surface evaporation experienced in them, often the cultivated field stretches whither for want of irrigation water towards crop maturity. In some seasons, these fields remain uncultivated as well and the consequential cropping intensities are very low. If funds are generously made available, one remedy would be to enlarge these small tanks to hold more water. Hereto, the return to investments will be still low, because a tank may be enlarged by raising and extending the length of a tank-bunt, but land available down stream for asweddumization will be still limited.

The third school of thoughts, which dramatically surfaced during the last decade of the 20th century is the so called economists' view – a view promulgated as an antithesis to the beneficiaries' view that they need state support for increasing food production. This economists' view is, that, the cost of production of rice in this country is excessively high and that cheaper rice could be imported and as such, the concern has to be on the over all economic development in other more viable and promising areas making the economy strong and competitive in the ever expanding globalization and free market economy, facilitating easy rice imports with increased export earnings in the other promising sectors

It was largely prompted by the visiting experts of the international donor agencies, which, some of the local planners and economists were inclined to accept tamely. However, not all were willing readily to gulp it down as at least at present, there is increasing evidence to ascertain that there is a yawning gap (still widening) between the predominantly paddy cultivating majority of the poor which totals to any thing between 30 and 50 per cent of the country's population and those earn their living from non-agricultural occupations. The political decision makers, therefore, thus far remained hesitant to accept publicly, the suggestion of the donor agencies, as votes seem to matter to them more than pleasing the donors who proposed it.

The concept has not died altogether; its sparks remain hidden under ashes for the time being. Economists and planners need to be extremely careful of the donor agency suggestions because for any nation food security is of paramount importance.

Finally, the latest inclination of the agricultural scientists and a limited range of experts and scholars in the agricultural development related fields is, to ascertain the extent to which the small-tank irrigated farming can ensure future food security in the country. **It is their expressed concern, that, the state- sponsored large irrigation schemes though contributed to increase food production in the country , that, they are liable to fail or collapse if state aid is withdrawn in a free market economic climate where the state may be compelled to discontinue its support and even its active patronage!**

Farmers themselves will be unable to manage those large schemes all by themselves. Hence, if the state support is withdrawn or ceases to exist, these massive schemes are

liable to fail. Historically, this had been always so. In ancient Sri Lanka where the state patronage was not forthcoming, all the major irrigation schemes degenerated and finally collapsed while the small systems stood the test of time, because the technological knowledge required to sustain them was found well within the management capabilities of the beneficiary villagers themselves. Indications, therefore, are that the small village tank irrigation systems have a higher potential for their continuous existence even under difficult circumstances, contributing their shares to food security without a serious collapse as such.

The Role of Small Tanks Underestimated

It has become almost and established norm now to assess the importance of a small tank on the basis of a 'rupees-and-cents' value attributed to the quantity of paddy produced in fields irrigated by these small tanks and how much do they contribute towards the long-term environment sustainability. It is to be reiterated that, a tank, big or small, should not be viewed solely as a 'water tank' that releases its limited quantity of water to irrigate a small patch of paddy cultivated downstream of it. A village tank, small or big, is the **heart of the village with its entire physical environment. It has certain veins through which it receives its life blood, the water (from upstream supplies) and it is the heart which pumps blood (stored water) through its numerous arteries to economic, social, cultural and environmental organs of the village society (fields, home gardens, households, temples, nearby vegetation through ground water impact) and its total environment, making them collectively sustainable and effectively functional.** To nurture and foster only the economically functional organ(s) of the village community is only underestimating and staving the other equally important organs of village life, and then, the lonely functioning economic organ(s) alone cannot sustain the complex structures or their functions in the village society. It is, therefore, clear that the planners and developers need to recognize not only the manner in which the village heart (tank) makes economic organs work, but also recognize how all other organs' function as a unified whole. Recorded evidence of this kind of treatment abounds the historical records in the country.

Muttimangallaya

In the *muttimangallaya* which is a ceremony organized for coupling of culture with physical environment in a cultural milieu, the above development perception in the Rajarata appears to have continued throughout the 19th century and possibly up to the middle of the 20th century or even to a still later date. Leveres in his noteworthy book – **Manuals of the North Central Province** published in 1899, refers to this total development approach in describing the above ceremony organized in fulfillment of vows made to the god **Ayyanayaka** thus:

The god Aiyana presides over tanks which are supposed to be under his special protection. When a tank fills and is about to spill the elders of the village, chiefly Gamarala, proceed to the tank ,and at the muttinamana tree a salute is offered to the god by the firing of two guns. The chief gamarala then steps forward and sends up a yatika, or and address,in which he anounces to the god that the tank is being filled, and that cultivation will be begun, and that after the harvest is gathered, the imangalle will be performed by closing this ceremony by committing the tank, village, its residents, and its cattle to the protection of the deity..... The villagers assemble and appoint a day for the performance of the mutti ceremony.....The pots, incensed and daubed with saffron, are now placed on the platform [specially prepared for the purpose] or the yahana .....The god through his Anumetirala [master of ceromony-cum-interpriter] makes known that the offerings are accepted, and that the tank, the village with its inhabitants, both man and beast, are taken under his protection for a period—one, two, or three years, according to the pleasure of his divine majesty'

– Levers, 1899 :109-110

It is quite clear from the above that the protection of tank does not mean only 'the protection' of water collected in it for irrigation.It has a wider meaning, well being of all the villagers and all other living beings and vegetation with the proper maintenance of bio-diversity of village's total ecosystem.

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A Case in point

There is also provisional evidence of total development effort made in our past hydraulic civilization. In common parlance, we frequently hear of a royal wish or a vow of King Parakramabahu the Great which goes on to say, 'let not a single drop of rain water freely flows in to the ocean...). Often those who hear it tends to take it very superfluously as a wish of that king to construct tanks and large reservoirs and store rain water for irrigation.That great ruler must have meant much more than surface Water storage for irrigation only. He must have meant that whilst arresting the free flow of rain water at every conceivable location, creating surface water storage for every possible direct use of them let surface water stored be induced to seep down in to the subsurface to raise the ground water stored level artificially high, enabling the enrichment of moisture requirement of entire vegetation and there by support animal life as well which together will exert a profound influence on human existence. If this was so, how justifiable are the modern moves mode to value water in a tank only in monetary terms pegged to the crop harvests gathered in irrigated field cultivation ?

Tank Ecology

Admittedly, irrigation had been one of the principal objectives of constructing most of the main axis tanks (village tanks). However, many if not most small tanks have been constructed for purposes other than field irrigation, including ecosystem enrichment. It is common knowledge that the free flow of rain water is arrested at least temporarily by vegetative debris entangled with plant roots at the ground surface level. The thicker the layer of debris on the surface beneath the vegetation cover, the grater the prospects of retaining the water derived from rainfall giving sufficient time to percolate a good amount of water in to the sub-soils. The sub-soils which eventually be-

come pregnant with such water, ooze out a certain amount of that water in capillary action or simply in the forms of springs (ulpath), at places down stream. Water emissions though capillary action is generally short-lived, may be for a few days after the cessation of rain, but springs lasts longer and some of them will be perennial. Presence of springs also conditioned by the geological formations of the bed-rocks and soil characteristics of the sob-soils.

Forest covers and high grounds or mountains are then, reliable sources of both surface and ground water which facilitate agricultural activities and vegetative growths down stream of them, during the times of rain and afterwards. If seepage to sub-soils is encouraged and springs are protected and maintained they are dependable sources of supplies. But man's reckless interference with forest cover is likely to hurt or totally destroy these sources affecting down stream irrigation activities and vegetative growth.

The ancient tank builders who constructed tanks in undulating land, one downstream of another by blocking an ephemeral axis stream in the keel of a valley have adopted a strategy of constructing small tanks on the valley slope, below its crest. These side-slope small tanks are not constructed one down stream of another as in the case of village tanks across the main axis stream, but along a suitable contour in such a manner that they can be fed with spill over waters of a nearby village tank. Thus, these small tanks are networked in to a main tank. Down stream of these small side-slope tanks there are very limited extents of land suitable for asweddumization for gravity guided irrigated farming. Because of this land limitation, these small tanks are able to retain considerable amounts of water during many months of the year. There are many instances where the main village tanks run dry because the demand for draining of water from them for irrigating large extents than from those small side slope tanks are high and as such resident villagers use these small tanks to meet their domestic water requirements.

More than for irrigation, these small side-slope tanks, were meant at least for three other purposes. First, to ensure a regulated supply of water for certain cultural needs of the society which revolved round the village temple. Such tanks are called **pinvewas** or the tanks constructed to acquire merit. They were exclusively meant for the pilgrims' and temple dwellers' use. Second, They are to keep ground water levels high so that vegetation and micro-climate around them are satisfactorily maintained. Finally, they serve as water holes for village cattle and wild animals, thus these contour based small tank chains were largely meant for cultural ecological and ecosystem maintenance.

Benefits of Multifunctional and Multipurpose Tanks

Because of the multifunctional nature of all tanks, it is extremely difficult to make a clear functional categorization of these tanks. Even a particular tank had been constructed with a specific purpose like silt trapping or providing water for temple use, they have been useful in many other ways, at least indirectly. Hence, only an inventory of uses is attempted here, without resorting to any systematic categorization as such

1. **Tanks for irrigation of paddy lands** down stream of them, enabling the villagers to meet their staple food requirements and use a fraction of it for sale to meet their cash requirements.

2. **Tanks constructed to maintain a regulated water supply** avoiding short falls in supplying to irrigated field.

3. **Tank is a device of keeping water arrested** to make use of that water during the rainless, periods mitigating drought stress and releasing excessive amounts of water received in it when such releases are necessary to safeguard the tank embankments downstream.

4. **Tanks which have their own devices to discharge sudden influx of water** from upstream sources (from freak floods and releases from upstream tanks) avoiding bund breaching. The devices that they have are specially designed sluices and spills.

5. In the event of a water storage in a tank down stream, the tank immediately upstream has the ability to release a certain quantity of water to the former with a mutual agreement of the settlers in association of both villages

6. In a situation where it is observed that a tank downstream is already under the stress of too much water accumulated in it, the ability of the upstream tanks to control their discharges giving sufficient time to the down stream tank to release its excess water and be relieved of a possible bunt breaching and then exercise a regulatory release of water so held temporarily in upstream. However, it should be noted that, these operations have their own limitations, notably in seasons of excessively 'above average rainfalls'.

7. As already noted, there is some provision in some situations, to release excess of water in a main village tank from its spill(s) to the side-slope tanks of the same village down stream of the main tank so that they in turn have an assured supply of water to irrigate land down stream of them or some extents under the main village tanks.

8. The ability of some of these side-slope tanks to supplement the irrigation needs of some portions of the fields fed by the main village tank, when that becomes really necessary due to water shortages in that main tank.

9. The **silt-trap tanks (kulu wew)** in the upstream side slopes of a main village tank, which reduces the silting of that main tank, by accumulating silt in themselves and releasing only the clean water to the main tank.

10. Ability of the tanks to store water and thereby enrich ground water table in its immediate environment, artificially high, fostering tree crop plantations in the village compound usually located at or near one end or both ends of the tank bund.

11. The artificial maintenance of the water table high, to facilitate water supplies to home garden wells intended to supply all domestic water needs and water supply to agro-wells facilitating limited farming practices.

12. As the vegetation in the vicinity of a tank flourishes well, and some trees flower well, the presence of bees become ubiquitous and as a result the numbers of bee hives increase providing honey to the villagers.

13. Clay soils available in the upper tank bed areas is ideally suited for making bricks and during the dry season many brick making sites are established in upper tank beds. The same soil is suitable for wattle and daub constructions in the village

14. Tanks provide fresh water fish. The general restrain of villagers from eating beef and the severe shortage of game animals because the forests have been butchered already, the demand for fresh water fish has risen. Even in the past where hunting was not uncommon, there remained a very high demand for fish. In fact tank fishing had been an important social and economic event in the Dry Zone villages. Many indigenous devices of fishing in tanks, streams and even in paddies have been evolved over the centuries and there are accepted norms to be followed in fishing and in sharing the fish harvest among all families in a village.

15. Tanks have become storage of food not only in terms of fish available for harvesting, but also storage of other varieties of food which are able to supply supplementary food to the 'family food basket'. A variety of food items – roots, yams, stems, leaves and seeds of water plants and water frontage plants are gathered, cooked and added to the plate.

16. With the recession of the upper shore-line of the tank water and baring a grater portion of the upper tank bed, limited extents of quick growing guard varieties of vegetables are grown using indigenous methods of lift-irrigation .

17. Also, with the recession of the upper shore-line of the tank water, women plant reeds in enclosures and use that harvest for bag and mat weaving / which can be developed as a lucrative cottage industry.

18. When the village paddy lands are cultivated and the cattle forced out of the paddy fields the tank bed and its upper catchment area is used as a grazing land.

19. Tank is also the source of drinking water for the domesticated as well as wild animals.

20. There are mini-tanks called ***godawalas*** primarily intended as water holes for the wild beasts and village cattle (buffaloes in particular) frequenting the forested areas in search of tree fodder.

21. A tank serves the purpose of providing drinking water to the people. Tank is also the place where people bath and do a great deal of washing

22. A water body in a tank ameliorate the climate in its immediate environment;

23. Tanks add to the environmental beauty with lush vegetation around them, and the water plant growth attracting numerous water loving birds, local and migratory. Tank environments are in fact mini bird sanctuaries so long as water is retained in them tanks can be special attractions to serious kinds of tourists interested in fresh water biology.

24. Tanks offer many opportunities for local and foreign tourists in terms of boating and fresh water fishing for recreation.

25. As already referred to elsewhere, temple tanks provide water needs of the pilgrims and the temple residents.

26. It is now evident that tanks were constructed in the past not only for the purpose of irrigated farming. They were truly multipurpose creations. In the mid twentieth century, it was the expressed view of the irrigation department that, 'a tank means a village and a village means a tank' (Arumugam, 1957). This is half the truth. No village settlement was possible without a tank and a village certainly meant a tank. But the converse is not true. In association with all functional tanks there were no settlements. A village settlement besides a tank constructed across a main axis stream in a cascade own several small tanks (***olagamas***) on the side slopes of that cascading valley, but down stream of the main tank. Even the silt-trap (***Kulu wew***) tanks belong to the village settlement beside the main tank.

27. There were no irrigated cultivation down stream of each and every tank. The silt-trap tanks(***Kulu wew***) and the ***godawalas*** in the forest which were the water holes for the wild animals and the ***pinwewas*** the temple tanks were never used as sources of irrigated paddy cultivation . As already noted many tanks were multipurpose constructions made to facilitate a total development of villages with due concern for the improvement of their physical environment. **Tank construction in an inter-connected network in a cascade was an ingenious human invention made to out wit the limitations otherwise imposed on beneficial human activities in a water deficit climatically harsh environment.**

28. **In dealing with these tanks, we should**

never fall into the mental trap of considering each of them in isolation; they need to be always considered as all-in-lone network of reservoirs, big or small, in an entire cascade and that cascade requires to be taken as a total development unit.

-IV -

The Latest Approach to Study Cascades

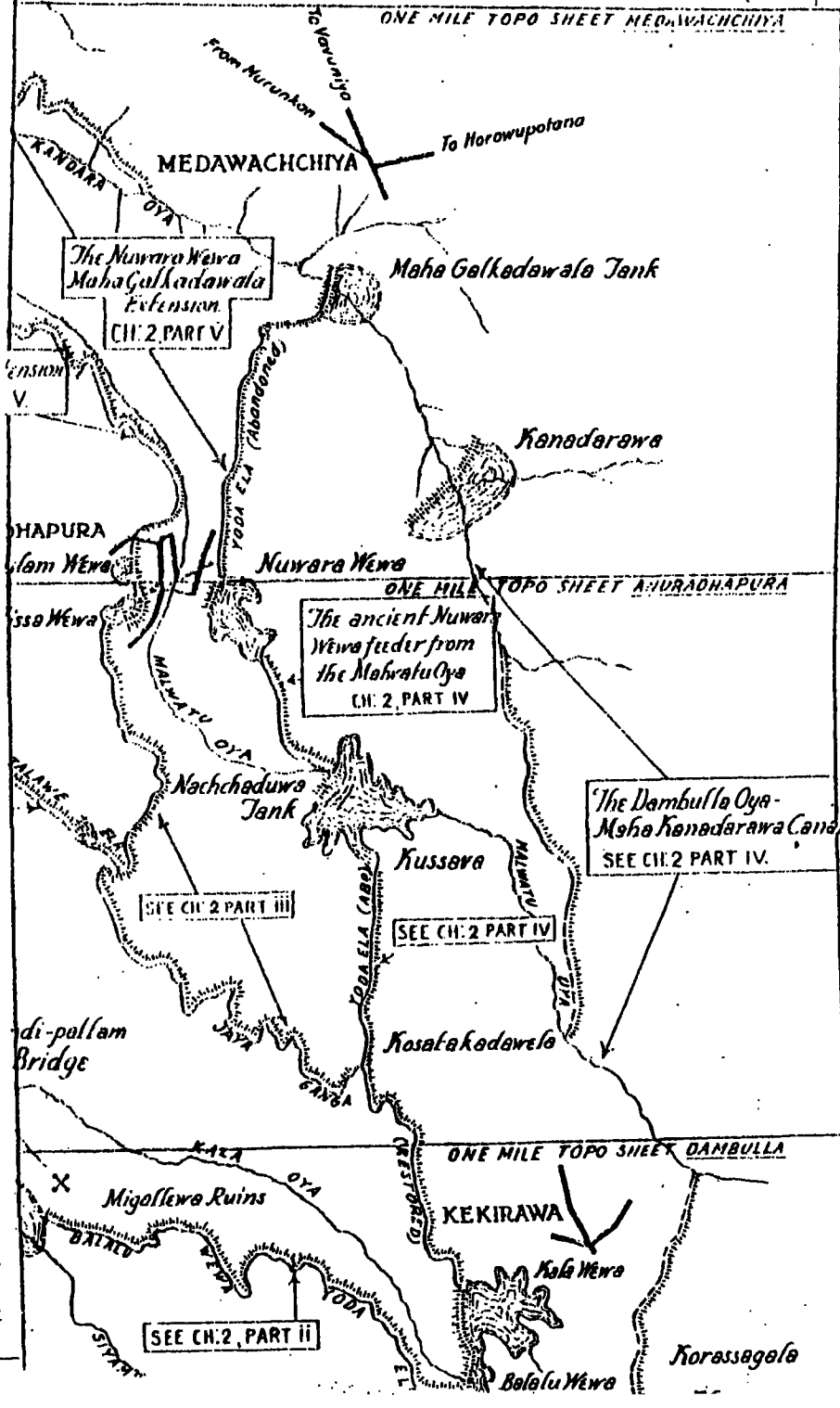
From time to time during the past three decades, many individual scholars have attempted to study the cascades in the Dry Zone confining themselves to their chosen study areas (Panabokke, 1999, 2000; Tennakoon, 1974, 1980, 1994, 2000; Madduma Bandara, 1985; Somasiri, 1979; 1992 ; Itakura and Abernethy 1993 ; Handawela, 1994 ; Nawaratne 1998 ; Dharmasena, 1992; Senaratne, 1996 ; Sakthivadivel et al, 1996 ; Perera, 1997 and Ulwishewa 1995). The International Irrigation Management Institute (IIMI), now International Water Management Institute (IWMI) has shown a considerable interest in cascade based studies.

Recently, Dr. C. R. Panabokke (1999) a doyen of soil science and hydrography has completed a study of small tank cascade systems of the Rajarata amplifying their setting, distribution paterns and hydrography, in order to "provide the professional staff of the Mahaweli Development Authority of Sri Lanka (MASL), a clear depiction of the Rajarata, based on properly demarcated main and sub-watersheds and sub-watershed boundaries, together with the individual small cascades that make up each of the sub-watersheds." He has identified the boundaries of the main river basins, boundaries of 50 sub-watersheds in those river basins and the boundaries of 457 cascades in those sub-watersheds in the entire Rajarata.

The study is well substantiated with requisite master maps of (a) the main river basins; (b) the soil distribution ; (c) the ***maha*** season's rainfall probability in selected sub-watersheds ; (d) a schematic representation of a small tank cascade near Anuradhapura .This study also contains an authentic statistical information in respect of main and sub-watersheds and cascades. This study would be of an immense value to all professionals connected with planning, designing and laying out national irrigation network in the future development areas in the Rajarata outside the Mahaweli Development Area. This benchmark study has undoubtedly, opened a new chapter for studying the cascade based hydrography of not only the Rajarata but also of the entire Dry Zone

It is time to call for more and more authoritative techno-analytical works on the total spatial configuration of cascade-based indigenous irrigation systems based on Panabokke's benchmark study and also press for policy attention on the role of cascade based irrigation systems which should be heard as a priority development issue.

When Panabokke's contribution (1999) is closely examined, it becomes inevitable to formulate the question – Whether we have not followed a wrong policy in attempting to develop Dry Zone tanks and villages in isolation, and whether we should not consider a cascade (with



several villages in association) as a viable development unit to provide food security in the first instance, and withstand, at least to some extent, the challenges of globalization with its monstrous free market economic operations.?

It is unjustifiable to keep pushing the above question under the carpet any more. Over the past seven decades the state has committed huge amounts of money in terms of financial and other resources towards the Dry Zone development. Undeniably some development has taken place in it, but all that remains below expectations. Anuradhapura district remains the poorest district in the country! What is the level of economic and social achievement of an average Dry Zone peasant family in development attempted from 1950 to 2000? And at that slow pace of achievement, if the same development, strategies are continued, where will that family be in the year 2010 or 2020?. If not for the remittances of housemaids working in the Middle-east countries, and soldiers in the battle front, the plight of rural families could have been either same as before or even worse-off. These remittances have brought about only a temporary solace. These income- sources are not going to be perennial any way. What we have is only a borrowed time to well prepare ourselves to accelerate Dry Zone rural development.

Cascades appeared to have been the viable economic units and social entities in the past. There are historical palimpsests which can be cited in support of this thinking. How come that all the villages in a cascade appeared to have had a single ancient temple (as often depicted in One Inch to One Mile Topographical sheets), and not a dagaba and a temple in every village ? If that was really so, not a single village but all the villages in a single cascade would have had a single focal point and a single apex management organization and hence, a federated (one) economic organization.

There are still other historical palimpsests that require painstaking studies to ascertain whether such economic and social federations existed during the times of Anuradhapura and Polonnaruwa agro-based hydraulic civilizations. A careful study of one-inch-to-one mile topographic map sheets, covering the Rajarata area has shown that, at least in four locations, distantly located from each other are four Medawachchiyas – one in the north, one to the west of Anuradhapura, one in the Negampaha Korale in the southern extremity of the Anuradhapura district, and still another close to Gomarayankadawala near Trincomalee. Lervers, in his book (1899), states that Medawachchiya is a currupt Tamil expression of the Sinhala term, **meda wata** (around the centre or focal point). Within about the radius of 10 miles of each of these **meda wata**, there is a **Kallanchiya** which is also a currupt Sinhala term for the Tamil term, **Kalanchi**, (meaning, granary). In between them there is a **Rambewa** in each location, (unloading points of **"ran"**) at stream crossing points. This term **"ran"** would have meant paddy, because in Sinhala literary works we hear of **ran wan karal** (sheaves of paddy like gold) .These three place names of locations in clusters need an explanation. There could have been many other clusters of. **Meda wata, Kalanchi and Ranbewa** in many other localities in the Rajarata but their names have been either lost during the peoples drift to the Central Highlands or changed them by the new settlers who came back to the Rajarata in the early 19th century, that is more than 1,000 years of abandonment.

Even the existing 4 clusters of these village trio appeared to have been abandoned and resettled at different time of history. In some of them the last resettlement would have been during the early 19th century, without any significant change in their names. By the time of re-occupation and thereafter, they would have lost their strategic positions in respective federations. On of the factors responsible for the loss of importance and identity of these centers is the road system that developed under the British rule, primarily to meet their military and administrative requirements. The British designed road network in the Rajarata, envisaged no interior area development as such. So the interior remained neglected and the wealth of the region was drained out via the main roads which were sucking out the areas wealth to other district capitals particularly to those in the South

As a series of growth poles in the interior connected with present trunk roads that traverse the Rajarata, is very necessary to accelerate interior development, taking cascades as physical development units, each with suitably located villages as growth poles. This needs the approval of the policy makers after careful planning of requisite development activities in them. Initially it would be necessary to connect these growth poles with each other to facilitate collection of produce and distribution of farm inputs and other needs of the populace. Then (like Dambulla), they pick up momentum calling for numerous services and industrious. People will respond to those calls. Services demanded and made available as responses to those demands, new technology and new skills would come in and so long as there are basic infrastructure facilities such as water, electricity and transport, these growth poles become habitable places for the service providers and those willing to invest in new ventures offering employment opportunities and furthering the skills that the people will be having in or around those growth poles. As these small growth centers become conducive to live with basic facilities available, people will be less inclined to move into big cities to live. They will remain where they are, and in place of going in to urban areas, they bring urbanism to their own environment. This would greatly facilitate the increased urbanization that is under way. During the next 10 years, at least 50 per cent of our population will be in the urban and semi-urban areas.

Finally, looking through many windows that Panabokke has opened in his 1999 study, new thinking, new visions and re-discoveries in cascade-based development would be necessary. In this regard, scholars and planners in this subject area are also reminded of the need to shift their emphasis from the single purpose of using tank water for irrigated paddy cultivation, to multiple use of that water for social, cultural and economic advancement of the village communities. It is high time to challenge the long-prevailed misconception that, tank water is meant for gravity-guided irrigated paddy cultivation only.