CONSTRUCTION AND MAINTENANCE

Construction

Introduction

We have so far traced the history of irrigation under tanks from the earliest period to the present day. Such a study would be incomplete without knowing about the measures adopted in the past and at present for the construction and management of these works, the arrangements made for their maintenance and the system of distribution or management of water under them; the cost of construction, and water rates to be charged for the beneficiaries. A study of these various aspects of irrigation administration will enable us to draw lessons, from the past procedures. Let us first study the construction practices.

Most of the tanks which our ancients built were small. Many of them have been abandoned or do not exist. Some of the larger tanks, which were repaired and restored in various periods are remaining. They too are in a neglected stage - being full of weeds and silt. Tanks, which are situated in the command areas of major irrigation canal system, however, have continued to be useful due to the direct and indirect inflow they are receiving from the major canal system. These tanks and other tanks which
have been in use for more than two or three centuries are a proof of the knowledge possessed by their builders regarding the design and construction of tanks and tank bunds. For our study, information relating to these aspects has to be obtained from inscriptions and archival sources.

**Inscriptional Evidence**

An examination of the various inscriptions do not indicate the existence of any storage works across the major streams like the Tungabhadra, the Kaveri, the Hemavathy and others. Most of the storage works were tanks or bunds across minor streams. They were by and large earthen embankments with one or two canals taking off from them. Excepting the Porumamilla inscription in Badvel taluk of Cuddapah district of Andhra Pradesh, the other inscriptions do not give any details regarding the length or height of the bund or the period taken for its construction, etc.

**Porumamilla Tank:**

The inscription\(^1\) of Bhaskara, a Vijayanagara Prince, at Porumamilla dated 1369, is the only available evidence, which describes in some detail how a tank was constructed and what its features were. This tank called Anantharajasagar is constructed by connecting four natural hills by three short earthen dams. The length of the bund is 4500 feet and the total length including the hills is about 14,000 feet. At the deepest portion, the bund is about 12 feet wide at the top and 150 feet wide at the bottom. Its height is about 33 feet. It is possible that the present dimensions of the bund represent additions carried out much later after its
construction. This is evident from the statement made in the edict that the length of the dam together with the portion of the hills was 5000 *rekhadandas*, the width and height being eight and seven *rekhadandas*. Considering the actual length of the dam which is 14,000 feet and the same as described in the inscriptions as being 5000 *rekhadandas* we can infer that a *rekhadanda* as described in the inscription must be about 3 feet. Adopting this measurement of a *rekhadanda*, the width and height of the bund as described in the inscription would mean a width of 24 feet and a height of 21 feet. A width of 24 feet for a bund of 21 feet height cannot be the bottom width of the bund. It could mean only the top width of the bund. The existing top width of the bund is 12 feet and it is a result of the increase in the height of the bund from the original 21 feet to the present 33 feet. Further, adopting the original dimensions of the bund as given in the inscription, the side slopes provided for the bund would have been 3 horizontal to 1 vertical. With the increase in height of the bund, carried out at a later date, the side slopes now existing represent 2 horizontal to 1 vertical. In other words the side slopes adopted originally were much flatter when compared to the present existing side slopes.

**Criteria for a Good Tank**

The inscription describes twelve requirements or *sadhanas* to be satisfied for the construction of a tank. It also enumerates six faults or *doshas* that should be guarded against in such a work.

According to this edict, the twelve requirements for constructing a good tank are:
1. a king endowed with righteousness, rich, happy and desirous of acquiring permanent wealth or fame,
2. a brahmana learned in hydrology (Pathas - sastra),
3. a ground adorned with hard clay,
4. a river conveying sweet water and three yojanas distant from its source,
5. hill parts which are in contact with it (bund).
6. between these portions of the hills a dam (bund) of compact stone wall not too long but firm,
7. the two extremes (sringa) pointing away from fruit giving land (phala - sthira),
8. an extensive and deep tank bed,
9. a quarry containing straight and long stones,
10. the neighbouring fields (command area) being level and with fruit-growing trees,
11. a water - course (the sluice) having strong eddies (brahma) on account of the position of the mountain (advi-sthana), and
12. a gang of men skilled in the art of its construction.

The six faults to be guarded against are listed as :

1. water oozing from the dam,
2. saline soil,
3. (situation) at the boundary of two kingdoms,
4. elevation (kurma) in the middle of the tank-bed,
5. scanty supply of water and extensive stretch of land (command area), and
6. scanty land and excess of water.

It can be surmised from the various statements made in this inscription, that construction of bunds on a bed of hard impervious clay and providing of surplus escape arrangements through sluices built at the ends of the bund were well known. It is further seen that care was taken to ensure that there was adequate catchment area (three yojanas) for the tank, the water to be used for irrigation was potable and the command area of the tank was level fertile land. It is also evident that adequate measures were taken to ensure that there was no seepage from the bund. But it is not clear as to how the bund in the valley portion was plugged. It is, however, certain that the technique of constructing an earthen embankment of about 25 to 30 feet, over such a length, the tackling of river diversion during the construction period spread over a period of two monsoons (the inscription states that the work was completed in two years) was well known and adequate skilled labour was available.

Construction Organisation

From the inscriptions we learn that the tanks were constructed by employing unskilled labour for the earth work and stone masons for the construction of sluices. The Rajagundalahalli tank had an “embankment with plenty of earth, with a stone sluice made secure with bricks and good mortar” (1496). The expenditure for constructing the Narasimhapura tank provided for cart material, labour, cartsman, carts for the tank, supervision over excavation, senabova (accountant), stone mason who prepared two sluices and some miscellaneous
items (1310). The Tekal inscription\(^4\) (1475) of Malur taluk states that the tank had breached and the local stone mason was asked to rebuild the same. The Kalludi inscription (1388) of Gauribidanur taluk\(^5\) says that the diversion of the Pennar stream to Penugonda was carried out by Singayya Bhatta, a *Dasa-vidya Chakravarthi* (master of ten sciences) and *Jalasutra* (irrigation engineer). According to the Sorab inscription\(^6\) (1159), Birisetti constructed the tank after examination by experts (*Siddharasodhadinde*).

Each region had therefore experienced skilled professionals like earth *waddars* and stone *waddars* who undertook the construction of tanks. The location of tank sites, the location of waste-weir and the alignment of the canal system as seen from the existing tanks, speak highly of the civil engineering knowledge and expertise available in that period. But none of the inscriptions tells us of the existence of any definite department, as in the present day which undertook the investigation, construction and maintenance of irrigation works.

Even in the 18th century, during the rule of Hyder Ali and Tippu, there was no separate department of the Government dealing with the construction or maintenance of irrigation works. It was only, in 1834, that a post of Superintendent of *maramat* was created in Mysore State and a Department of Public Works was constituted in 1856\(^7\). Construction and maintenance of minor irrigation works, before this period, were solely the responsibility of the local community. The Central Government carried out such large works like the *anicuts* on the Tungabhadra and the Kaveri and the tanks at Madag-Masur etc. with its resources and personnel, which also built fortifications and temples.
Bund Design

All these irrigation works display boldness and skill in construction. The Madag-Masur embankment across the Kumudvathi is about 800 ft. thick at the base and about 100 ft. high. The Ramasagar embankment across the Palar is about 150 ft. wide at the base and 45 ft. in height. Though their exact period of construction is not known, it can safely be inferred that these tanks belong to the period of Vijayanagar. Tanks constructed earlier would have been similar in nature. Even according to the present standards of design, the dimensions of the embankments cannot be termed as being very conservative.

However, it is not clear as to how the waste-weir capacity was determined and how the embankment was made water-tight. Some of these old tanks do not exist today. This leads us to infer that due to inadequate spillway capacity they perhaps breached and went into disuse. The Haridra dam was damaged within a period of 14 years and had to be rebuilt. Even the Madag-Masur tank was in a breached condition, when it was restored in 1862. It is also possible that these old tanks were obliterated not only due to their breaching but due to silting and disuse on account of non-retention of water by the embankment. Also, perhaps, due to the failure of rains for two or three years continuously, the tanks must have got into a state of disrepair. Probably, the tank beds were encroached upon for raising rain-fed crops which must have led to deliberate breaching of the bunds. In the absence of reliable details we are in darkness on these aspects of design.
Capacity of tanks

The capacity of a tank is mostly related to the area to be irrigated under it. The inscriptions do not furnish any information regarding this aspect. An indirect inference could be drawn from the land granted for construction and maintenance as bittuvatta under a tank. The Soma-samudra inscription (998) indicates that one-tenth of land was granted as bittuvatta\(^9\). But except in very few instances, the area of land granted as bittuvatta is not recorded in inscriptions.

The Pumagame inscription (1139) indicates the granting of “4 Khandugas of wet land below the first bund of the tank” and “1 khanduga of wet land below the first bund of Asadagatta, the flower garden below the small tank”\(^10\). Assuming that the land granted was one-tenth of the area irrigated under the tank, we can infer that the large tank must have been irrigating 40 khandugas and the small tank was irrigating about 10 khandugas.

The irrigated lands are mostly described in terms of khandugas or mattars or salages. A khanduga of land is the extent that requires one khanduga of seed for sowing. This word khanduga has generally been used relating to paddy lands. Paddy is always preserved along with its husk. It is preserved in pits called hagevu. “These pits contain about 15 to 30 khandugas or 83.5 to 167 English Bushels”. On an average about 1.25 bushels of seed are required for one acre of land\(^11\). It can, therefore, be inferred that one khanduga of wet land would be equivalent to about 4 to 5 acres. We may assume that mattar is also equivalent to the same area\(^12\). This, however, cannot be applicable
for all places and in all situations. The type and quality of seed, the nature and character of soil may differ from place to place. Rice says that on dry land one khanduga of seed would suffice to sow 64,000 sq. yards (13 acres 8 guntas) and for wet or garden land, a khanduga would only sow 10,000 sq. yds (2 acres, 2 guntas). Buchanan, in his record of his journey in Karnataka (1800) has indicated that one khanduga of rice land near Srirangapatna was about 6.2 acres. Hence the assumption that 4 to 5 acres of wet land as equivalent to one khanduga appears reasonable.

Another aspect seen from the inscriptions is that the cultivators used to construct small ponds in their fields to conserve the available water. The boundaries of Anehalli (1218) indicate “to the south-east the western weir of Kalammagere; to the north-west the inner line of Kesiyanna’s tank, to the south the bund of Siriyabova’s pond, these are the boundaries.”

Other features of tanks

In the small tanks, the outlet through which water was drawn for irrigation was only a cut in the earthen bank, which was opened when water was required for irrigation and closed by putting back the earth when the water supply was not required. Perhaps, when the capacity of the tank was increased or when the arrangement of such temporary cuts in embankment was not working satisfactorily, a sluice was built. The sluice for the Vadigenahalli tank (1378) and the sluices for the Agaram tank (870) were built much later after the tanks were constructed.
The Nuggehalli inscription\textsuperscript{17} (1253) tells us that Basavanna enlarged the tank and built a stone embankment. The stone embankment perhaps refers to the stone revetment. With the increase in the size of the tank, the water-spread had been enlarged and revetment as protection from wave and wind action became necessary. Large tanks, therefore, were provided with stone revetment. In the case of Araluguppe tank\textsuperscript{18} (1091), the inscription says that a stone tank was built. It can either mean that the structure built was a masonry dam or the revetment constructed was in the nature of a well-built masonry structure. In either case we may infer that the tank was a large one.

\textbf{Archival evidence}

This lack of information from the inscriptions is made good to a great extent by a vivid description of the tanks constructed before the 19th century as given by Col.Charles Green and Major Sankey, Chief Engineers of Mysore, in their reports\textsuperscript{19}.

According to their reports, most of the existing tanks were of a length ranging from a quarter of a mile to one and half of a mile. With very few exceptions, all of these had a rough stone revetment, having a batter of about 1 horizontal to 2 vertical\textsuperscript{20}. The stone-facing varied from a yard to half a yard in thickness. A backing of loose rubble stones, for a thickness equal to that of the large stones in front was provided. Occasionally, revetment of a lesser dimension was existing on the rear slope of the bund.
The width of the earthen bund was proportional to its height, being greatest in the centre of its length. An ordinary bund was about 12 ft. wide at the top, 60 ft at bottom, and 18 ft. high. There were, however, quite a few which exceeded the above dimensions.

**Sluices**

Each tank was provided with one or two and sometimes three sluices, by which the water was let out to the fields. Their position was generally at the same level as that of the bed of the tank, but if any portion of the lands to be irrigated happened to be above that level, one or more of the sluices was placed at a corresponding height. A tank sluice was large, substantial and an expensive work. It consisted of a 2 yard square brick or stone cistern about one yard high to keep off the sand. The cistern had at the bottom one or more valves or plug holes of 6 inches to a foot in diameter. The valve or plug was attached to a pole so long, that its top was above the water level in the tank. It was held in an upright position by 2 or 4 vertical stone pillars of 9 inches to half a yard square to which horizontal stones were attached, one at the top and another midway. The valve rod passed through a hole in the centre of these horizontal stones and was worked with a stout chain and pin to uphold it when necessary and to regulate the discharge. The pressure of the water upon the top of the valve kept it sufficiently tight when lowered to prevent the escape of water.

At the rear of the bund another cistern of about the same dimensions and usually of brick in lime was built. Three sides of the cistern were furnished with square
openings and shutters to permit water being turned off in the required direction. The two cisterns were connected by a tunnel, the length of which depended on the cross section of the bund through which it was laid and was generally from 10 to 30 or 40 yards. The vent in the tunnel, for the passage of the water, was about 2.5 ft. high and 2 ft. wide. These dimensions were adopted to permit a boy going in to clear any obstructions and to examine the state of the tunnel. The vent was generally rectangular and covered with granite slabs about 6 to 9 inches thick.

‘Codi’ or Waste-weir

In addition to the sluices, each tank was provided with masonry outlets called codies or waste-weir through which the surplus water of the tank escaped to other tanks below. The codies varied from 10 to 100 yards in width. As the rush of water over the codies would wash away any but a strong description of work, the codies were necessarily made very substantial with the largest sized rough stones procurable in the neighbourhood.

Codies were generally square in shape covering as much ground length-ways, as in their width. The front consisted of a solid rough stone wall from 1 to 2 or 3 yards deep, according to the quality of the soil, and of proportionate thickness. It was provided with large stones, which projected a yard and a half, and were built firmly into the top of the wall at 1 yard intervals. With the addition of some sticks, straw and turf placed in front of these vertical stones the ryots were enabled, after the monsoon was over, to retain the water in the tank at a level about two feet higher than the normal level and with this they were
able to hold water for a much longer period. The sides of a cody were protected by wing walls, 1 to 2 yards high, of rough stone, or brick work which contracted or approached one another at the ends of the gorge wall and widened out above and below forming, as it were, the sides of a tunnel of discharge. The stones on the lower side of the weir wall, were usually laid over suitable foundation in the form of a sloping apron, starting from the top of weir wall to the bottom of the halla (valley). By such arrangement the force of water was broken. Where it was found difficult to provide for such an arrangement, recourse was taken to provide a flat pavement at the foot of the weir wall (whatever be the height of the latter) taking care to have a very solid iron clamped platform of cut stones for the water to cascade upon.

Sometimes in the halla (valley) immediately below a cody another rough stone work like the cody, called cuttay a small dam was built. From the cuttay another irrigation channel was taken off. The cody retained the water in the tank at its highest safe level and the cuttay below appropriated the surplus water, which the cody had discharged, and which but for such cuttay would have been lost.

As the surplus water discharging over the codies for over 10 or 15 days annually was of a great quantity, the cuttays below were exposed to a great shock from the impulse thereof, and required to be substantially constructed. Like the river anicuts, the cuttays were, therefore, built with care.
Desilting

During the height of the monsoon, the stream carries with it huge quantity of silt. This is carried with the water through the sluices into the channels. As the strength of the current abates, the silt separates itself from the water, and forms a sediment at the bottom of the channel. This had to be got rid of before the commencement of the next season. The water which in its disturbed state had caused the harm, at the close of the cultivation, when the river was flowing gently was applied as a remedy. The sluice which earlier was partially closed was opened fully and water rushed through the channel washing away the silt, thus saving much labour that would have been necessary to attend to its removal.

The same process was taken recourse to in discharging the silt from the tank beds. But a different season was selected. Instead of the close of the monsoon, its commencement was chosen. No sooner did the monsoon set in, then the ryots ranged themselves about the sluice head in the tank. (Since it was at the commencement of the monsoon the depth of water was shallow). They agitated the bed till it was reduced to a semi-liquid state and the silt passed out through the sluice along with the water. Even though this was a partial remedy it helped to great extent in keeping the sluice free of silt.

When a great quantity of silt was brought down by the supply channel of the tank, the expedient resorted to was of constructing a rough stone wall or cuttay, across the bed of the channel, similar to an anicut. This had the effect of checking the velocity of the water, and arresting
the silt. To ensure the perpetuity of this desirable result, it was necessary that the cuttay be kept in repair. These contrivances for keeping the silt out, were neglected and the beds of the tanks were converted into receptacles for silt.

Most of the small tanks received their supply from the high ground in the neighbourhood and irrigated paddy fields or gardens immediately below them. But many tanks were partly supplied by long winding channels which caught all the rain water flowing down the sides of hillocks. Water courses, or small streams which functioned during a local fall of rain were also dammed up and their contents in like manner appropriated to the benefit of tanks. A single tank would sometimes possess several feeders of this kind, all of which were kept in repair. In like manner, the fields to be irrigated were occasionally at a distance from the tank. The connecting canals were all kept in good repair as the success of the crop depended on them.

The wisdom of our ancients had given the country the benefit of some of the most useful and creditable tanks. Some of them were massive, yet they had the merit of combining the requisites of efficiency and durability.

Success after Failure

It must not be supposed that all their projects were always successful. They made a number of experiments some of which failed. For example, three dams across the Tungabhadra, which they built, failed\textsuperscript{21}. With regard to the dams on the Kaveri and its tributaries, Rice says :-
In addition to the anicuts now in use, the remains of probably more than three times as many others are still visible when the rivers are low. From some of these, the original excavations made for the old channels are still apparent, while from others, channels do not appear to have been excavated. It is therefore clear that the success that resulted from the construction of the works that are still in use was not obtained without a very large proportion of failures, and the perseverance displayed by the constructors in spite of these failures is none the less remarkable and shows the high value placed in former ages on irrigation works.

Present status of construction

Most of these tanks were small structures and intended for the use of one season. The idea of storing water during the wet season for use during the dry season was not a familiar concept. Probably the need did not arise. Perhaps in many instances they were built to supply water for man and animals. Supply of water for irrigation was a secondary purpose. With the increase in population, during the 19th century, the need was felt for restoring and improving the capacity of existing old tanks and for taking up new construction. The construction and design procedures adopted were based on the earlier practice and experience.

During the present century, with the development of science of soil mechanics, the improvement in the procedures and techniques for a satisfactory analysis of the properties of the soil, the development of mechanical equipment for compression of soil and for placement of
the required soil at a very fast pace on the bund, the construction of an earth dam has become a precise and systematic operation. Even though the material used for the construction of the bund has remained the same as in the past, the technique of construction and assured knowledge of the properties and behaviour of the soil used has made building of larger and higher dams more safe and practicable.

**Anicuts**

Even though this study primarily relates to tank construction, it would be desirable to examine the construction of anicuts (dams) as built by our ancestors, since it gives us an idea of how they tackled the bunding of a stream with the available material. An anicut was a barrier built across the stream to enable diversion of flood waters to lands on the adjoining banks, through canals. Due to the steep slope of the country and the very small fall or slope in the bed of the river, the canals connected the river with the very small extent of land which was irrigated.

These anicuts on the Tungabhadra and the Kaveri consisted of a mass of rubble and stone. All the interstices between the larger stones were filled in with small and large rubble. The stones were well shaped and laid in regular courses, each course projecting about 2.50 ft. beyond the upper one. With the object of decreasing the depth of water flowing over the anicut during flood and also with a view to throw the stream at other times directly into the channel, the anicut was constructed in a curved line. The rear slope, and the apron of the anicut masonry called as soojicuttoo, as its very name signifies, was a fine
needle-like stonework. The body or heart of the anicut which was called nariancuttoo was composed of large stones, the largest of which were laid on the top as cap stones\textsuperscript{23}.

Across the Tungabhadra, the Vijayanagar rulers have built a number of anicuts. Twelve of them are still existing. Three anicuts are submerged under the Tungabhadra reservoir and the area under those anicuts are irrigated directly from the reservoir. The locations of these anicuts were chosen with great judgement and the channels have been formed with consummate skill. The anicuts are built with large boulders and rough mass of stones piled one upon another without mortar or cement. In some anicuts, stone clamps and pegs have been used to hold the stones together. In a few anicuts, iron clamps have been used instead of stone clamps. Except for the Turthu anicut near Hampi, none of them is constructed straight across the river. They run diagonally or in a zig-zag manner, utilising the ledges of rock in the river-bed, small islands or large boulders which the river bed happens to contain\textsuperscript{24}.

It has been held that the stability of such construction was based on size and position of the materials instead of homogeneity and cohesiveness of the work as a whole. These anicuts were constructed as stone dams or walls over which water would overflow during heavy floods. And across major streams, any such pucca structure to withstand the overtopping of flood waters would certainly have been a huge and costly structure. Perhaps, economic considerations and the feasibility of timely repair to a section of the anicut as and when it breached by overtopping was considered desirable. Further, such structures though
they had breached in certain locations, have withstood all floods even to this day at certain other locations.

Another defect often pointed out in these structures is that they being leaky, allowed all summer flows to escape. Perhaps it was intended to be so. Flows in summer were allowed to escape, to meet the requirements of men and beasts down below. Further, the silt and sand filtered through the interstices and helped in keeping the river bed clear of silt.

The channels taking off from these anicuts generally did not have aqueducts. The cross drainage from the adjoining high ground was allowed into the channel. Rough stone silt dams constructed across these drainage channels arrested the silt from entering the anicut channels. The surplus water entering the channel was allowed to escape through masonry escapes of rough stone work. The silt accumulating in the channel from the cross drainage was scoured out through outlets constructed at low levels at convenient points. In addition, it was considered as the duty of the beneficiaries under the anicut channel to clear the accumulated silt. In addition to removal of silt, the beneficiaries had also to attend to periodical removal of weeds. That such a practice was in force can be seen from an order issued by the Government of Mysore in September 1890, in respect of Rekalgere channel in Challakere taluk. The farmers under the tanks fed by this channel were exempted from their duty of silt clearance on the ground that the distance between the villages concerned and the channel was about 8 to 19 miles. But in lieu of this, they were levied an annual charge of 8 annas (half a rupee) per acre towards the clearance of silt by the Public Works
MAINTENANCE

Importance of maintenance

Every irrigation work is useful only for a certain period. With proper and timely maintenance and repair, this period can be enhanced. Lack of such effort results in a tank getting silted up or its bund getting weakened resulting in its breach or leakage of stored water through damaged sluices. All these ill effects are equally true of an irrigation canal if its maintenance is neglected. Proper maintenance of an irrigation work is as important as its construction. Our ancestors realised this and gave more importance to maintenance than to construction. They said it is more meritorious to maintain an old work than to build a new one.

The importance attached to maintenance is evident from the regulations laid down in the Arthasastra. While dealing with remission of taxes it states that, "Persons who cultivate the lands below tanks etc., or persons who are permitted to enjoy such lands free of rent of any kind, shall keep the tanks etc., in good repair, otherwise they shall be punished with a fine of double the loss". Not only was maintenance given importance, but it was an accepted policy that the responsibility of the maintenance of an irrigation work in good shape rested solely on the person/persons who benefited from such an irrigation work.
Normal maintenance works

Maintenance of a tank involves generally:

1. Periodical removal of silt from the tank bed and canal bed,
2. periodical earth work to the bund, wherever damages have occurred due to rain or other causes,
3. periodical repairs to the sluices and cody (waste-weir) wherever damages have occurred,
4. keeping the catchment area free from encroachment, and
5. arrangements for checking of silt coming into the tank.

Arrangement for carrying out maintenance works:

Formerly the maintenance of a tank or a channel was primarily the responsibility of the village community of which the beneficiaries were an important part. They entrusted this duty to a person or a group of persons of the village and granted him or them certain land as bittuvatta or as dasavanda or a tax benefit to enable him to perform the task of maintenance. In respect of large irrigation works, the use of certain local taxes for carrying out of the repairs was granted to the local body by the ruler. Sometimes, cash grants were made and in some instances land (government land) was granted to the local bodies for executing the repair works. In certain instances, carts and lands were granted for their maintenance. Maintenance of the carts was for conveying of earth from and to the tank.
Epigraphical evidence

A large number of inscriptions exist which indicate the importance attached to the work of maintenance and repairs. The inscriptions of Kurtakoti, Mirle, Sirur and Tonnur record the act of granting the use of certain local taxes for the maintenance repairs.

The Kurtakoti inscription of Gadag taluk (1082) during the reign of Vikramaditya VI, records the gift of income from fines to the mahajanasa of the Kurtakoti agrahara for the benefit of Kadalagere tank. The Dambal inscription (1184) in Mundargi taluk of Dharwad district records the gifting of income derived from a tax on all gardens except those endowed as tax free to the deity, for dredging of the tank-bed, repairs to stone and wood of the sluice of the local tank called Gonasamudra. In the 13th century, Narasimha, the Hoysala king granted 64 gadyanas from out of the Holey Sunka (river cess) to the mahajanasa of the Tonnur agrahara for annual repairs of the channel of Harahu.

The inscriptions of Karya, Hosahalli, Belathur, Arasibidi and Belavanki record the making of cash grants or granting of lands for maintenance work. The inscription of Karya (Nanjangud) in 968 A.D. records the gift of four khandugas of land as bittuvatta for the maintenance of the tanks Devigere and Piriyakere got excavated by Nagavarma. The Hosahalli inscription of 1070 A.D. in Somwarpet (Kodagu) records the grant of 40 gadyanas for the maintenance of Gaurali tank. The Arasibidi inscription of Hungund taluk (1087 A.D.) records the grant of certain lands below Mariyabbeyakere.
to the *mahajanars* of the Brahmaṇpuri. Perhaps, the lands were granted for the maintenance of the tank\textsuperscript{32}. The Belathur inscription (H.D.Kote) registers a grant of 10 *khandugas* of land for the maintenance of a tank\textsuperscript{33}. Land was gifted by Palageya Chavundamayya and his wife Santikabbe of Belavanige (Ron) in 1102 A.D. for the upkeep of the Muthalagere tank, constructed by them\textsuperscript{34}.

The inscriptions of Holenarasipura, Hirenallur and Bolekyatanahalli record the unique procedure of granting of carts for maintenance work. The Holenarasipura inscription of 1232 A.D. (Hassan) states that the *mahapradhana* Madigadewa Dannanayaka spent 2200 *gadyanas* and 8 *panas* for cart material, labour, cartsmen, carts, for the supervision over excavation, stone mason who prepared the two sluices and other miscellaneous expenditure in connection with the construction of the tank. It also states that 800 *gadyanas* were spent for maintaining the carts. The provision of 800 *gadyanas* for carts clearly shows that the maintenance of the tank was thought of at the construction stage itself\textsuperscript{35}. The Hirenallur (Kadur) inscription of 1207 A.D. records the granting of a cart, by Madiraja for conveying earth for repairs of a tank\textsuperscript{36}. The Bolekyatanahalli inscription of Arkalgud (1371 A.D.) records the granting of land and taxes to certain persons of that village for maintaining *bhandies* (carts) for the tank. Certain taxes were also remitted. It also stipulates that the recipients should meet from their own funds the expenses of the buffalo (*kona*), wood (*kirumuttu*), iron and oil (grease) for the carts\textsuperscript{37}.

Apart from these inscriptions which deal with granting of land, cash etc., for the maintenance of tanks, the Mirle
inscription of the 15th century tells us how the mahajanasa of Hampapura who were unable to carry out necessary repairs to the channel in their village which had breached in eight or ten places decided to hand over the task of maintaining the channel to Gaunda prajas of Halli Hiriyur and sold them for this purpose a house, 12 khandugas of wet land and 150 kambas of dryland. (In addition to the maintenance of the channel, the sale was also for the purpose of constructing a choultry in their village). This inscription clearly tells us that the maintenance and repairs of an irrigation work were considered the primary responsibility of the members of village community, and when they were unable to discharge their duty in this regard, it was entrusted to others.

Another interesting inscription, which spells out in detail the entire arrangement existing for the maintenance of a tank is the Rajagundlahalli inscription of 1496 A.D. in Mulbagal taluk. The inscription which is an agreement between the builder of the tank and the major beneficiary under the tank (the temple) states as under:

On your expending money and causing a virgin tank to be constructed in the Mavinahalla to the west of the old tank of Gundlanahalli ..., four parts rice raised in them you may enjoy free of rent. After these four parts have been filled up, we grant you in the rice lands, that will be formed under the tank as dasavanda of three in ten as kattukodige, making out with stones the best, middling and inferior soils and of the dry lands granted as kattukodigamanya for this tank which
are now cultivated and are sown with *ragi*, we
give you as *kattukodigemanya* one *khanduga* land.

If any damage should come to the tank you build,
you will make it good from your four parts of
*manyá*, when that is filled up, if any of the least
failure occurs, we will levy money and grain from
the rice lands and on the tank, including those
of your *dasavanda* and have it repaired.

In the rice lands and dry lands and dry fields of
your *kattukodige* there are no payments under
various heads (as specified) on account of our
temple.

These *kattukodige* rice lands and dry fields are
granted to you for posterity.... with right to bequeath
or sell.

This agreement grants the builder of the tank 4 parts
of the rice raised in the land irrigated by the tank free
of rent as *dasavanda* and three-tenths of the wet and dry
lands as *kattukodigemanya* not only to compensate for the
task of building the tank but also to keep the tank in good
repair. Failure to maintain the tank makes the builder
liable to pay for the repair work from out of his grants.

**Observation made by Francis Buchanan**

That such a system was in existence even at the close
of the 18th century is borne out by the observations made
by Francis Buchanan, who journeyed through Mysore in
1800 A.D. He states that in the country around Kolar, the
irrigated land was watered entirely by means of reservoirs and when any rich man built a reservoir or a tank, it was customary to give him and his heirs, free of rent one-tenth part of the land which the tank watered and also for every khanduga of watered land thus formed, the builder was to obtain free of rent, six seers sowing of ragi land, which amounted to about 146 acres of dry fields for every 1000 acres of irrigated land. So long as he enjoyed these he was bound to keep the tank in repair. If the tank was very large and expensive, the man who built it and his heirs had one-fourth of the land irrigated by the tank, but they did not get any dry field. When the family of the original builder became extinct, the Government resumed the free land and kept the tank in repair\(^4\).

**Bittuvatta, Dasavanda, Kattukodige**

In the inscriptions we come across the terms *bittuvatta, dasavanda and kattukodige*. Let us now discuss their meanings.

*Bittuvatta* is understood to mean land or lands granted to a person/persons for his/their act of constructing a tank or for its maintenance. Lands granted were always those that were irrigated by the water of that tank. The Somasamudra inscription of 993 A.D. indicates *bittuvatta* as being one-tenth (*dassiva*) portion of land\(^4\). Other inscriptions merely indicate the extent of land granted but fail to record as to what portion of the command it formed. However, in the Arani inscription, there is no mention of any grant of land and *bittuvatta* is understood to mean the granting of a portion of the produce for the upkeep of the tank\(^4\). And according to Rice\(^4\), it may mean, *vatta*
a reduction, on a usual rent for *bittu*, sowing or cultivation. *Bittuvatta* could therefore mean the granting of a portion of the land below the tank at a reduced rent in consideration of the act of constructing the tank or for the upkeep of the tank.

*Dasavanda* is another term, commonly used like *bittuvatta* to denote granting of land to a person for repairing or building a tank. According to Rice, it means grant of land at one-tenth of the usual rates (rent) to a person in consideration of his constructing or repairing a tank. The Keregodu inscription refers to grant of *dasavanda* tax. The system of *dastaband* existing in erstwhile Hyderabad State in the early 20th century meant granting to a person one-tenth of the land revenue in consideration of his maintaining the tank. The Nakkerhalu inscription however records the fixing of *dasavanda* payment. This could mean granting of land on condition of his paying in money or kind, one-tenth or certain fixed share of the produce. *Dasavanda* like *bittuvatta* would denote granting of land or a tax concession or as in the old Hyderabad State grant of the one-tenth of the land revenue.

*Kodige* or *kattukodige* is another term commonly used and is much similar to *bittuvatta* and *dasavanda*. *Kodege* or *kodige* means a 'gift or grant' and refers to a grant of land for service rendered in connection with restoration or construction of a tank or for its maintenance in good order. Such *kodige* lands, later treated as *inam* lands, were lands granted free of tax or on a light assessment. It is also seen that there were in existence *kerebandi* and *kerekulege* inams granted for undertaking repairs of a tank.
Maintenance during Tippu Sultan's times

The importance attached to regular maintenance of tanks is also seen from the revenue regulations issued by Tippu Sultan in 1788. (According to Rice, these regulations were the same as issued by Chikkadevaraya (1672-1704 A.D.) but were republished by the Sultan)\(^49\). The tanks which were constructed by the local people and held by them as \textit{inam katu kodige} were to be maintained by the \textit{Inamdares}. They were also to dig up the silt from the tank and use it for the embankment. If the \textit{inamdar} had not the means to repair a tank which had gone into ruin, it had to be done by Government, and a yearly assessment proportional to the expenses of the repair, was to be levied upon the \textit{inamdar}\(^50\).

In respect of tanks constructed by Government, it was laid down in these regulations, that the \textit{amil}, \textit{mutsaddy} and \textit{hircarrs} -revenue officers- should go and inspect the tanks themselves and in making the repairs they should be particularly attentive to the advantage of Government and the increase of the produce. That such repair was carried out annually is clear from the instructions to use buffaloes for conveying the mud for embanking the tanks and an account being kept by \textit{shanbogs} (village accountants) of the quantity of mud thrown every day round the tank\(^51\).

Decline in maintenance:

In spite of such incentives and regulations for the proper upkeep of tanks, the situation in 1799, as reported by Major Wilks was one of “most lamentable decay”. “Tanks which had been broken and disused from two to
three hundred years were visible in every part of the
country and very many were overgrown with jungle, and
forgotten or unknown". This description though very
sweeping was perhaps true to a large extent.

In the early days, the village community consisted
of kinsmen and the lands were generally cultivated by the
village agricultural community, most of whom had a share
in the irrigated land. It was, therefore, in their interest
to keep the tanks in action and in good repair. With the
passage of time, floods destroyed the bunds, famines and
wars depopulated the village community, high or
oppressive taxes were levied by the rulers to defray the
expenditure for their warfare. Perhaps all these factors
led the village community to neglect the tanks. At the
beginning of the 19th century, with the annnexation of
the Mysore State by the British, after the fall of Tippu
Sultan, the State Government had to pay to the British an
annual amount as expenses for their army. Land was
always the main source of revenue to the State. An all
out effort was made by the State to restore and repair the
irrigation works to enable not only to increase the food
production but also as a source of increased revenue from
the land under irrigated agriculture. And after the State
came directly under the British administration, an irrigation
cess was levied towards repairs to irrigation works. In
the words of Dewan Seshadri Iyer, (1894 A.D.),

Undue importance was given to the responsibility
of Government for the upkeep of the tanks, the
ryots' liability being altogether ignored and when
Government found that its costly agency, could
not with any prospect of adequate return for its
capital, undertake the management of the tanks, in the province, the ryot was called upon to take charge of the majority of the tanks. But the ryot had by this time lost all traditions of contribution for works of public utility nor were the civil officers in a position to enforce the ryots' liability in an efficient manner. The various inams and privileges attaching to the upkeep by the ryots had been swept away and cesses had been imposed on the understanding that the work would be done by the Government\textsuperscript{53}.

He further stressed that,

Reform in our tank system must start with a clear recognition of the fact that it is beyond the ability of Government to undertake the repair and maintenance of all tanks in the Province, with any ultimate benefit to its revenues, nor will it be equitable to throw the burden on the ryots after the village system or what little remained of it has been disorganised and after the ryot has tacitly been relieved of his responsibilities by the imposition of special cesses for the repair of tanks\textsuperscript{54}.

**Role of Village Headman**

Earlier the patel, the headman of the village, enjoyed complete authority over the village and was a well-to-do villager. Since he also held certain lands under the village tank, he took care to see that the tank was kept in repair.

According to Rice, in 1654, Kanthirava Narasaraja struck a blow at the powers of patels by reducing their
inams. Their allowances were partially restored by Chikka Devaraya (1672). His son and successor, Kanthirava Raja, however confiscated the shares of the patels. Haider Ali, took no steps to restore to the patels their allowance. Under Tippu Sultan, assessment was levied upon their inam lands.

The ruin of the patels was completed by Purnaiya in the year 1800. Until the period of his Government, the patel’s inams, though sequestered, were still entered as such in the accounts of the Sivayi Jame, or the extra revenue, thus kept separate, it was easy to restore them to their original possessors. Purnaiya, however, at once destroyed such expectations, by including the whole of these allowances under the general revenue of the country”55. The same state of things continued under the later Maharajas.

Under the British, at the season of cultivation, the shekdar made a tour of the villages in his circle, advised and directed the shanbogs in their assignments. In the case of lands under tanks, he ascertained the portions which were to be under sugarcane and under rice and should the supply of water be insufficient to bring the whole of the Sarkar (Government) lands under full wet cultivation, he arranged for the production of the most remunerative dry crop on the portion which would remain wholly or partially unirrigated. One important duty of the amildar was to inspect the bunds of the tanks and the embankments of the water courses in his taluk and keep the Superintendent constantly informed of their condition. The Superintendent generally proceeded on his Jamabandi circuit as soon after
the month of November as was practicable, after the *amildars* had concluded their settlement of the taluks. The *pattas* which had been previously prepared, of each cultivators' holding, were then distributed to the *ryots*\(^5^6\).

This system of distributing the *pattas* brought every taxpayer, in personal contact with the Superintendent, and as all were obliged to be present to receive their *pattas*, an opportunity was thus offered to everyone to seek redress for every grievance which he had.

The reduction of the *inams* of the *patels/shanbog* and revenue assessment of the lands direct by the Government, resulted in the loss of stature and position of the *patel* in the village. He was reduced to a mere paid-servant of the Government and could not force the villagers to undertake repairs to tanks. He also lost the personal zeal or interest in getting such works done. Though the system as introduced by the British eliminated the autocratic or sometimes oppressive working of the ancient system, it struck at the village community interest. It transferred the responsibility of maintaining the village tanks from the village community to the Government.

**Measures adopted by British**

Since it became a difficult task to take up the repairs or restoration of all tanks, a proclamation was issued in 1863 by the Chief Commissioner of Mysore\(^5^7\) permitting a private individual who undertook repairs or restoration of a tank long in disuse, to hold the lands irrigated by it:
(a) at a reduction of one-fourth of the average wet assessment of the taluk or

(b) at the highest dry land rate prevailing in his own and the surrounding villages, or

(c) at the average wet assessment of the taluk, the maximum rate of such assessment being reached in a series of years under the shraya or kaul system.

And in a further order issued in 1871, the above concessions in respect of works undertaken prior to 1871 were as a rule restricted to a period not exceeding thirty years\textsuperscript{58}. Again in 1876, another order was issued indicating that in the case of Government lands in the occupation of persons other than the builder or repairer of the work, the full assessment would be collected from the occupants and one-fourth of such collections paid to the person by whom the work was constructed or repaired. And in the case of inam lands it was laid down that one-fourth of the water-rate imposed would be paid to the builder\textsuperscript{59}.

Since the position regarding repairs to tank was not very encouraging, it was declared in 1884 that in respect of tanks which were constructed or repaired in terms of the 1863 proclamation, reduction of one-fourth wet assessment would be granted as a permanent concession\textsuperscript{60}.

**Maintenance of Tanks by the Land-holders**

Meanwhile in 1873, having realised that it was impossible for the Government to undertake the repair and
maintenance of the thousands of tanks in the State, it was considered necessary to hand over to the villagers such tanks as were either already in a state of efficient repair or had been restored to the required standards. With this object in view, certain rules were promulgated.

The enforcement of these rules was entrusted to the patel of the village to which the tank or tanks were attached and the shekdar of the hobli was to assist the patel in the enforcement of the rules.

Individuals held responsible for the maintenance and upkeep of the tanks were the pattedars, shikmidars, inamdars, people holding lands attached to the village, either dry or wet, and all others deriving benefit from the tank, either directly or indirectly. The proportion of the work to be done by each of the individuals was to be decided by the patel and shekdar, according to the amount paid by each person to the Government, for lands, for houses, or other property attached to the village.

The works falling under tank maintenance were ordinary earthwork and repairs of every description connected with the tanks and their subsidiary works. The repairs, as a rule, were to be carried out at periods to be fixed by the village authorities, but when necessary repairs were to be attended to at once. In case of default by any individual in the execution of his obligations, the village authorities were empowered and required to carry out the portion of work that ought to have been done by the defaulter through paid labour. The cost was to be recovered from the defaulter as a revenue demand.
The village *patel* was held primarily responsible to ensure that the tanks were maintained up to the standards laid down for each tank. It was the duty of the *shekdar* to satisfy himself, by personal inspection in each case, that this had been done. A regular inspection of each tank in the taluk, was to be made annually, between the months of December and March, by the *amildar* himself, otherwise by the *peshkar, shirastedar or taluk maistry*, specially deputed for such duty by the *amildar* and the results of such inspection were to be entered in a prescribed register. Whenever a tank on such inspection was found not up to standard, a second inspection was to be made of the tank prior to the end of April, by which time the repairs had to be carried out failing which the repairs were to be got carried out by the *amildar* and the cost recovered from the defaulters as a revenue demand.

A duplicate copy of the Register was to be forwarded by the *amildar* to the District Revenue Officer prior to 1st June, by which date repairs to all tanks works were to be completed.

The Assistant Commissioners in charge of subdivisions were expected during the period of *jamabandi* and on other convenient occasions, to inspect personally as many tanks as possible and test the accuracy of the returns, entering the date of inspection and their remarks in the Tank Book. The result of their inspection was to be communicated to the Deputy Commissioner.

Similar duties were also to be performed by the Deputy Commissioner, who was held responsible to see that these rules were fully and intelligently carried out.
and not allowed to become a mere formality.

Any work to any tank ordered to be carried out by an officer of the P.W.D. of the Engineer-Grade was to be done on that officer’s responsibility. And should any portion of such work not form part of the duty of the ryots, a notification for the sanction of the same was to be submitted by the amildar through proper channel. Any work considered necessary by an officer of the P.W.D. of the subordinate-grade was to be reported by him, without any delay, to his departmental superior, and in case of emergency direct to the amildar also.

The inspection report of the Assistant Commissioner was to clearly indicate:

(a) if the bund was level and of full width, clear of jungle, weeds and free from holes,

(b) if the slopes were full and free from ruts, turfing was in good order or otherwise

(c) if the revetment was in condition,

(d) if the sluice was in order or not, and

(e) if the waste-weir was perfectly secure and free from leaks.

Notwithstanding the efforts made by Government to restore many tanks to the necessary standards and hand them over to the ryots for upkeep, the maintenance of tanks was neglected by the ryots and there was failure on
the part of the Revenue Officers to enforce the maintenance rules. Owing to such neglect, it became necessary for the Government to restore them so as to preserve the tanks from complete ruin. Questions were raised as to whether the ryots were liable for the costs of such earthwork as arising due to cumulative neglect of maintenance of many years.

To enable Government to deal satisfactorily with the whole subject, a committee was appointed to examine all these issues. The orders issued by the Government of Mysore in December 1904 based on the report of the Committee provided for the following measures:

(a) The liability of the ryots in executing repairs to tanks, which had deteriorated due to neglect of maintenance was limited to one year’s assessment of land in the aatchkat of the tank,

(b) though as a general rule ryots should do earthwork and Government the stone and masonry work, but when the amount of earthwork to be done was deemed to be such as would create an unreasonable burden on the ryots, it could be relaxed at the discretion of the Deputy Commissioner with the approval of the Government,

(c) larger grants for the improvement of tanks with an aatchkat of Rs.300 and below, and

(d) the distinction between tanks having a aatchkat of Rs.100 and those having an aatchkat of above Rs.100 was removed and all irrigation tanks classed as minor
were treated alike.

The maintenance works to be carried out by the *ryots* were clearly laid down as under:

(a) the bund was to be maintained to the standard level and specified slopes,

(b) gullies or other inequalities caused by rain and the treading of cattle upon the bunds of tanks and channels were to be filled up,

(c) growth of prickly pear and similar rank and pernicious weed on the bunds was to be checked,

(d) underwood on the bunds of tanks, wherever it may be injurious, was to be cleared,

(e) accumulations in sluices and in all channels issuing from tanks, which obstructed the flow of water to the fields was to be cleared; earthwork of petty and branch channels was to be cleared and repaired,

(f) supply channels of tanks were to be kept in order,

(g) bunds of all tanks were to be watched during rainy season; parts of the bund acted by the waves were to be turfed, the opening and closing of the sluices was to be assisted, and

(h) all minor duties to prevent breaches and other accidents.

In the inspection report, a further column relating
to the condition of subsidiary works including feeders and distribution channels was also introduced. (However, it is seen that there is no indication in these rules regarding the removal of silt from the tank bed and this appears to have been neglected).

**Tank Panchayat Regulation 1911**

In spite of these rules, it was observed that the maintenance of tanks was neglected due to the disappearance of community spirit in the villagers and due to slackness of the village officers entrusted with enforcement of the rules. Government felt that a remedy would be to enlist the co-operation of the people of the village by giving them a voice in the measures necessary for the maintenance of their tank and powers to execute the necessary work with control over funds that might be set apart for that purpose, so that they might feel that the work was not one in which the Government alone was concerned. With this objective, Government enacted in 1911 the Tank Panchayat Regulation.

According to this regulation a Tank Panchayat was to be constituted for any village if not less than two-thirds of the *ryots*, holding in the aggregate not less than half the area of the wet lands under the tank, so desired. The *Panchayat* was to consist of the *patel* and *shanbog* of the village and three or more members elected by the *ryots*. One-fourth of the elected members were to be from the *ryots* not holding wet or garden lands and the rest were to be from the *ryots* holding wet or gardenlands. The elected members were to hold office for a term of three years. The *patel* of the village was to be the chairman of
the *Panchayat*.

The *Panchayat* was to control a fund made up of the following items:

(a) the amounts collected from *ryots* who fail to do the work allotted to them or preferred to commute their quota of labour into money payment;
(b) the proceeds received from the sale of the right of fishing in the tank, the right of grazing in the tank bed, the right of cutting and removing the grass on the tank bund and the produce of the trees in the tank and on the bund,

(c) the rent or share of produce obtained from the granting of temporary cultivation of quick growing crops in the tank bed,

(d) grant allotted by Government, from Irrigation Cess Fund,

(e) amount advanced by Government, for the restoration or improvement of the tank if the *Panchayat* so desired and

(f) any other grant or loan, which Government may make to the *Panchayat*.

The *Panchayat* was empowered to regulate the issue of water from the tank. It was also empowered to determine in any year, having regard to the quantity of water available in the tank, the area to be cultivated with wet crops, and the area for growing of sugarcane.
With the coming into existence of a Tank *Panchayat*, the enforcement of the customary obligations of the ryots for the maintenance and upkeep of all tanks as laid down in the rules of 1873 and 1904 came to rest in the *Panchayat*.

During 1913-14 following thirty Tank *Panchayats* were sanctioned:

1. Bangalore Dist. Dodballapour Taluk Madhurai Tank
2. Bangalore Dist. Magadi Taluk Kempasagara Tank
3. Bangalore Dist. Bangalore Taluk Bellandur and Varthur Tanks
5. Kolar Dist. Malur Taluk Honganahalli Jambukere
7. Tumkur Dist. Madhugiri Taluk Siddapur Tank
8. Tumkur Dist. Tumkur Taluk Bellavi Tank
9. Tumkur Dist. Tumkur Taluk Honnudike Tank
10. Tumkur Dist. Koratagere Taluk Agrahtar Tank
11. Tumkur Dist. Pavagada Taluk Palavalli Tank
12. Tumkur Dist. Tiptur Taluk Nonavinakere Tank
13. Tumkur Dist. Turuvekere Taluk Mysandra Tank
14. Tumkur Dist. Turuvekere Taluk Sulekere Tank
15. Mysore Dist. Krishnarajapet Taluk Deevarammannikere
17. Hassan Dist. Hassan Taluk Sankere
18. Hassan Dist. Channarayapatna Taluk Hirisave Tank
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<th>19. Hassan Dist.</th>
<th>Holenarasipur Taluk</th>
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<td>20. Shimoga Dist.</td>
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<td>23. Shimoga Dist.</td>
<td>Sorab Taluk</td>
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More such *Panchayats* were sanctioned each year and in 1919-20 there were 109 such *Panchayats*. And in 1934-35, there existed 127 Tank *Panchayats*. Of these only seven worked actively.... Very few *Panchayats* were reported to have collected funds and interested themselves in the distribution of water, in clearing rank vegetation of tank bunds and in doing maintenance repairs. A few Tank *Panchayats* were abolished since they were not performing the duties imposed upon them. (The Bharamasagar Tank *Panchayat* in Chitradurga Dist. which was constituted in March 1915 was abolished in January 1936).
Failure of Tank Panchayats

Either due to lack of co-operation among the ryots, or due to lack of enthusiasm in the patel or shanbog to enforce the customary maintenance obligations or for some other reason the Tank Panchayats failed to perform and became 'defunct'. Enforcement of the customary obligations by the patel or the Village Head was not possible as he had been reduced to a mere titular head, one among the many paid servants of the Government. The patel was no more a resident of the village but was living in a close-by urban centre. Because of the development of social and economic groups or factions in the village, it was not possible for the Headman to enforce his orders. Also, due to large growth in population and due to greater economic and social prestige and power in the urban centres, most of the large, well-to-do landholders migrated to urban areas, leaving the care of their lands in the hands of their trusted labourers. All these and many more reasons perhaps slowly led to the neglect of the customary obligations.

Taking over of Maintenance by Government

Perhaps with the understanding that it was not possible to enforce the customary obligation of every villager towards the maintenance of tanks and such other works Government introduced under the Mysore Irrigation Act of 1932 a provision to commute the performance of such labour to a contribution in cash leviable from all such persons. It, however, made it necessary for two-thirds of the persons under the tank to give their consent for such a levy.
When all these measures failed to achieve the desired result of keeping the tanks in repair, Government agreed to take over the entire responsibility of such of the tanks (minor irrigation works) which it considered necessary to do so in the interest of proper irrigation of lands. A clause was introduced in 1952 in the Mysore Irrigation Act of 1932 that in respect of all such tanks whose maintenance would be taken over by the Government, every landholder in the area benefited by the tank shall pay a sum of three rupees per acre per annum to Government as maintenance cess in addition to the assessment fixed as land revenue.

And in the Irrigation Act, of 1965, the term 'minor irrigation work' occurring in the Act of 1932 was omitted, and provision was made for Government taking over the maintenance of any irrigation work which was being maintained by any person or body of persons. Since, 1965, no such notification taking over the maintenance of any irrigation works has been issued by the Government. One has, therefore, to conclude that all the irrigation works were already under the maintenance of Government.

Present Status

Before the formation of Zilla Parishads in 1987, all tanks with an irrigable command of ten acres or less were maintained by the Panchayats or Local Bodies from the grants made available by Government. All other tanks were maintained by the Public Works Department. There were no specific norms adopted for determining the maintenance grants. Few large tanks had specific grants, while the rest were mostly neglected. As seen from the information furnished by the State to the Eighth Finance
Commission, only about rupees twenty per acre was provided towards maintenance and repairs of tanks. This included the salaries of the sowdies and other such staff. Necessarily, therefore, the amount spent on actual repairs to tanks was extremely negligible.

With the formation of Zilla parishads, the maintenance of tanks with an irrigable command of 5000 acres and less is vested with the Parishads and only the remaining larger tanks are maintained by the Government. Even though the maintenance grants provide for about rupees forty per acre, there are no specific norms regarding the scale of establishment or nature of repairs to be carried out. Most of the expenditure incurred is towards the salaries to the staff and very little is spent on periodical repairs.

Need for People’s participation

The present neglect of tanks is largely due to the absence of feeling among the village community that the tank is their common property or a resource belonging to them. The tank is being regarded as an item owned by the Government, maintained by the Government and repaired by the Government.

The various inscriptions and observations made by Buchanan indicate that in the past the maintenance of a tank was generally the responsibility of the builder who was the recipient of bittuvatta, dasavanda or kattukodige from the community. If the upkeep of the tank was neglected by the builder, another individual would generally undertake its repairs and restoration as an act of merit. For this act, he was granted a fresh kattukodige.
The maintenance of the tank was the responsibility of the kodigedar who owned lands under the tank. Vesting of the responsibility of maintaining the tank in a single agency, who was a beneficiary under the tank was an ideal system. The kodigedar who had an interest in the well-being of the tank could plan and execute the work in an integrated and efficient manner. The neglect of our tanks, was perhaps a result of our giving up the system of kattukodige. It is also possible that such a system was largely limited to a tank serving a single village and when large tanks were built by Government to serve large number of villages, a suitable system of maintenance was not evolved.

The neglect in the maintenance of our tanks was also due to frequent breaching of the tank and bund on account of floods and the kattukodigedar not having adequate resources to restore the bund to its original condition or due to frequent inadequate inflow into the tank resulting in non-supply of adequate water to the kodigedar’s lands to enable him to raise paddy crops. Such neglect over a long continuous period, made it difficult for the kodigedar to undertake any repairs.

The granting of certain extent of land as manya (free of rent) to a kodigedar was a well conceived and adequate scheme for the maintenance of a tank. For instance, if we assume that ten acres of paddy land was granted as manya under a tank with an atchkat of 100 acres, and assuming an yield of ten quintals of paddy per acre, the value of paddy for the ten acres (at 200 rupees per quintal) which he would have paid as rent to the Government would be 10,000 rupees. (Fifty per cent of the produce was being given to Government as rent). This works out to about
100 rupees per acre of command area and is adequate compared to 40 rupees being spent presently by Government.

With the decay and abolition of the ancient system of *kattukodiges*, disappearance of traditional authority of village headman or *gowdas*, the age-old system of tank maintenance was replaced by State management of tanks. Maintenance of thousands of tanks which are located in an equal number of villages, was and is indeed a difficult task for any agency. (Even inspection of all the tanks in a district in any single year by a single person is impossible considering their number and distances involved). Encouraging the local people to organise themselves into a society, for the maintenance and management of the catchment and command areas of the tank could be a reasonable solution to the problem. Afforestation in the catchment area, development of fisheries in the tank bed and soil conservation in the command areas could be integrated into the work of tank maintenance and an economically viable structure could be developed. Such work could be entrusted to the village society or *Panchayat* on the same lines as was envisaged in the *Tank Panchayat Rules of 1911*. The *Panchayat* could appoint a *neerganti* or *sowdi* from among the villagers for the regulation of water. The *Sowdi* could be given a share of the produce as remuneration as was being done in the earlier days. This suggestion is explained at length in the last chapter.

**Notes and References**

3. EC VIII (R) - Holenarsipur - 42.
5. EC X - Gauribidanur - 6.
6. EC VIII - Sorab - 328.
8. EC XI - Davangere - 23.
9. MAR - 1931 - 42.
10. EC V (R) - Hassan - 88.
12. S. Rajendrappa in QJMS XXXIII - p.28 says that mattar is equal to 3.75 acres.
12A. Rice - II - Vol I. p.810.
14. EC VIII (R) - Hassan - 61.
15. EC X - Chintamani - 68.
16. EC XI - Bangalore - 79.
17. EC V - Channarayapatna - 237.
18. EC XII - Tiptur - 57.
19. Letter No.3828/507 from Major R. H. Sankey, Chief Engineer, to the Secretary to Commissioner of the Territories of HH the Rajah of Mysore dated 19.11.1866 - Para 42
20. This batter appears to be too steep and does not agree with many old tanks.


27. SII - XI - i - 127.

28. SII - XV II - 37.

29. EC VI (R) - Srirangapatna - 56.

30. EC III (R) - Nanjangud - 282.

31. EC I (R) - Coorg - 48.

32. SII - XI - i - 135.

33. EC III (R) - HD Kote - 107.

34. SII - XI - ii - 151.

35. EC VIII (R) - Holenarsipur - 42.

36. EC VI - Kadur - 134.

37. EC VIII (R) - Arkalgud - 11.
38. **EC V (R) - Mysore 92.**

39. **EC X - Mulbagal - 172.**

40. *Francis Buchanan - Vol I, p.279.*

41. **EC IV (R) - Chamarajanagar - 404.**

42. **EC VII (R) - Nagamangala - 99.**

43 & 44. **EC IV - Introduction p.12.**

45. **EC VII (R) - Mandya - 38.**

46. *Irrigation Commission 1901 - 03 - Select Evidence - p.337*

47. **SII - IX - II - 676.**

48. Papers relating to enfranchisement of kodi ge inams - 1911 - Govt. of Mysore - G.O. No.9620 Rev 43 dated 20th December 1876.

49. **Rice - II - Vol I - p.599**


52. **Report of Wilks - p.46.**

53 & 54. Address of Dewan of Mysore to the Dasara Session of the Representative Assembly on 1-10-1884.

55. **Rice - II - Vol I - pp. 637-9.**


57. **Chief Commissioner of Mysore - Proclamation dated 13th July 1863.**

59. Chief Commissioner of Mysore - Proceedings No.7905-R-239 dated 14th November 1876.

60. Dewan of Mysore's speech of October 1884, *loc. cit.*

61. Chief Commissioner of Mysore - Notification dated 2nd October 1873.


65. Administrative delegation has been effected only in respect of works with an *atchkat* of 120 acres - *Role of Panchayat institutions in Irrigation Management - Law and Policy* - M. S. Vani - p.123.
WATER MANAGEMENT AND FINANCE

Water Management

Introduction

Proper regulation of water from an irrigation work is an important aspect of water management. The Arthasastra enjoins, "Persons letting out water of tanks at any other place than their sluice gates shall pay a fine of six panas; and persons who recklessly obstruct the flow of water from the sluice of tanks shall also pay the same fine"¹.

Regulation of water envisages the utilization of the stored water in a tank, by all the beneficiaries under that tank, in a manner which results in optimum use of water to produce the maximum yield. Such a regulation is best achieved by an understanding among all the beneficiaries. And water management assumes importance in times of water shortage in the tank. Restricting the area to be irrigated or growing of light irrigated crops are generally the measures adopted under such circumstances.

Kunala Jataka tells us that the Sakiya and Koliya tribes had constructed a dam across the river Rohini, which flowed between the cities of Kapilavastu and Kolia. The waters from this dam were utilized for cultivation of
crops. In the month of Jethamula, when crops began to droop, the labourers from both the cities assembled. Then the Koliens said, “Should this water be drawn off both sides, it will not prove sufficient for both of us. But our crops will thrive with a single watering; give us then the water”\textsuperscript{2}. Restricting the area to be supplied with water when the supplies were short, was the arrangement adopted.

Under the Doddakere and Manuganekunte tanks at Bodampalli in Chintamani taluk, Kolar district, whenever the tank fills to half or one-third or one-fourth capacity, the farmers cultivate only a proportionate part of the command area in the head reach. The interesting part of this is, “that all the farmers including those below the head reach participate in the cultivation of the Damasi Command Area”, in the head reach in proportion to the land held by them under the tank and the availability of water in the tank\textsuperscript{3}. This practice of sharing the available waters and the irrigable land in a cooperative manner is reported to be in operation since a long time.

Inscriptional Evidence

The Bhairapura inscription of Krishnarajapet taluk (1312) tells us that when five khandugas of wet land was sold it was agreed that this plot would receive water from an existing katte (tank) and in case such water was insufficient, arrangements would be made to supply water from another tank also with a fixed schedule of turns\textsuperscript{4}. It is evident from this that the distribution of water in the command area of a tank was done by adopting the turn system, which is now considered as an efficient system of water management.
The Rajagundlahalli inscription of Mulbagal taluk (1496), which has been quoted earlier which is an agreement between the temple and the builder of the tank, tells us that if the tank were not to fill sufficiently for irrigating the dasavanda lands given to the builder under the agreement, he shall also take his turn for receiving water from the tank. These inscriptions indicate that efficient water management under tanks was well established even in the medieval period.

An undated inscription in Oblapura in Nittur hobli of Gubbi taluk tells us that an agreement was arrived at between the mahajananas of Naranghatta and Madhusudhana temple authorities to the effect that the lands of the temple under the Chikkakere (small tank) would be irrigated from the water of that tank alone and not from the waters of Naranghatta. For this act of agreeing to permit the use of Naranghatta waters exclusively by the mahajananas, they promised to pay the temple an annual rent of one gadyana. This inscription tells us that construction of irrigation works in series was in practice and enabled the use of all available waters.

The Rudrapattana inscription (1357) of Arkalgud taluk quoted earlier tells us that since the channel from the tank had to pass through some villages, the sides of the channel were ordered to be lined with stones. This again shows us that the lining of irrigation channels was carried out whenever it passed through the villages, so that the houses and grain yards located below the channel were not affected by seepage.
Water Management as seen by Buchanan in 1800:

According to Buchanan, at the end of June, when the agricultural season commences, the farmers used to assess the quantity of water available in a tank and they would go in for a crop of jowar or ragi, if the storage available was not adequate to sustain a paddy crop over the entire area. And paddy would be raised as a second crop to the extent feasible based on the quantity of water available in the tank.

The paddy lands were in terraces, level plots surrounded by little banks of earth. These plots, owing to the slope of the land were irregular in shape and small in size. The cultivator used to lead water from the irrigation canal by excavating his field channels. He would fill these channels with water when required and turn off the supply by blocking the channel with mud at the head.

Buchanan also indicates that after the tank was built, the farmers formed channels for conveying water to their fields. Perhaps these channels were field channels and the main canal under large tanks was constructed by the builder, since it involved excavation through lands belonging to different land-holders.

Another interesting aspect described by Buchanan is in respect of the layout of water distribution system under a garden or a sugarcane plot. From the main channels, supply channels were dug at right angles and 22 cubits apart. To drain off the excess or superfluous water, drains were excavated deeper than the supply channel and parallel to them. The drains were in turn connected to a main drain.
Layout of a sugarcane field
as seen by Francis Buchanan - 1800

Legend
1. Main channel
2. Supply channel
3. Main drainage channel
4. & 5. Sugarcane fields
6. Excess water drainage field channels
7. Subdivision of each field
8. Field supply channel
9. Field bunds
Further, it is also seen that at Srirangapattana and its vicinity, sugarcane was never repeated on the same ground till three crops of rice had intervened\textsuperscript{12}. And at Maddur, a sugarcane crop was succeeded by seasmum, next by rice and then by sugarcane\textsuperscript{13}.

All these indicate clearly that adequate attention was given to ensure that the lands do not get water-logged.

**Organisation for water management**

Now, let us examine the organisation employed for water management. Every village had twelve officers and during the Vijayanagara period these were known as *Ayagars*. They were

- **Shanbog**: The accountant
- **Gaunda**: The headman
- **Kammara**: The blacksmith
- **Badagi**: The carpenter
- **Agasa**: The washerman
- **Panchangi**: The calenderer
- **Nayinda**: The barber
- **Madiga**: The shoemaker
- **Akkasali**: The goldsmith
- **Nirganti**: The watchman of the tanks
- **Talari**: The village watchman
- **Kumbara**: The potmaker
These twelve were the village servants. Their offices were hereditary passing from father to son. They were authorised to sell or mortgage their office when in distress. The *ryots* gave them a share of the crop produced in their village. In certain cases, they were also allowed lands as *manya*.

The duty of *nirganti* was to attend to the tanks and close, when necessary, their sluices or *tubus* with the stoppers usually fitted for this purpose. "In winter, he was to watch carefully on the banks of tanks to preserve the water. It was his duty to divide among the *ryots* of the village the requisite water for the production of the crops. When the water diminished, he rendered account thereof to the managers, lest he be suspected of disposing of it clandestinely". For these duties, he received *hore-hullu* and *mura-batta*. *Hore-hullu* seems to mean a bundle/bundles of straw and *mura-batta* seems to mean some portion of grain (rice) produced\(^\text{14}\).

Buchanan in his diary indicates that for every *candua* or 1,920 *seers* of produce, the *nirganti* was given 24 *seers*, which works our to 1.25 per cent\(^\text{15}\). He further states that six *nirgantis* were sufficient to manage 150 *canducas* of land, which was about one hundred acres for each man\(^\text{16}\). Assuming an yield of 13 quintals of paddy per acre and a quintal of paddy being sold at two hundred rupees, the shares of each *nirganti* would be about 3,250 rupees and 650 rupees per month for a crop season of five months. The remuneration coupled with share of straw was a reasonable arrangement for proper management of water under a tank. The decay of the village system in the British period completed the neglect of our ancient and efficient tank system.
Even though the traditional village officers are abolished and the water management under tanks is entrusted to sowdies appointed by the Irrigation Department, the system of nirganties is still in practice in some of the old large tanks as was observed during our visit to Ramasagar tank in Kolar district. The nirganties are informally appointed by the village and they are in receipt of their share of the village produce as in the past. Perhaps, a formal revival of the past practice of nirganties being appointed by the village community and they being paid for their services in terms of the produce and giving them sufficient authority would be a much needed reform in water management under our tanks.

Construction Cost

Introduction

There were at least 45,000 tanks in Karnataka at the close of the nineteenth century\textsuperscript{17}. A few of these tanks were big but most of them were small. They had been built centuries earlier. They had not been built at any single period. They were the remnants of the developmental activity spread over centuries. All these tanks represented an investment of a hundred million rupees\textsuperscript{18}. An investment of such a magnitude in that period on irrigation tanks was indeed a great achievement even if it was spread over a long period.
Public Investment

It would be interesting to examine if the investment on construction of tanks was made by the ruler/king or by private individuals. An investment made by the ruler or the State has to be treated as public investment made with the sole purpose of increasing the prosperity of his domain. Though such prosperity would bring additional revenues to the State coffers, the investment could not be aimed solely as a profit-earning venture. That such was the policy of the State is clearly seen from Amuktamalyada, the magnum-opus of Krishnadeva Raya, the great Vijayanagara ruler. He states that the prosperity of the State would increase only when tanks and irrigation canals are constructed and favour is shown to the cultivators in the matter of taxation and services\textsuperscript{19}.

It is also seen from the various inscriptions that most of the investments made by the kings were on building of anicuts across important streams. The anicuts across the Tungabhadra, the Kaveri and the Hemavathi are evidence of this. Some of these anicuts were built by them primarily to supply water to their palace and the capital city. From them, irrigation was an additional benefit. Others were constructed solely for irrigational purposes. Construction of these dams involved resources and organisation of a magnitude, which only a king could afford. For the same reason, only large tanks, which the local population could not tackle were built by the kings. Public investment was largely limited to large works.
Private investment

In 1902, out of about 22,000 tanks existing in Mysore, only 26 were large tanks with an irrigation of about 1,000 acres and more. Rest of the tanks were small in size. Most of them were very small and irrigated only a few acres belonging to a single individual or a single family. Tanks bigger than these served the interests of one village or areas in two adjacent villages. Most of such tanks, which served a village were built by private individuals.

They were mostly built by wealthy traders or powerful chieftains. Sometimes tanks were also built by temples from their funds. They were all built mostly to earn merit. Sometimes, they were built to commemorate their near or dear relatives. Looking at the cost of the dam and appurtenant works and the small storage created by the tank, their construction could not have been taken up with a view to earn profit on the capital invested\(^{20}\). The tanks were necessary to provide water both for man and animals. They were built as works of charity.

It has been held by some historians that such investment made by individuals was in the nature of a 'developmental investment', undertaken by them for securing long lasting income rights to a portion of land brought under irrigation by the tank\(^{21}\). Though the builder derived certain income rights from a dasavanda or kattukodige, he was in return made responsible for the maintenance of the tank. The element of profit obtained from such investment would have been marginal considering the fact that the area irrigated under all such tanks was small and the obligation to maintain the tank devolved on him irrespective of the
fact that the tank filled or not to obtain any income from agricultural production. Though investment made by individuals for construction of tanks secured them land under the tank, the investment made was largely with a view to earn public recognition and merit.

Decline

Such activity of constructing new tanks appears to have been predominant during the period from 10th to 16th century. In the next two hundred years, we do not see any evidence of active construction of new tanks. Either due to all sites feasible for building of tanks having already been tackled or due to the succession of wars and ravages caused by such wars, the tradition of building tanks by individuals for the welfare of the community lessened or was lost. The British, who appeared on the scene during the 19th century, did not encourage or promote the tradition that existed. The introduction of the ryotwari system and the abolition of the village officer's system, brought about the decline of the traditional Indian village. Restoration of tanks which had been neglected in the 17th and the 18th centuries was not within the means of village community. People had lost interest in such activity. The traditional conception of earning merit was given up in the wake of the western influence. Construction of public works began to be considered as the responsibility of the Government.

The British Government also laid down under the various Acts the authority of the Government to use and control for public purposes the waters of all rivers and streams flowing in natural channels, and of all lakes and
their natural collections of still water. A private individual or entrepreneur could not build except with the permission of the Government.

The East India Company, which was essentially a business organisation, and later the British Government, were interested in developing such irrigation works which were remunerative or which gave them adequate returns. They improved the anicuts and channels taking off from main rivers, which had an assured flow of water during the agricultural season. Small tanks which depended on small catchment draining into it failed when rain failed. Revenue from such tanks was uncertain. They were therefore, neglected. Only such tanks which gave an assured return on investment were taken up for construction.

Construction of tanks and all such public works were financed from the general resources of the State. It was only in the beginning of the present century that financing of public works, from public borrowings, which were anticipated to be returned based on the earnings from the new assets was contemplated.

Public contribution

Sometime in 1888, the Government of Mysore conceived a procedure of obtaining public contribution to assist in the financing of irrigation schemes. It laid down that when the Government undertook a large irrigation work which added to the value of the lands below it, the State had a right to participate in some moderate degree in the value that is imparted to the land by irrigation. The beneficiary was required to contribute to the State a portion
of the increase in the value of land on account of irrigation. The contribution per acre payable by the landholders who benefited by an irrigation work was conceived as varying from a third to a fifth of the difference between the market value of an acre of dry land and an acre of wet land. They were required to execute a mutchalike (agreement) binding themselves to pay to the Government on the completion of the irrigation work, a specified contribution per acre of dry land which would be converted to wet land. And where holders of not less than five-sixths of the area executed mutchalike (agreement) and holders of the remaining area refused to do so Government was to decide whether the work should be abandoned by reason of such refusal or whether such landholders should be compelled, as a measure of good to the community, to pay their share of contribution either in one lumpsum or in seven or eight annual instalments or by a temporary addition to the wet assessment for a specified number of years. Such payment of contribution was considered only in respect of works costing more than Rs.25,000. In respect of works costing less than Rs.25,000/-, it was laid down that contributions would not be demanded and all such works would be undertaken after examining the enhanced revenue likely to accrue from it, the extent of relief the work was likely to afford to the neighbourhood, and the availability of grants. However, if voluntary contributions were promised and mutchalike (agreement) executed, such works were likely to receive priority in investigation and sanction.

Based on these principles a number of works were executed by the State, and, in the Mysore Irrigation Act, 1932, it was laid down that if the Government considered that the construction of an irrigation work cannot be taken
up unless the payment of contribution or water-rate or both is guaranteed by the landholders benefited from that work, an enquiry was to be held by a specified officer or the Deputy Commissioner and if at least two-thirds of the landholders gave their consent in writing to the payment of proposed contribution or water-rate or both, he would submit a report to the Government. Based on the report, the Government could abandon the scheme or take up the same with modifications if necessary. The contribution payable by the landholders was not to exceed one-third of the difference between the value of the wet and dry lands in the locality. After the completion of the irrigation work, the contribution was recoverable as a revenue demand.

This idea of obtaining from the cultivator, a portion of increase in the value of his land due to the providing of irrigation facility by the Government was indeed a unique attempt in involving the cultivator in the improvement of the assets and perhaps giving him a sense of participation in the construction of the irrigation work.

A committee (headed by Sri Nagan Gowda, the Minister for Agriculture) constituted by the Mysore Government in 1954, to examine the question of scales of water rate and contribution, recommended that :-

It is reasonable to recover by way of contribution not less than half the estimated increase in the value of the land as a result of the execution of an irrigation project. The amount realised by the levy of contribution should be earmarked for repayment of the funds that may have been borrowed to finance the execution of the irrigation project.
The Committee was also of the view that, maximum and minimum rates of contribution in regard to several classes of irrigation works should be indicated to enable a proper determination of the rates applicable to each project within those limits, and also to enable the ryots to understand properly the basis of this form of levy.

These recommendations of the Committee were incorporated in the Mysore Irrigation (levy of Betterment Contribution and Water-rate) Act of 1957. The betterment contribution was fixed as equal to one-half of the difference between the market value of the land before the commencement of the construction of the irrigation work and the market value after the date of completion of the work. A ceiling limit of Rs.500/- per acre was fixed for such betterment contribution. This was revised in 1974 to Rs.1,500/- per acre. However, in respect of irrigation works not capable of irrigating more than one hundred acres of land, no betterment contribution was leviable.

Levy of contribution when it was first conceived and implemented was in the nature of a voluntary agreement of the landholders to partake in the building of an irrigation work. However, in 1957, the voluntary nature of the levy did not exist, and the contribution assumed the nature of tax. And like any other tax, its mode of imposition generated unrest, violence and ultimately led to an executive direction in 1980 not to levy any betterment contribution. Even though the Betterment Contribution and Water Rates Act has not been amended, the executive order prevails and no contribution is being levied under any irrigation work. This is very unfair. The betterment levy should be revived and it should be made the first step in the beneficiaries’ participation.
Water Charges

Earliest Evidence

The *Arthasastra* indicates that the State was entitled to collect one-sixth of the produce (*shadbhaga*) as a tax on all lands and when such land was irrigated, the State was entitled to collect a higher share of the produce.

Those who cultivate irrigating lands by manual labour shall pay one-fifth of the produce as water rate (*udaka bhaga*); by carrying water on shoulders one-fourth of the produce; by water-lifts one-third of the produce and by raising water from rivers, lakes, tanks and wells, one-third or one-fourth of the produce\textsuperscript{23}.

The rationale in determining the different scales of tax for different modes of irrigation is not clear. Further, no distinction is made in respect of irrigation works constructed by the State or by private individuals. It has to be inferred that irrespective of the source of investment made on the construction/maintenance of the irrigation work, the State was entitled to levy an enhanced tax for using water from natural rivers, lakes, tanks and wells. In other words, it declares the sovereign right of the State on all waters whether surface or underground and enables the State to levy a tax for use of such water.

It is however seen that the exercise of such right was not to be oppressive and such enhanced tax was not to entail hardship to the cultivator. The *Arthasastra* says:
Out of crops grown by irrigation by means of wind power or bullocks or below tanks, in fields, parks, flower gardens, or in any other way, so much of the produce as would not entail hardship on the cultivator may be given to Government\textsuperscript{24}.

Further it is also laid down by the same authority that in respect of a new work such tax was to be remitted for five years.

In the case of construction of new works, such as tanks, lakes etc., taxes (on the lands below such as tanks) shall be remitted for five years\textsuperscript{25}.

Evidently, it was agreed that it would take at least five years to develop fully fresh lands for irrigation and the enhanced tax on irrigated land included a charge for the use of water for irrigation.

**Inscriptional evidence:**

Inscriptions indicate that generally the guidelines given in the *Arthasastra* were being followed by all the rulers. The Nandi plates of the Ganga ruler, Madhava I, relating to the period of 8th century record the grant of ten *khandugas* land under the tank of Pusuru. The donor of the gift land was to till the soil on payment of one-sixth produce as tax (*arutondi*).\textsuperscript{26}

The Rampur inscription of Satyakama Perumadi (905 A.D.) reveals that in consideration of constructing a dam at Talvare, Kasiga was permitted to pay one *arani* in the
first year, *pattondi* (one-tenth) in the second year, *elalavi* (one-seventh) in the third year and *aidalavi* (one-fifth) thereafter as tax.27

The Avani inscription states that a fifth of the produce of forest tracts and lands on which dry crops are raised and a third of the produce of the lands below a tank on which paddy is grown should be given as Government share.28 The Tayalur inscription in Maddur taluk states that Polalasetty having built a tank, the farmers and *gamundas* of Kaderu made him a gift of 35 *khandugas* of land of which he could enjoy 5 *khandugas* of land after paying *pattondi* (one-tenth).29 The Bettamakki inscription (1362 A.D.) in Thirthahalli taluk indicates a grant of a share of land yielding 100 *hon* subject to a deduction (for taxes) of 20 *hons*.30 Thus one-fifth of the value of the produce from the land was deducted towards taxes.

It is clear from these inscriptions that a portion of agricultural produce either in kind or in terms of value of the produce was being collected as tax. It is also evident that in consideration of constructing a new tank the taxes collected on the lands below the tank were levied at a reduced rate during the initial period as seen from the Rampur inscription. The normal tax on irrigated lands varied from one-tenth to one-fifth of the produce. The inscriptions, however, do not tell us as to whether any separate or additional charge was being collected when water was supplied from an irrigation work constructed by the State. The Tonnur inscription (13th century A.D.)31 mentions a *Holeya Sunka*, which appears to be only a charge for the ferry services rather than an irrigation cess.
Evidence relating to 19th Century

The earliest reference to the levy of a specific water/irrigation cess relates to the year 1813\textsuperscript{32}. Mattagode in Mysore was a Jodi village, granted to Narasimhabhatta before 1811 A.D. The Krishnarajakatte channel was constructed in 1811. In June 1813, the Maharaja of Mysore issued a sannad directing that in addition to the Jodi (rent) of 29.50 pagodas, 15.50 pagodas be levied from the Jodidars on account of the additional benefit derived from the channel. The enhanced Jodi was on account of the value of water. This shows that the State was entitled to levy a water-rate in addition to the land tax on lands for which irrigation was provided by the State at its cost. This element of water-rate (irrigation cess) was included in the assessment made in Mysore by the Survey and Settlement Commissioner in 1863-64. The Survey Guarantee published in 1870, clearly indicates that in respect of lands irrigated solely from wells or water courses built by the cultivator at his own expense no water rate was leviable.

Irrigation Cess

In 1868, it was decided by the Government of Mysore that in respect of all irrigated land, one anna for each rupee of assessment shall be imposed as an irrigation cess and that this amount shall be used exclusively for repairs, improvements and reconstruction of irrigation works, but not for maintenance, except in respect of tanks and other irrigation works which were under the maintenance of the Irrigation Department; for example, irrigation channels taking off from the Kaveri and the Hemavathi in Mysore
and Hassan districts and large tanks situated near large towns were under the control of the Irrigation Department.

In the Malnad taluks, as a large portion of wet cultivation was carried out from natural streams or springs, and did not involve the construction of any irrigation tanks, there was dissatisfaction among the people towards the imposition of the irrigation cess. In 1875, irrigation cess as a separate levy was abolished and a lumpsum equivalent to the cess was merged in and collected along with the normal assessment of wet lands in respect of villages where settlement was carried out after the issue of the notification in February 1875. In respect of taluks/villages where settlement had been made before February 1875, the separate levy of irrigation cess was not abolished. This amount (which would be 1/17th of the assessment) was set apart by the settlement officer out of the annual revenue of the taluk to form the ‘District Irrigation Fund’, to be administered by the District Committee for the repair, improvement and reconstruction of irrigation works in the taluk\textsuperscript{33}. (In 1862-63 as per the Administrative Report, the average assessment of wet land was Rs.5-12-00 per acre. The irrigation cess at one anna for each rupee of assessment would mean a cess of six annas per acre of wet land).

In Malnad taluks, after setting apart the sum required for irrigation works, the balance amount was to be utilized for the construction and repairs of roads. Such amount was to be treated as grant-in-aid to the Local Fund of the taluk. (The Local Fund was a levy of one anna in each rupee of assessment on all lands and was to be used for the construction and repairs of roads, for educational purposes and for such other local needs).
In respect of Inam lands and lands irrigated under the river channels in Mysore and Hassan districts, where settlement had not been made, an irrigation cess of half a rupee per khandi of land was leviable as per orders issued in 1864.

Irrigation Cess Fund

The Irrigation Cess Fund created from the realisation of the irrigation cess and the lumpsum equivalent of the cess was utilized:

1. for the maintenance of a suitable establishment for the inspection of the tanks in each taluk;

2. for the repair of the masonry of such tanks as had been brought up to the standard and made over to ryots for upkeep;

3. for such other indispensable repairs to tanks, in excess of ryots’ ability to execute; and

4. for repairs to channels, the maintenance of which was with the Irrigation Department.

As far as possible the fund was to be expended upon the tanks of the taluk. And the District Committee was competent to divert funds for tanks of the same series in neighbouring taluks and for any general purpose connected with the irrigation works of the district. Before the creation of the Irrigation Cess Fund, all repairs to tanks were being carried out from the general revenues of the State.
Before 1864, the maintenance and management of all irrigation works were carried out by the revenue officers. In 1864, a small engineering unit, called as conservancy establishment, was set up for the maintenance and management of the large river channels in Mysore and Hassan districts; but the officers of this set-up were working under the control of the revenue department. It was only in 1872 that a separate irrigation department was formed under a Superintending Engineer. With the formation of an Irrigation Cess Fund, a question arose as to whether the repair works under this fund should be under the control of the District Engineer or the Deputy Commissioner. After discussions and consultations, it was agreed that execution of all District Fund works should be under the control of the District Engineer, while the Deputy Commissioner, as the Head of the District and the President of the District Fund Committee will have to decide the works to be undertaken from the District Funds. All estimates for the works and progress reports relating to them were to come up to him.

The District Engineer in his technical and professional capacity was subordinate only to the Head of his department. The administration of Irrigation Cess Fund, therefore, led to dual control; consequently the Government ordered in September 1908 that though the administration would continue with the PWD, the following procedure should be adopted for framing a judicious budget for the district works:

1. The Taluk Boards would draw in the form of a budget, a programme of local works to be undertaken during the year and submit the
same to the District Boards;

2. the District Boards would scrutinise these programmes and prepare and submit an annual District Budget to the Revenue Commissioner and

3. the Revenue Commissioner would examine and modify them, if necessary, with due regard to the funds available and in consultation with the Chief Engineer, he would submit to Government a consolidated budget for the State for sanction.

Even with these guidelines, the state of affairs did not improve. The expenditure in some districts was much in excess of the receipts realised in those districts, while in others it was less than the receipts. Government, therefore, appointed a committee to examine the matter and formulate proposals for regulating the expenditure under the Irrigation Cess Fund. Based on the report of this Committee, the Government laid down in September 1914, the following further rules:38

1. Seventyfive per cent of the total amount collected each year in a district be set apart exclusively for expenditure in that district, the balance of the realisations amounting to 25 per cent being formed into a general fund, to allow of supplementary grants being made, where necessary, in exceptional cases in addition to the ordinary allotment by districts;

2. a triennial programme of urgent and important works in each taluk should be prepared by the
Amildar in consultation with the Taluk Board and submitted to the Deputy Commissioner, who would approve it in consultation with the Executive Engineer and the District Board;

3. the amount of 18 per cent being charged to the Irrigation Cess Fund, towards establishment, tools and plants, should be waived and this amount was to be provided from the general revenues of the State;

4. Extraordinary repairs due to breaches and heavy damage to tanks, channels, anicuts, etc., be debited to State funds and irrigation cess fund should be used only for ordinary repairs and

5. a certain percentage (to be decided by Government in each case) of the cost of maintenance of the river channels in Mysore and Hassan districts should be met from the State funds and only the balance should be debited to the irrigation cess fund.

In 1916, while approving the Irrigation Cess Fund Budget for 1916-17, contribution from the State funds for the maintenance of the river channels in Mysore and Hassan districts was fixed at 40 per cent.

In 1919, in respect of Mysore and Chitradurga districts the limit of 75 per cent of irrigation cess funds being utilised for repairs to irrigation works in the district was raised to 95 per cent. Further, the contribution from the State funds for the maintenance of river channels in Mysore and Hassan districts and in respect of Vanivilassagara
was increased from 40 to 60 per cent.

Maintenance Cess

The Irrigation Cess was primarily to be used for repairs, restoration of irrigation works and not for normal maintenance works of a tank. The normal maintenance work was considered as a customary obligation of the cultivator to be carried out at his cost. Thus, maintenance of small tanks came to be neglected and the irrigation cess fund came to be used for the repairs of major tanks and sometimes even for construction of new tanks. With the construction of a number of large tanks or reservoirs, it was considered necessary to provide for a separate levy towards the maintenance of such works. The Irrigation Act of 1932 was amended in 1952, so as to provide for the levy of an acreage cess not exceeding three rupees per acre per annum. And under the Karnataka Irrigation Act, 1965, this levy was enhanced to four rupees per acre and was made applicable to all irrigation works. Necessary rules for the determination of the amount of maintenance cess leviable were made by Government in 1972. It is however, understood that no maintenance cess has been levied under these rules.

Water Rate

Whenever new irrigation works were constructed or improvement of old works was taken up and assessment did not provide for the water use, a separate water rate was levied by Government. And these water rates were revised from time to time. For instance, under the Krishnaraja Sagara channels, the rates were revised in 1925, after the
initial period of 6 years. Six years were considered as being required for wet cultivation to establish under those new channels. In the Mysore Irrigation Regulation (Act) of 1932 it was laid down that the water-rate shall be liable for revision after the expiry of a period of ten years and thereafter at intervals of not less than fifteen years.

Present Status

During 1957, a separate legislation was made for the levy of water-rate. Water-rate was treated as a charge leviable by Government for making available water for irrigation. Separate scale of water-rates was fixed in respect of irrigation works having an irrigable area upto 100 acres and more. Subsequently, this was modified and uniform water-rates were prescribed in respect of all irrigation works. Since in Malnad areas, the supply of water from the tanks or irrigation works was restricted to only a limited number of waterings unlike the areas in Maidan which totally depended on the supply of water from the irrigation work, a slight modification was introduced in respect of paddy crop raised in Malnad region. For the paddy crop in areas with an annual rainfall of 1250 mm, a water-rate of 20 rupees per acre and for paddy crop in other areas a water-rate of 30 rupees per acre was prescribed.

These water-rates for the various crops were enhanced from time to time. The latest water-rates as prescribed in October 1988 have undergone further revision. In respect of irrigation works having irrigable area upto 100 acres, no water-rates are leviable; in respect of irrigation works having irrigable area ranging from 101 to 5,000 acres, only 50 per cent of water-rates leviable in respect
of irrigation works having irrigable area of 5,001 acres and more are proposed.

More than 90 per cent of the tanks have an irrigable area of 100 acres and less. Therefore, none of the farmers under such tanks may have to pay any water-rate. And in respect of the very few tanks which have an irrigable area ranging from 101 to 5,000 acres, the water-rate leviable is 200 rupees per acre for sugarcane, 50 rupees for paddy and garden crops. And in respect of all other irrigated crops it is less than 50 rupees.

If, in respect of more than 90 per cent of the tanks, no water-rate or maintenance cess is levied, it would indeed become difficult for Government or any local body to maintain these tanks and very soon they may all become overgrown with jungle. It would, however, be reasonable, as already indicated, while discussing the question of maintenance, that the responsibility of maintenance and repairs to tanks be left entirely to the farmers under that tank.

Notes and References

1. *Arhasastra* - Book III - Chapter IX, p 196.
4. EC VI (R) - Krishnarajapet 96 .
5. EC X - Mulbagal - 172.


8. *Buchanan* - Vol I. p. 283


17. Tanks in Mysore State in 1871 36,266
   Tanks in Dharwad Dist. - 1884 3,150
   Tanks in Belgaum Dist. 663
   Tanks in Bijapur Dist. 12
   Tanks in Uttara Kannada 4,631
   Tanks in Bellary Dist. 233
   Tanks in Hyderabad Karnataka 700

   **45,655**
18. Probable cost of repairing 19,222 tanks in Mysore State as estimated by Sankey in 1871 was about Rs.48 lakhs. Roughly the cost of repairing a tank on an average could be about Rs.250/-. Assuming the cost of construction a tank at ten times the cost of repairs, it could be Rs.2,500/- per tank. The cost of about 45,000 tanks in 1871 could be about Rs.1,125/- lakhs.

19. Amuktamalyada - Canto VI - Verse - 236.

20. Minute of Thomas Munro dated 31 December 1824 cited at p.365 of Cambridge Economic History of India - Vol. II - 1989 - Orient Longmans. "The native chiefs were fond of building tanks as good works or as the means of transmitting their names to posterity, and they frequently erected them at an expense far beyond what the land can yield as an adequate return for when they were broken down by floods, their successors did not always think it advisable to repair them".

21. Cambridge Economic History of India - Vol. I - p.114, see for the opposite view, the above footnote.

22. Northern India Canal and Drainage Act 1873 - Preamble.

23. Arthasastra - Book II - Ch. XXIV - p.131.


25. Ibid.

26. Dr. K. V. Ramesh, Inscriptions of the Western Gangas, pp 7 to 9, Delhi, 1984

27. EC VI (R) - Srirangapatna - 85.


29. EC VII (R) - Maddur - 56.
30. *EC VIII* - Tirthahalli - 20

31. *EC VI (R)* - Srirangapatna - 56.

32. *Revenue Manual 1911* - p.551, *Govt. of Mysore*

33. Notification of the Chief Commissioner of Mysore - No.341 dated 11th February 1875.

34. *Notification of the Chief Commissioner of Mysore* - No.62 dated 7th May 1875.


