

SUGGESTIONS

Need for Revival of our Tank System

We have so far traced the history of tank irrigation in Karnataka since the beginning to the present. We have seen how the tank system, an ingenious method of conservation of our water resources, which was once the pride of the country has come to a state of disuse and neglect. At the close of this story of rise and decay of the tank system, we may examine how this old system could be revived and the lessons we could learn from its past working. In the following paragraphs an attempt is made to analyse in brief the present status of the tank system and to make a few suggestions for its revival.

Shortly after the annexation of Mysore, the British Resident had reported in 1803 that the area under wet cultivation, that is, the irrigated area in Mysore State was 8,13,491 acres. The estimated population then was about 21,71,754. In a period of about a hundred years from then, the population had more than doubled and had reached a figure of 55,39,399. But the area under irrigation had gone up hardly by 10 per cent and was 8,91,510 acres. The per capita area under irrigation which was 0.37 acres in 1803, had come down to 0.15 acres in 1901, that is by more than 50 per cent, in about one hundred years.

In a further period of 50 years, i.e., by 1951, the

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population of Mysore State had rapidly increased to 68,54,835 while the area under irrigation registered a growth of less than 15 per cent and was 10,17,197 acres. The per capita area under irrigation had decreased to 0.12 acres.. Even though in 1902, there were in operation about 22,000 tanks with an *atchkat* of about 8,05,000 acres and about 7,000 tanks in a breached condition, the area irrigated under tanks had come down to about 5,38,000 acres by 1951. Evidently, most of the tanks which were in operation in 1902 had gone into disuse.

We have also seen, while tracing the development of irrigation in the period after 1956, that the per capita area under irrigation in 1981 was 0.09 acres. This was in spite of the fact that during the period 1961 to 1981, the area under irrigation which was 22.99 lakh acres in 1961 had increased by about 50 per cent and was about 34.02 lakh acres in 1981.

Another interesting aspect noticed was that in 1989, the 36,408 tanks existing in the State had a registered *atchkat* of about 16 lakh acres, whereas the area irrigated under them was only about 8 lakh acres. Only about 50 per cent of their designed capacity was under irrigation. Perhaps a large number of tanks had gone into disuse or a number of them had lost their storage capacity due to silting and encroachment of the foreshore.

All these figures regarding the area under irrigation reveal a state of neglect of our tanks. Karnataka which was once rich "with clusters of groves with well filled channels, with large tanks like seas, surrounded with growing crops, with crowds of people and with splendid

temples", is today a land with a huge hungry population and very low level of irrigated land to feed it.

No doubt, a number of huge reservoir-irrigation systems, a number of medium sized and minor irrigation tanks have been constructed in the period after 1951. The area irrigated under all these sources was about 52.29 lakh acres in 1989. This certainly is a big achievement. But when compared with the ever increasing population, which stood at the level of 370.43 lakhs in 1981, the utilisation of our water resources is inadequate.

If we are to provide at least minimum requirements of food to our fast-growing population, a further increase in the irrigated area and an increase in the level of agricultural productivity is a must. Our agriculture which is dependent on erratic monsoons has always been based on conserving the rainfall by means of ponds, tanks and wells. Construction of large storage reservoirs across most of our major rivers has either already been completed, or under construction or under contemplation. There are very few or no feasible sites for construction of any fresh large reservoirs. We are, therefore, left with the alternative of development of all our minor streams. Even here, we are faced with a situation of all feasible sites having already been tackled by a system of tanks and very few sites being left untackled for the construction of new tanks. Our next choice would be the construction of small tanks or *kuntas*, which make use of local depressions to store rain water. These could also be low dams built across minor streams, where tanks are not feasible, to serve as percolation ponds which will enable the rise in the water table in the adjoining country. Small bunds built across the fields could arrest the rain

water and assist in the retention of moisture in the fields. Raising of trees along the field bunds will not only arrest the erosion of soil but will also assist in the retention of moisture in the fields. These and many such measures were in use in our country for optimum usage of rain water. With the disappearance of our village community system and the community spirit behind such system, the tanks and the various other measures for conservation of rain water and utilisation of natural resources for increasing the productivity of the soil have been lost.

The first step in the reconstruction of our water resources would be the restoration of all our tanks which are in a breached condition or silted up, and are incapable of storing any water. Restoration of all such tanks to their original capacity will increase the irrigated area under the tanks and increase our agricultural production with minimum investment. Apart from increasing agricultural production, it will also assist in the development of fisheries under those tanks. The storage in the tanks will also improve the water-table under the wells in the village. In short, the tanks will develop the economy of those villages.

Watershed Development

However, before undertaking restoration of such tanks at random, it is necessary that a detailed survey of each watershed is made and an exact plan of operation for the restoration, repairs or reconstruction of tanks is drawn up. - Such a plan should deal not only with the restoration of the bund and the removal of the silt from the tankbed but bestow equal attention to the development of the catchment area so as to reduce the erosion of soil

which leads to the silting of the tank. Check dams along the valleys, afforestation of the hill slopes, raising of trees along the roadside and on the banks of the valleys should be some of the important items in such a plan. All such measures which will improve the soil and water conservation should be an integral part of the watershed development.

Investigation of the existing system of water distribution in the command area, identifying the area for water conservation, and an understanding of the socio-economic needs of the population would also require equal attention. The development of the irrigation system should be one of the measures for the integrated development of the watershed.

Such planning cannot be satisfactorily completed within a targeted time of six months by the existing Governmental agencies alone. Other non-Governmental agencies, who have the expertise in such work should be employed for undertaking this task. The entire State could be divided into various micro and macro watersheds and investigation taken up in respect of each watershed. Since such work has to be carried out in a limited time and would involve employment of experts it would require adequate funding for the job.

Such investigation work is presently being carried out by various non-Governmental agencies in a limited manner. Further, most of such efforts lack the approach of an integrated development of the watershed. Some aim at the desilting of the tank, some have the object of developing sericulture and some others are for establishing village industries. All these aspects of rural development are to be integrated into an overall development of the village. Further, all such development plans are presently drawn around a village or

a taluk as a unit. If our agricultural production has to improve, all such plans should have the watershed as a unit, since it is the water resource which is the primary input for the development of our agriculture. Hence the need for having a plan for the development of each watershed. It was exactly on this principle of watershed being made the unit of administration that the *Nadus* were formed in the ancient period in South India.

Once the plan for each micro watershed and the macro watershed is drawn up, an integrated plan for the entire state could be decided upon. The development of each watershed could then be entrusted to the Zilla Parishad for being executed through the Mandal Panchayat in whose boundary the watershed happens to be. The Karnataka Panchayats Act 1983 provides for construction, renovation and maintenance of medium and minor irrigation works with an *atchkat* not exceeding beyond the district, as one of the functions of the Zilla Parishad. The Mandal Panchayats are vested with the construction, repair and maintenance of wells, ponds and tanks for the supply of water for domestic use. The Mandals are not entrusted with similar responsibility in respect of irrigation works. It is desirable that Mandals are also vested with the responsibility for construction, renovation and maintenance of all minor irrigation works with an *atchkat* not exceeding the jurisdiction of the Mandal. Such a provision will not only create effective decentralisation but also enthuse the Mandals to actively participate in the agricultural development of the Mandal.

Having considered it desirable to execute all these works through the Mandal Panchayat, the next important

task would be to find financial resources for the same. Our State and Central Governments are generally anxious to obtain loan assistance from international agencies like World Bank for such works. Even though such assistance results in receiving the much-needed scarce foreign exchange, it is highly desirable to plan our schemes based on our own resources, since lending agencies normally specify their own criteria for construction and management, which may not suit our local conditions.

Hence, we may examine if we could adopt with suitable modifications, the system that existed in our country, before the entry of the British.

Development of our Tank System :

We have seen that before the introduction of British administration in our country, in the nineteenth century, the construction and management of our tank system was in the domain of the local village community. Only in exceptional cases, where the investment involved was large, as in the case of large tanks or *anicuts* across major rivers, the ruler or the king was involved. Such a system of irrigation management by the local village community disappeared largely due to the taking over of the village administration by the British Government through its 'paid' staff and a programme followed by the British of severance of traditional ties between the village servants and the village community. (It is significant that this system is continued even after independence by the Government in its policy of transfer of Government Servants).

Construction of Tanks

In the pre-British period, the construction of a new tank or restoration of an old tank was considered as an act of merit. The builder of a tank generally was the local chieftain, a wealthy trader or a local entrepreneur. In most cases, the builder was granted some land under that tank. He was made responsible for the upkeep of the tank. Such a grant was generally hereditary and he was allowed the cultivation of that land at a concessional payment of revenue. Perhaps, there existed in those days, a certain extent of cultivable land which was community property and from this the builder was granted a portion. Today we have scarcely any cultivable land which is available as common property.

This ancient system of granting land under the tank to the builder in recognition of his services to the community and making him responsible for the maintenance of the tank was an ideal system, which worked well for centuries in the past. The village community was involved in the construction of the tank and in its maintenance. The builder of the tank, who was granted land under the tank by the community became a beneficiary under the tank. He, as a part of the village community, was interested in the proper upkeep of the tank in his own interest. Can we bring back that system with necessary adaptations to suit our present socio-economic conditions?

As in the earlier system, the construction or reconstruction of a tank even today could be entrusted to a local entrepreneur, who may be granted land under the tank. In the absence of any community or Government

land, the landholders who will be benefited by irrigation may be persuaded to part with about one-third of their holding in lieu of the benefit of irrigation to their lands. For this act of their surrendering their lands they could be granted a concessional water rate for say five to ten years. Such lands could be obtained from landholders who hold more than say ten acres. In respect of reconstruction of an old tank, the existing canal system could be extended and similar procedure adopted in respect of lands which are to be brought afresh under irrigation. Such a scheme of obtaining land from landholders was adopted successfully under the Krishnarajasagar Project for providing land to families whose lands were submerged under the reservoir.

The extent of land to be granted to the builder in all such cases could be, as in the past, about one-tenth of the command area under the tank. For these lands so granted, a concessional water-rate could be granted for a specific period.

As an alternative to the granting of land under the tank, the builder of the tank, may be entrusted with the responsibility of maintaining the tank and permitted to deliver a measured quantity of water at the tank outlet and collect a charge for the water so supplied, based on the cost incurred for the construction, maintenance of the tank, etc., at a rate determined by the Zilla Parishad. After a period of about 20 or 25 years, the builder should relinquish this right over the tank and its water and the same should become the property of the Mandal Panchayat.

Since our sole object is to create and bring back the

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village community spirit, it would be desirable to entrust the work of the construction or reconstruction of a tank to a Mandal Panchayat or a local body. Works with an irrigable command of 1000 acres and less could be executed by the Mandal Panchayat and larger works could be executed by the Zilla Parishad. These local bodies could execute the works by obtaining necessary funds from a commercial bank with the State Government as a guarantor. The loan could be returned within a period of 10 to 15 years after completion of the work by collecting necessary water rates from the beneficiaries. Since it is necessary to create a sense of involvement of the community in the construction of their asset, we suggest that 10% of the cost be contributed in kind or cash by the entire village community. Another 10% of the cost may be contributed in terms of voluntary labour by each household and of the balance 80% of the cost, half should be contributed by the State Government and the remaining half borrowed from the Bank. Such a system of beneficiaries' contribution to the cost of an irrigation work has successfully been adopted under Pani Panchayat movement in Purandhar taluk in Maharashtra. A system of contributions from the beneficiaries for taking up an irrigation project existed in the Mysore State.

Reconstruction of our tanks involves largely the removal of accumulated silt from the tank bund. The silt could be utilized for the strengthening of the existing bund. Fine silt could be utilised as fertilizer. Good clay could be used for the manufacture of bricks and tiles. Most of the silt could be utilized for the reclamation of low lying areas in the village. Funds generated from all such works should be used by the *Panchayat* for its developmental activities.

Maintenance and Management of our Tanks.

The next stage after reconstruction would be the proper upkeep or maintenance of the tank. As in the past, the builder of the tank, who has been granted land under the tank could be made responsible for the maintenance of the tank and the canal system under it. For this task of maintenance he could be granted a tenth of the produce from the command area. Though such a system may ensure proper maintenance of the tank by a beneficiary, who has an interest in it proper upkeep, it may not be effective in the development of a common community interest in our present village society with its factions and caste groups.

Further, it is not only the maintenance and proper upkeep of the tank, but the proper management of water under the tank that is of equal importance. Management of water requires the involvement of all landholders under the tank. It has to be a cooperative effort. All the farmers need to have a common approach in selecting the crop pattern, sowing time, and water delivery schedules suited to the availability of water so that the distribution of water is equitable and reliable.

Such participatory management has been in existence in our country since a long time. The unique *Damashi* system is in operation to this day in Kolar district. Elsewhere in this book, this has been described in detail. A system of Tank *Panchayats* was conceived and put into operation in Mysore State in the early part of this century. But these *Panchayats* did not function effectively and failed. Perhaps proper motivation was lacking. The powers and functions

of these Tank *Panchayats* are described elsewhere, and the reader may refer to them.

In Maharashtra, the *Phad* system of distribution of water, maintenance of the irrigation system has been in existence for over 200 years. Under this system, the management of irrigation is done by a *Panch* Committee elected by all the irrigators. Maintenance is through community effort and payment to the water management staff is in kind in terms of a share of the harvest. Such a system of water distribution, through *Neerganties* was in existence in Karnataka and still exists in some interior villages. A brief note of the *Phad* system can be seen in Appendix 13.

In Gujarat, under the Kakrapar project, the farmers have formed themselves into a co-operative society. The water is sold to the co-operative in bulk and water rates are levied on the basis of the volume of water delivered at the outlet. The effective distribution of water amongst the farmers is the responsibility of the co-operative. The entire canal system is maintained by the Society. The Society levies and collects water charges at the rates fixed by the Government. Details of this system and a note on its performance is given in Appendix 14.

In Madhya Pradesh, under the Tawa Project, *Sinchai* (irrigation) *Panchayats* have been set up. They are entrusted with the responsibility of management and distribution of water. The maintenance of the irrigation system vests with the Government. The *Panchayats* collect the irrigation water rates and remit the amount to the Government Treasury. A brief note on the working of these *Panchayats* may be seen in Appendix 15.

In Karnataka, Zilla Parishads and Mandal Panchayats were constituted in 1987. Zilla Parishads have been vested with the power of construction, renovation and maintenance of medium and minor irrigation works with an *atchkat* not extending beyond the district. A minor irrigation work by definition is an irrigation work with an *atchkat* of 5000 acres. The Mandal Panchayats have been given wide ranging powers for providing water supply for public and private use. As mentioned earlier, no such powers have been given in respect of irrigation. The Karnataka Irrigation Act 1965 under Section 43, provides for the constitution of Irrigation *Panchayats* and Irrigation Boards (covering two or more villages). But no such *Panchayat* or Boards have been constituted and no rules have been framed for their functioning.

Most of the Minor irrigation works have an *atchkat* of less than 100 acres. Generally they lie within the jurisdiction of a Mandal Panchayat. Since the construction or maintenance of such works is vested with the Zilla Parishad, the Mandal Panchayat will have no control over such works. As already suggested, it will be necessary to suitably amend the provisions of the existing Act and vest the Mandal Panchayats with necessary duties and responsibilities in respect of irrigation works in their jurisdiction.

Irrigation Panchayats.

According to the Zilla Parishad, Mandal Panchayat Act 1983, a Mandal comprises of a village or a group of villages having a population of not less than ten thousand and not more than fifteen thousand. Further, the Mandal

will have one member for a population of five hundred. In respect of each village in the Mandal, constitution of a *Grama Sabha* is envisaged. Most of our tanks are small village tanks. In some villages, there exist more than one tank. In certain other situations, a tank may command more than one village. In each Mandal, there may exist more than one tank. To expect the Mandal to carry out efficient maintenance and management of all tanks in its jurisdiction would not be realistic. It would also be totally against the aim of making the beneficiaries under a tank responsible for its efficient maintenance and management.

It would, therefore, be necessary to constitute for each irrigation tank or work, an Irrigation *Panchayat*, which would function under the guidance of the respective Mandal Panchayats. The Irrigation *Panchayat* should be a body elected by the irrigators. Its number could be limited to five or seven, with elections being conducted every alternate year. The *Panchayat* should meet at the beginning of the irrigation season, at the close of the season and once in the middle of the season. It should assess the water available in the tank and plan by consensus the crop pattern to be adopted, the water supply schedule according to the availability of water and inform all the irrigators of its decision. The performance of the water-supply schedule adopted should be carefully watched and mid-season review made. At the end of the season, based on the storage available, it should plan if feasible, a second crop and decide on the crop pattern and the area to be irrigated etc. When in doubt, it should obtain the advice of the agricultural and irrigation experts working in the Zilla Parishad.

The *Panchayat* should employ staff for proper regulation and distribution of water to the fields. Their pay should be in terms of a fixed share of the produce under each field. Such staff, who may be called *Neerganties* as in the earlier days, could be employed at the rate of one person for every 100 acres of *atchkat*. Their employment as in the past could be made hereditary and should be reserved for the Scheduled Caste or Scheduled Tribe as in the past. The irrigators should maintain the canal system upto their outlets and failure to do so should be made an offence. Masonry structures on the canal should be maintained by the *Panchayat*.

The *Panchayat* should be entitled to develop fisheries in the tank bed and the same should be marketed through the Zilla Parishad. The *Panchayat* should raise fruit-growing trees along the boundary of the waterspread. Periodical removal of silt from the tank bed and its use for manufacture of bricks, tiles, etc. should be encouraged. The revenue earned from all these sources and the water-rate collected from the irrigators should be utilised for undertaking periodical maintenance works to the bund, and the supply channel to the tank.

To enable it to undertake maintenance earthwork to the bund, it would be necessary for it to maintain one or two bullock carts and a tractor depending on the size of the tank. This equipment should be owned by the *Panchayat* and its procurement funded by contribution from all the irrigators and the entire village. The carts and tractor when not in use for the tank work could be hired by the irrigators and revenue collected. The *Panchayat* should

raise resources locally and use the same for the development of the entire village. The Zilla Parishad and Mandal Panchayat should assist the *Panchayat* in all such matters. The Chairman of the Irrigation *Panchayat* and its members should be accorded representation in the Mandal Panchayat, and their views given due consideration in all matters relating to their village.

It may be said that the Tank *Panchayats* established in Mysore in the early part of this century were a failure. How are we sure that such a system will succeed now? The Tank *Panchayats* failed owing to the lack of awareness among the beneficiaries and the lack of interest in the administrators, in the development of the *panchayats* and the apathetic outlook for the growth of tank irrigation. To-day about fifty years after freedom from British rule, we have realised that the developmental activity meets with success only when the people concerned are directly and fully involved in it. Further, people have also realised that their interests are best served if they plan and execute themselves all activities related to their development. Keeping all these in view, the creation of Irrigation *Panchayats* is considered by us as the most effective solution for the construction, maintenance and management of our tanks.

With the restoration of all tanks and the storage of water in them, the water-table in the neighbourhood of the tank is certain to improve. Water level in the existing wells will increase and perhaps this water could be used for supplementing the rain-fed agriculture in dry lands. With a proper assessment of the hydro-geology of the area it should be possible to take up the digging of a number of new wells.

Our suggestions can be summarised as follows :

A comprehensive plan for the development of the various micro and macro watersheds should be drawn up. Construction and reconstruction of our tanks should be entrusted to a local entrepreneur. He may be granted land by the community for his work of construction or he may be permitted to charge a water-rate for a specified period. Alternatively, construction should be undertaken by the village community. Forty percent of the cost should be borne by the Government and the remaining cost should be borne by the community partly in cash and partly by voluntary labour and partly by borrowing from a bank. Maintenance and management of irrigation should be the responsibility of a tank *Panchayat* under the guidance of Mandal *Panchayats*. Existing *Panchayat* Act should be amended suitably.

APPENDICES

1. Moti Talab (Tonnurkere)

Moti Talab at Tonnur village near Srirangapatna, is the second oldest large tank in Karnataka. The construction of this dam is believed to have been undertaken, sometime in the eleventh century, during the time of Sri Ramanujacharya, the great Sreevaishanava Saint.

It is formed by an embankment built across a gap between two hill streams, the Yadavanadi and a mountain stream. The dam is about 80 feet high above the river bed and is about 500 feet long. As is common with most of the old dams, this dam is not in a straight line but has a curve towards the upstream. But unlike the other dams which are very wide at the top, this is only about 50 feet wide at the top with a bottom width of about 450 feet. Compared to its huge storage of about 18,000 acrefeet, the area irrigated is only 800 acres. This is because the sill level of the sluice is about 45 feet above the bed level and the live storage available above the sill is only about 25 feet. Nearly two-thirds of the storage is below the sill level. Nasir Jung, son of the *Subedar* of Deccan, who visited this lake in 1746 gave it the name of Moti Talab (a lake of pearls) because of its crystal - clear water¹.

A special feature of this dam is that the flood waters and the irrigation waters are allowed through the same channel which has been cut through one of the hills. The entry of water from the irrigation sluice in the dam to this channel is controlled by a gate. When the reservoir is full,

the surplus waters escape from the top of the sluice structure into the channel and a little distance beyond the hill, the channel forks out into two. The left channel functions as the irrigation canal and the other channel on the right is led to the river valley below the dam through the masonry open ducts. Such an unusual arrangement has been possible since the storage provided in this lake is more than twice the yield of the river and the surplus of the lake is a rare event.

Local tradition states that the original bund constructed in the days of the Hoysalas was reset and repaired in the days of Tippu Sultan.

A close examination of the steps and stones used for the bund supports this view, since the jambs, lintel stones and cornice pieces of many old temples have been used for steps. One set of door-frame pieces near the *Brindavana* was found to have two fragmentary inscriptions about Chalukya or Hoysala times. And there are four sculptured pieces, two of which are intricately carved. One of them represents the story of *Gajendra Moksha* and the other the story of Sala fighting the tiger. The latter is a piece brought from some dilapidated temple or an old structure confirming the construction of the bund in the Hoysala period. Tippu who was a lover of tiger fights very probably got it set up prominently as a memorial of his reconstruction².

It is also seen that Purnaiya had repaired this tank during 1800. According to him, this tank which had "remained in a state of ruin for a series of years, has been

recently rebuilt in strongest manner and at present contains a body of water of about twelve man's depth"³ (about sixty feet depth). This means that even though Tippu initially repaired and restored the Moti Talab dam, he damaged it with a view to ensure that his enemies did not obtain the benefit of the waters in the lake.

Another interesting feature of this dam is that the revetment is built of stepped stone masonry, as is the case of Watadahosahalli tank. But the workmanship at Moti Talab is not as good as that in the other tank. Could it be that these two tanks were rebuilt in the same period and also perhaps the good rock easily available in the adjoining hills made it possible for adopting this type of construction?

Sources :

1. *Rice II, Vol 2, p. 274*
2. *Mysore Archaeological Report 1939, p 29*
3. C. Hayavadana Rao, *Mysore Gazetteer 1930 - Vol. II - Part IV, p 2796.*

2. Shantisagara or Sulekere

The Shantisagara tank is the largest old tank in Karnataka situated about 12 miles from Channagiri in Shimoga District; it was well known as Sulekere till recently. The construction of the tank is believed to have been undertaken in the 11th or 12th century by Shantavva, a legendary heroine. The tank is now appropriately named after her. The bund of this tank is not very lengthy. It is only 1,100 feet. Nor is it very high being only about 60 feet. Its greatness, however, lies in the enormous waterspread of about 10 square miles with a perimeter of about 40 miles. Located in a narrow gorge between two hills, the lake presents a beautiful picture of a vast sheet of calm waters. Though the name Shantisagara is said to be after the founder Shantavva, it can also mean calm (*shanti*) waters (*sagara*).

As mentioned in chapter 3, on the same stream, on which Shantisagara has been built, viz., Haridra river, a dam had been built in the 15th century at Harihar, about 35 miles below the Shantisagara. This dam breached within 14 years of its construction and was rebuilt again. It does not exist now. Perhaps, the reconstructed dam too breached and was washed away. As against this, the Shantisagara dam, an earthen bund has withstood the enormous floods to this day. This testifies to the good construction of the bund and the efficient functioning of the 200 feet long waste-weir.

Two canals, one on each flank of the river, take off from this tank. The left bank canal is about 10 miles in length and is called Basavanala. It irrigates about 1,800 acres. The right bank canal is about 22 miles in length and is called Siddanala. It irrigates about 3,500 acres. The sluices in the tank bund from where these canals take off are masonry ducts of enormous size through which a man could pass through with ease. For a long period, these canals had been in disuse. During the period 1864-65, the canals were repaired and cultivation of paddy and sugarcane was taken up. With the construction of the Bhadra project, and its right bank canal system, the Shantisagara lake now receives perennial supply of water from the Bhadra canal system. Further, with the construction of three small *anicuts* across the river about 10 to 12 miles below Shantisagara, the entire command of about 7,000 acres under all these canals (*anicut* canals and tank canals) presents a luxuriant picture of paddy and sugarcane lands.

On the right extreme of this tank bund there is a temple of Siddesvara in front of which some defaced inscriptions exist. One of them appears to be of Vijayanagara period of the 16th century.

Source :

Rice II - Vol II - p. 481 - 82

Appendices



Chandravalli Tank



Tonnur Tank or Moti Talab

Tank Irrigation in Karnāṭaka



Channel cut through at Moti Talab

Appendices



Shantisagar Tank



waterspread of Shantisagar

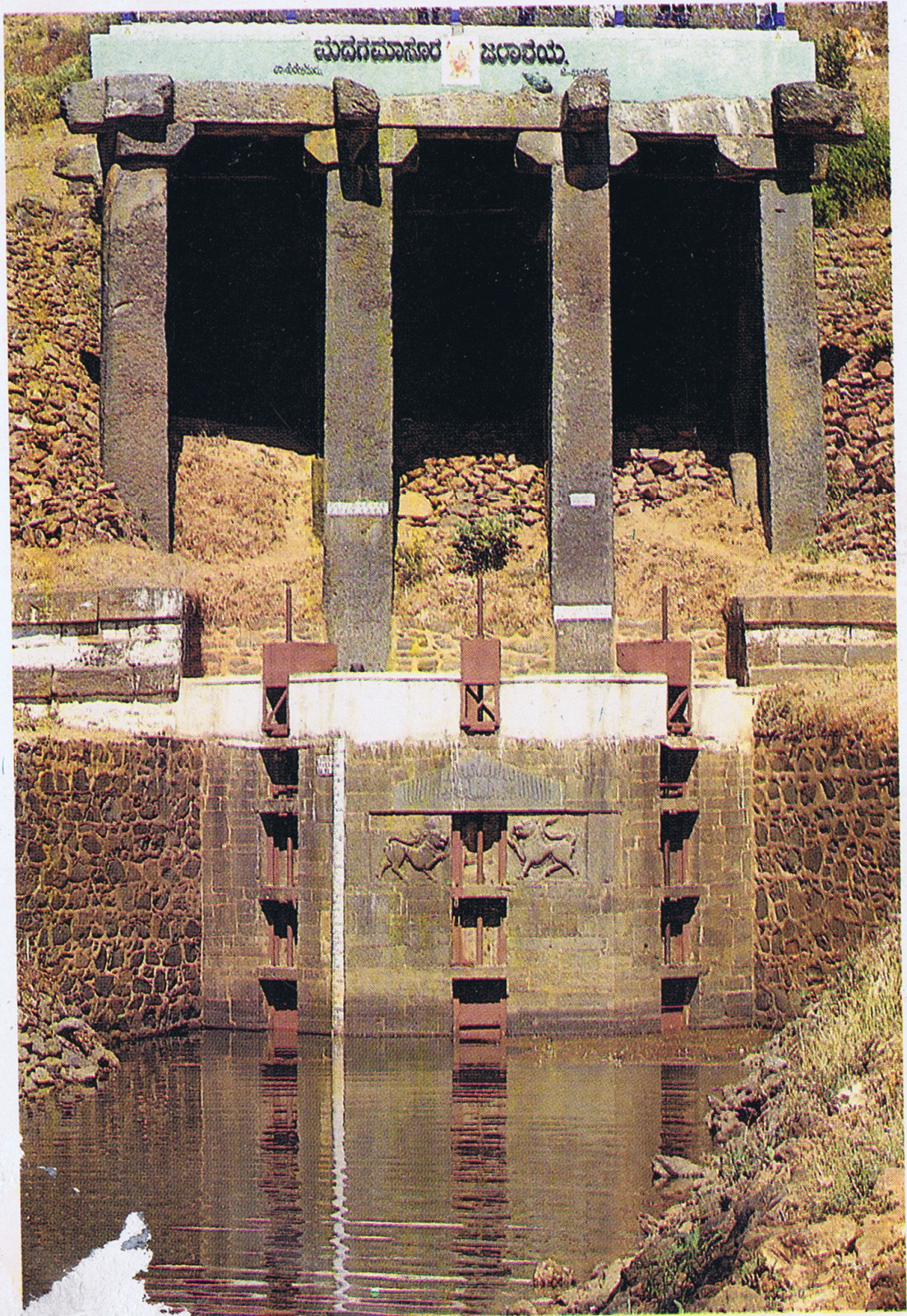
Tank Irrigation in Karnataka



Ramasagar Tank



Channel ducts at Ramasagar

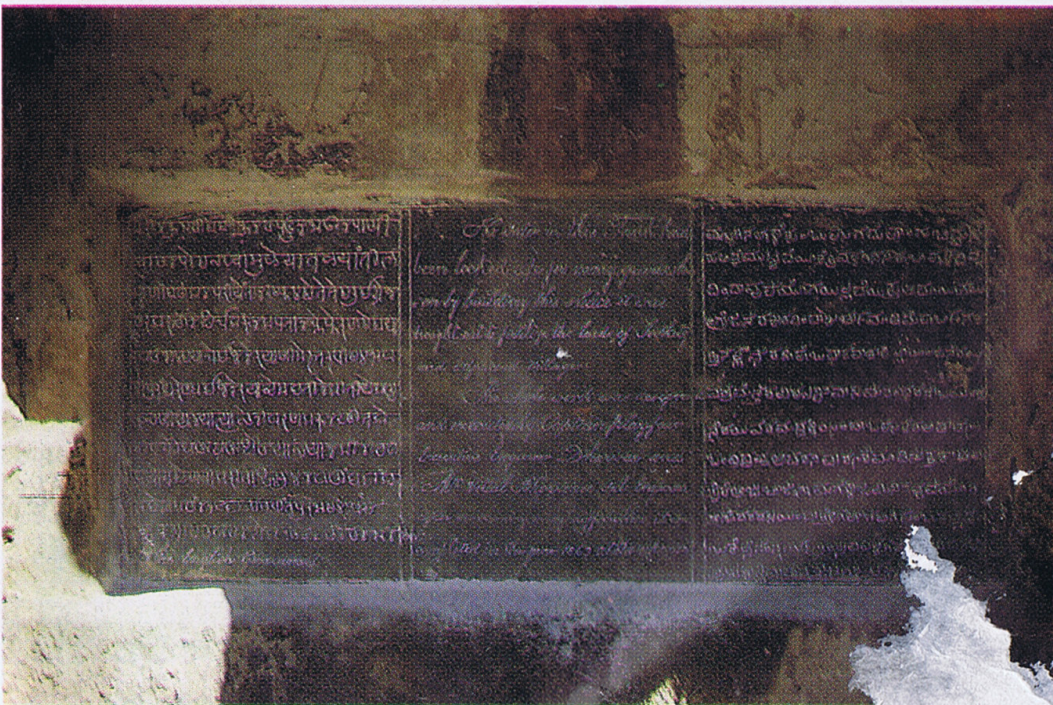


Stone Pillars at Madag-Masur Tank

Tank Irrigation in Karnataka



Inscription at Madag-Masur sluice



Inscription at the offtake of the Madag-Masur Canal



Madag-Masur Tank

Tank Irrigation in Karnataka



Daroji Tank



Rayarakere

Tank Irrigation in Karnataka



Watadahosahalli Tank



Revetment at Watadahosahalli Ta



Kadur - Madaga Tank



Waterspread of Kadur-Madaga Tank.

3. Ramasagara

Ramasagara tank about 20 miles from Kolar is the terminal tank across the Palar river in Karnataka. About five miles lower down, the river leaves Kolar district and enters North Arcot district of Tamil Nadu.

The tank is said to have been constructed during the time of the Cholas. However, as mentioned in chapter 3, an inscription in Ramasagar itself says that the tank was constructed in the time of Bukkaraya. It appears, the tank breached during the reign of Murarji Hindu Rao Ghorpade (1751-1782). He restored it and revived the earlier name of Bukkasagara. The tank bund was in a breached condition when Dewan Purniaya (1800-1811) restored it and changed the name of the tank to Ramasagar. In 1903, due to unusually heavy rains in the catchment and the breaching of many big tanks upstream, the bund of Ramasagara tank breached in three places causing great loss. A part of Vaniambadi town in North Arcot district suffered severe damage. The initial reaches of the irrigation canals of Ramasagara tank on both the banks were also washed away.

The Ramasagara bund is 12 feet wide at the top with side slopes of 2 horizontal to 1 vertical. Its height varies from 30 to 60 feet. The bund is not in a straight line and has a convex curve towards the upstream. When full, the water-spread of the tank covers a length of 6 miles and is as wide as 2 square miles. Being the terminal tank on the Palar, the thousandth tank in the series, it fills after the

upper tank begins to discharge. This series of tanks is remarkable for its length of about 50 miles and a drainage area of about 800 square miles. From its origin upto Ramasagara there are 999 tanks above Ramasagara on Palar. Though many of them are small, a few of them like Somambudhi, Jannaghatta, Mudvalli, Chillapalli, Manighatta, Holali and Bethamangala are large tanks. And for each square mile of Palar basin, there is at least one tank. This speaks of the ingenuity and interest shown by our ancestors in making use of the natural features in harnessing the river waters for the benefit of man and animal in that area.

At Ramasagara, Palar forks into two branches to unite again a few miles downstream. Utilising the high mound or the island in the middle, the tank has been built by constructing a stone masonry wall along the two forks of the river. The two walls function as the surplus escapes or the waste-weir. The crest of the weir is about 50 feet above the lowest river bed level. The location of the weir has been selected at a place where rocky bed is available. Apart from good foundations for the waste-weir body walls, this also provides good rocky bed for the high-velocity impact of the falling waters from the waste-weir.

The highest flood recorded over the weir is stated to be about 14.50 feet in 1903 above the crest of the weir., As already stated, this enormous flood breached the tank bund in many places and the weir on the right flank was also washed away. The present bund and the waste-weir are as reconstructed after 1903.

The Ramasagara tank has four irrigation canals. Two are on the left flank, one is in the middle of the island.

The fourth is on the right flank. The canal irrigating lands in the central island takes off directly from the tank bund. The other three canals do not take off from the tank bund. The sluices for these canals are located in the body wall of the waste-weir. Water let down from these sluices has to cross the river (waste-weir channel) before it can reach the irrigation canal located on the river bank. The arrangement adopted for this purpose is remarkable.

The two canals on the left flank are at two different levels. The lower canal is about 8 feet below the higher level canal. Water from the high level sluice in the waste-weir wall is let into the waste-weir channel. A lifting dam or a masonry weir is built across the waste-weir channel (river) near the offtake of the irrigation canal on the river bank. The water level rises in this area and feeds the irrigation canal sluice. For feeding the low level canal, the arrangement adopted is different. The water allowed to run down from the sluice in the waste-weir body wall is carried across the waste-weir channel through a covered duct constructed below the bed of the channel. Perhaps considerations like having separate channels for the two sluices which are at two different levels and also perhaps the channel bed levels did not permit a similar arrangement for the two channels. Indeed, the arrangement made is ingenious and speaks highly of the engineering capability of the builders of this dam. During the reconstruction of the dam after the 1903 floods, the arrangement of lifting dam for the high level channel has been abandoned and in this case also, water is now carried through a covered duct.

For the canal on the right flank, also, a similar

arrangement is adopted. Water from the sluice in the waste-weir body wall is taken for some distance in a covered duct constructed in the bed of the waste-weir channel. After leaving the duct, the water is held by a lifting dam constructed across the width of the waste-weir channel. Once again, from this point, water is led to the irrigation canal through another covered duct. This complex arrangement apparently was adopted to negotiate the topography of the place with the minimum cost. During 1918, the lifting dam was replaced by a covered duct and water is now conveyed from the sluice upto the channel through a covered duct.

All the four irrigation canals are contour canals. The second channel (low level canal) on the left bank meets the Thayalur *halla* (stream) in its fifth mile. (The Thayalur stream joins the mainstream (Palar) about three miles from this point). Instead of crossing the Thayalur stream with a long aqueduct, the canal is dropped into the Thayalur stream. About 3 furlongs below this point a lifting dam or a masonry weir is built across the stream. From the left end of this weir, the irrigation canal takes off in its second lap. After traversing about a mile and a half, the canal tails off into the Mustoor village tank. Once again the alignment of the canal shows the ingenuity of the builders of those days in overcoming obstructions in the alignment of the canal system.

Except for the right bank canal and the left bank low level canal which are about 6 miles in length, the other two canals are small in length. Together all of them command about 1,200 acres. The high level left bank canal has ten outlets and three open cuts to irrigate about 58

acres. The average area irrigated at each of these outlets and open cuts is only about 4 acres. The next canal, the low level left bank canal has 41 outlets and irrigates about 621 acres. The average area irrigated at each outlet is about 15 acres. The right bank channel has 34 outlets and irrigates about 360 acres. The average area irrigated at each outlet is about 11 acres. The channel taking off from the tank bund has only one outlet and it irrigates about 23 acres. The area commanded by all these outlets being very small, there is bound to be considerable wastage of water. Another important aspect noticed is that the channels are designed for a duty of 25 acres for 12 hours. In other words, irrigation is practiced only during day time. Even though such a design of the canal would require the construction of the canal for a larger discharging capacity, such an arrangement in respect of a small tank is helpful for proper water management. There is no wastage of water during the night. Perhaps such an arrangement would be helpful in respect of all our tanks which command 1,000 acres and less.

Source :

S. A. Ramasami - *Handbook on Ramasagara tank and channels* - Govt. of Mysore

4. Madag - Masur Tank

The Madag Dam across the Kumudvathi, a tributary of the Tungabhadra river is perhaps the highest earthen dam constructed in the period of Vijayanagar rulers (16th century). It is located about 4 miles from Masur village in Hirekerur taluk of Dharwad district. The dam is about 800 feet wide at the base, 400 to 600 feet wide at the top and about 100 feet high above the river bed.

A stone inscription fixed on the outlet of the Madag tank tells us that the sluice of the tank was repaired in 1863 by the British Govt.; this stone which was existing on the southern gate of the Fort on the hillock was brought down and fixed on the outlet. The stone also bears a Persian record telling us that the fort was built in 1632 by Muhammad Khan bin Raja Farid, an officer of the seventh Adilshahi king - Muhammad (1627-1656).

The Madag tank is formed by constructing an earthen bund across the river between two high hillocks.

Two similar embankments were also thrown across other gaps in the hills to the right and the left of the valley and a channel was cut along the hills for the overflow of the lake when it had risen to the intended height. When full, this lake must have been ten to fifteen miles long and must have supplied water for irrigation of a very large tract.

The top of the Madag dam is at RL.1973.00. The 600 meter (RL.1968.00) contour takes a turn round Shikaripur town, which is about ten miles upstream of the Madag dam. In all probability, the water level of Madag lake, when it was completed, touched the outskirts of this town. It could therefore, be assumed that the water level of the Madag lake when full was about RL1960.00.

The Dharwar Gazetteer says, "Each of the three embankments was provided with sluices built of huge slabs of hewn stones and two of these remain as perfect as when they were built. These sluices were built on the same principle as other old sluices, a rectangular masonry channel through the dam closed with a perforated stone fitted with a wooden stopper. But as the sluices had to be in proportion to the size of the lake, instead of the small stone pillars, which in ordinary works carried the platform over the stopper, the supports were formed of single stones weighing about twenty tons each".

"The lake was finished and filled. But in some heavy flood it burst not through the carefully closed valley but by the most westerly of the three embankments. Through this outlet a vast body of water forced its way in a deep groove, with a fall of nearly 100 feet, wearing a chasm with nearly perpendicular sides as if cut with a knife. As the pressure of water grew lighter and the strata to be cut became harder, the wearing ceased, and a certain quantity of water remained in the bed of the lake. After this disaster no steps were taken to make use of the water which the broken lake still held".

“When the breach occurred, the lowest of the sluices, which offered the only channel for drawing water through the enormously thick dam, was left too high above the surface of the water to be of any value”.

“Any attempt to dam the outlet chasm, and so raise the level of the lake sufficiently to use the old sluices was prevented not only by its great expense but by the opposition of the Mysore villagers, whose lands lay on the margin of the lake and would be swamped by any rise in its level”.

“Owing to these difficulties nothing was done until, in 1858-59, Lt. Col. Playfair (Executive Engineer of Dharwar and Belgaum) thought that if a culvert could be laid below the old sluice, the lake could be successfully tapped. This was done under Col. Playfair’s immediate supervision. For this, the old sluice had first to be cleared as it was filled with dirt. Clearing was begun on both sides, not without the opposition of the Mysore people, who at first drove the workmen off and objected to anything being done on their side. When the two parties of workmen came within 100 feet of each other progress was stopped as the stones that supported the roof were found to have fallen in. The sluice appears to have been originally laid on the rocky surface of the valley, roofed with enormous stones and the dam built over it. The weight of the one hundred feet of earth had been too great for the sluice roof. In the part, where the sluice roof had fallen, further clearing became a matter of great danger. The only plan appeared to be to gently dig over the broken stones and trust to find sounder ones beyond; and thus again to get a roof over the heads of the workmen. This attempt was successful. Only a few covering stones had fallen in; and

the earth above them was sufficiently consolidated by time to allow a passage being dug through it. The two parties at length joined, and the old subterranean gallery was opened through its whole length of 800 feet. The digging of the culvert below the floor of the old sluice was then begun, the old work acting as a ventilator as well as a roof till the new tunnel was arched. All went well till towards the centre where a mass of extremely hard rock gave much trouble. Blasting was out of question with a rickety mass of old masonry above and the remaining work was literally taken out in powder".

A stone tablet fixed near the end of the outlet, reads as under :

"The water in this tank had been locked for many years, when by building this sluice it was brought out to fertilize the lands to Sootkoti and adjacent villages".

"The whole work was designed and executed by Captain Playfair, Executive Engineer, Dharwar and Vittal Bhavane, Sub-engineer. After overcoming many difficulties, it was completed in the year 1862, at the expense of the English Government"¹.

The river had steadily scoured at the breached position (about 150 feet in width) to the hard rock level, i.e., RL.1874.00. In 1862, a masonry weir was constructed at this location, with its crest at RL 1877.73. The sill level of the new outlet constructed below the old outlet was kept at the RL 1873.25 (the sill level of the old outlet is

at RL1891.00). Two canals, one to irrigate the lands on the left bank and another to irrigate the lands on the right bank of the river take off from this outlet. The left bank canal which is 6.5 miles in length crosses the river by means of an aqueduct. The right bank canal is 8.5 miles in length. Together they irrigate about 620 acres. What appears strange is that though the sill level of the old outlet at the entrance is 1891.00, the sill level at the exit is about 1880.00. If irrigation had to be provided with a canal taking off at RL1880.00, why was the sill level at the entry of the tunnel kept at a level at least 10 feet higher? Perhaps good rock was available at that level (as seen from the description of the work carried out in 1862) and hence its adoption. This feeling is further supported from the fact that the alignment of the tunnel is not straight but has two kinks, again perhaps guided by the existence of rocky strata at the bed.

Since 1862, attempts have been made to create additional storage in the Madag lake and extend irrigation benefits to a larger area. But none of them has materialised on account of the areas likely to be submerged by any increase in the storage under Madag lake. In 1938, the Mysore State constructed the Anjanapur reservoir about 20 miles upstream of Madag lake and the right bank canal of Anjanapur reservoir irrigates lands upto Madag lake. A number of small tanks also exist in this area.

The Madag dam is 1850 feet in length having upstream slopes of 2.5 horizontal to 1 vertical and a slightly steeper slope of 2 horizontal to 1 vertical on the downstream slope. The slope facing the lake (upstream slope) is provided with revetment of "huge stone blocks descending in

regular steps from the crest of the embankment to the water's edge".

The vast earthen embankment of about 10 lakh cubic feet, the huge stones used for the sluices and the revetment would have needed a large workforce of thousands working perhaps for ten years or more. The organisation, and the employment of such a big labour force would have involved a high capability of construction management. It is indeed a marvel as to how such a huge and high earthen embankment was consolidated and made water-tight. And we have the testimony of Col. Playfair, that in 1866, the reservoirs in Europe were "quite miniature in comparison" with the Madag dam.²

Sources :

1. *Gazetteer of Bombay State - Dharwar District - 1959,*
pp 831 - 4
2. *Selections from the Records of Bombay Government -*
Irrigation Series, Nov. 1866.

5. Daroji Tank

Daroji is midway along the road from Hospet to Bellary. It is best known for the large tank existing in this place. It is not known when this was built, but Tippu appears to have restored it.

The tank has a huge embankment built across the Narihalla. The vastness of this tank is seen from the fact that during Tippu's period according to Kirmani "a large body of Mahrattas estimated at thirty thousand well appointed horse had concealed themselves in the dry bed of this tank". The bund is more than two miles in length and in some places about 45 feet in height. No doubt therefore that 30,000 cavalry could hide in the tank bed.

An inscription on the waste-weir of the tank bund tells us that the village of Daroji was completely destroyed by a huge flood in 1851 and was rebuilt in 1853. During 1851, Avinamadagu, upstream of Daroji had breached and the whole of its contents poured suddenly into the Daroji tank. The Daroji tank breached in two places and the huge mass of water emerging from this tank, totally destroyed the old village of Daroji. The flood appears to have registered a height of 14 feet above the waste-weir. The waste-weir was completely destroyed and washed away.

The Daroji tank irrigates about 2,000 acres. Paddy and sugarcane are largely grown. After the construction of the Tungabhadra Reservoir high level canal, the tank is fed from this canal.

1. *Madras District Gazateer*, Bellary, (Ed) W. Francis, 1904

6. Rayarakere or Rajapuram Tank

Within a short distance after leaving Hospet, the road to Hadagali, Harapanahalli and Kudligi, runs on a big embankment near Rajapuram. This huge embankment is built at the mouth of the two hill ranges which commence near Sandur. Between these two ranges runs a small valley and the embankment is built across this valley. The tank formed by this embankment presents a picture of a dry tank bed.

This tank, which is now dry has been described by Domingos Paes, a Portuguese traveller, who visited Vijayanagar in about 1521 A.D. and Fernao Nuniz, another Portuguese traveller, who visited Vijayanagar a couple of years later, as a great tank, constructed by Krishnadevaraya, which supplied water to a large number of 'gardens and orchards and great groves of trees and vineyards'.

According to Paes, the king built the tank which had 'the width of a falcon shot' and was at the mouth of two hills, and all water which came 'either one side or the other' was collected there. Besides this, water is stated to have been brought to this tank from another lake for 'more than three leagues by pipes which run along the lower parts of the range outside'.

The District Gazetteer of Bellary (1904) indicates that this "lake", referred to by Paes seems to be the Dannaikanakere, situated near Mariammanahalli to the

left of the road to Kudligi, at a distance of about 10 miles from the 'large tank' near Rajapuram. The Gazetteer further states that,

people still relate how the water from its (Dannaikanakere) surplus weir was once brought to the tank made by the big embankment by a channelled along the south side of the more southern of the two ranges which enclose Sandur, and it is said that the remains of this channel can still be traced there, near the line which the new railway to Kotturu follows along the slope of the hill¹.

The Dannaikanakere is understood to have been built by Mudda, a *Nayaka* (an officer) under Krishnadevaraya (1509-1530). This tank had adequate surplus waters and hence it was feasible to divert these waters to the Rajapuram tank built by the king. Conveying these surplus waters along the hill slopes for a distance of about ten miles was indeed a great feat of engineering skill. Since these waters were separated from the Rajapuram tank by a huge hill range, the waters could be led to that tank only by making an opening in the hillock by blasting. Perhaps, when Paes says, "In order to make this tank, the said king broke down a hill which enclosed the ground occupied by the said tank", he is referring to the making of an opening in the hill for the entry of the Dannaikanakere waters into the Rajapuram tank. Breaking a hill and leading the waters from one valley to another show how stupendous the job was and what an amount of skill was involved in its execution.

• But within living memory, this great tank has never

contained any water and the entire tank bed is now cultivated with dry crops. Perhaps, the diversion of waters from the Dannaikanakere, which was to be the main source of water to this great tank failed to function due to the damage from human hand or natural disturbances, which were not set right after the fall of the Vijayanagara empire. But despite its present condition, the tank is an example of planning and execution of an irrigation tank with meagre resources of its own and dependent on diversion of waters from another valley. Both Paes and Nuniz describe the enormous difficulties encountered by the engineers while constructing this lake².

Sources :

1. W. Francis, *Madras District Gazetteer*, Bellary - 1904, p.279.
2. Robert Sewell, *A Forgotten Empire - Vijayanagar* - for the accounts of Paes (p.237) and Nuniz (pp 345 to 347).

7. Watadahosahalli Tank

The Watadahosahalli tank is situated close to Gudibanda on the road from Gauribidanur to Gudibanda. It is situated at the end of the valley, which has its head near Gudibanda and receives the whole of its drainage converting the country below, opening to the westward, into a wide irrigated plain. The approach to the head of this beautiful sheet of water is by the pass in the mountains leading down from Gudibanda. Its length, when this tank is full, is perhaps two and a half miles by over half a mile in width. Though much smaller than many old tanks in Mysore, it is remarkable for the great height (sixty feet) of the bund, which is 12 to 1300 feet long and most picturesquely situated between two flanking hills at the end of the valley. The bund has a solid stone facing on both its front and rear slopes and differs very much from all others, not alone in its height, but the manner in which the work has been executed being straight and workmanlike throughout.

Though this is an earthen bund, the beautiful masonry on the upstream face built with well-cut dressed stones, gives us an impression that this is a stone masonry dam. These stones are revetment stones, and are not like the rough stones of all shapes and sizes, which are dumped on the upstream of a dam. The stones here are built like a stepped masonry wall.

This earthen dam has a top width of 75 feet and a bottom width of about 220 feet, with side slopes of 1.5

horizontal to one vertical on both upstream and downstream faces. However, the distinguishing feature of this tank is that its water spread is only about 255 acres as against its irrigable area of 2,425 acres.

Another interesting feature of this tank is its two sluices for a single canal. The main sluice is a high level sluice from which the main canal takes off. The other sluice is at a lower level. There is a separate channel from this sluice which joins the main canal a little distance below the dam. Evidently, the lower level sluice was operated when the water level in the lake went below the level of the upper sluice. Perhaps, the lower level sluice was made use of also as a scouring sluice to remove the silt from the tank bed.

This main canal has four branches and the canal system serves fourteen villages. It is not clear how water distribution is regulated under all those canals in the fourteen villages. Perhaps the tail end reaches do not get any water at all.

It is not known when this was built and by whom.