TANK IRRIGATION IN KARNATAKA

A HISTORICAL SURVEY

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Dedicated

to the

cherished memory

of

Dr. B. V. Krishna Murthi

CONTENTS

FOREWORD

Tank Irrigation in Karnataka is an extremely useful historical survey which is primarily concerned with small reservoirs or tanks built over the centuries, from prehistoric to present days. As the study points out, tanks are a peculiar feature of the southern peninsula as distinct from the northern alluvial plains served by perennial rivers. It is of significance to know how rainwater was conserved and used in this part of the country to protect the area from the vagaries of rainfall and provide water for irrigation and maintenance of water-table and a green environment. The well-being of the people depended on it and hence the village community had a vital interest in the construction and maintenance of tanks and water management. The study of these traditional practices is of great relevance not only in understanding life and its organisation in those ancient and medieval times but also in adapting some of these motivations and methods to subserve broadly the same purposes in modern times.

Village communities are not so isolated as they used to be, but they need to be integrated more closely with the whole process of modern development and cooperative endeavour to ensure greater participation of the people and better implementation of rural development programmes, especially in the field of water conservation and management which has become crucial not only for irrigation but for

the maintenance of water-table and availability of adequate drinking water. New initiatives and innovative thinking are needed in almost every field of rural development. In this exciting endeavour the lessons of the past cannot be forgotten.

The broad conclusion of the study is that till the middle of the sixteenth century tanks were built and maintained by the people and their rulers satisfactorily. (The irrigation works constructed by the Vijayanagar Kings on the Tungabhadra and the Kaveri are still in use.) Thereafter the decline began and the British later paid some attention to the restoration of big and productive tanks, while the small village tanks were grossly neglected because village communities lost much of their old strength and self-reliance as traditional practices fell into disuse including desilting of tanks. Watershed development to shape land and conserve every drop of water is the current restatement of a vital need, assisted by modern developments such as satellite images and scientific advances. But the scope to absorb all this to strengthen institutions, programmes and popular participation is immense. The Panchayat Raj bodies we are setting up at the village, taluka and zilla levels are units of local self-government which are also expected to do what is best done at each of these levels and interact with each other and the government in the best possible manner, in a system of decentralised development. Non-governmental organisations have also a vital role to play.

The Ford Foundation workshop held in Bangalore in 1989 on the subject of popular participation in the restoration of tanks in Karnataka was the beginning of the idea of this book which was to be undertaken by three authors who were eminently qualified for the purpose : Dr. G. S Dikshit's main research work is on 'Local Self-Government in medieval Karnataka', Dr. G. R. Kuppuswamy has written a book on economic conditions in medieval Karnataka and Sri. S. K. Mohan is an irrigation engineer in water resources development. Medieval experience and modern knowledge can be combined to find meaningful solutions to at least some of our present day problems, especially in the field of water conservation and management. Restoration of old tanks could be as efficacious as new percolation ponds in recharging ground water and maintaining the water-table which is crucial in an era of increasing population and alarming deforestation. The water-table which was well within the reach of open wells in many areas is now difficult to reach even with borewells. As is stated in the introduction to the study : "The situation is very bad now and the water-table has gone to hundreds of feet below the surface. How it has happened and what can now be done to improve the situation is the purpose of our enquiry", the sources for which are Archaeology, Inscriptions, literary texts, accounts of foreign travellers and state documents. A more detailed scientific study of the depletion of underground water resources and appropriate

methods for its comprehensive replenishment could supplement this work and further fulfill its objectives. The fast changing socio-economic environment also needs to be studied more closely.

It is in the fitness of things that the Gandhi Sahitya Sangha, which was started in 1942 by persons like Sri Siddavanahalli Krishna Sharma and Sri G. P. Rajarathnam to propagate Gandhian ideals, is publishing this book, incidentally for the first time in English. May it be the precursor of many more studies of this kind which are of interest to us in our present endeavours. No historical experience should be allowed to be lost especially when it is so closely connected with life and the well-being of the common man. The Ford Foundation has done well to fund this work and the authors deserve to be congratulated on their painstaking effort in researching and piecing together historical facts about so many irrigation tanks which sustained life in this area over so many centuries and still deserve our best attention.

M.Y. Ghorpade
MINISTER FOR RURAL DEVELOPMENT
AND PANCHAYAT RAJ
GOVERNMENT OF KARNATAKA

BANGALORE
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The debt we owe to the late Dr. B.V. Krishna Murthi (Consultant to the Ford Foundation) is immeasurable. He is the real author of this project. He was the Chairman of the committee to advise us. It is a great pity that he is not with us when this project, which was after his own heart, is completed. The other members of this committee were Dr. A. Sundar, Director, Irrigation Research Academy, Hyderabad, Dr. Suryanath Kamat, Chief Editor, Karnataka State Gazetteer and Sri. K. G. Katway, former Chairman, BWSSB, Bangalore. Sri. Katway later expressed his inability to serve on the committee. We are beholden to all these members for the valuable discussions we were privileged to have with them.

In the production of this work, we are indebted to :- Dr. S. Ramaswamy, Prof. B. Ramaswamy and Dr. B. V. Subbarayappa, who helped us in the editorial work,

Kumari Deepthi, who took the photographs which are reproduced in this work, Sri. B. R. Seshadri who neatly typed the script and the printers M/s. Rotagraphics who put up with all the inconveniences we caused to them and have done a commendable job. The members of the Irrigation Department of the Govt. of Karnataka have cooperated with us during our visits to the tanks.

Among the individuals who have helped us, we cannot forget Dr. M. H. Gopal, Dr. K. V. Ramesh, Dr. H. A. Khan, Dr. M. V. Nadkarni, Dr. H. Sridhar, Dr. C. V. Rangaswamy, Dr. K. Vasantha Madhava, Dr. Keladi Venkatesh Jois, Dr. B. V. Rao, Sarva Sri S. R. Ramaswamy, T. M. Kotraiah, T. K. Mukundan, K. Balasubramanian, Madhav Katti, Sitaram Jagirdar, N. Basavaradhya, Keladi Gunda Jois and A. Raghupathi. We have consulted many more individuals and made use of many libraries, whose names cannot be mentioned here as the list is very long. It is a pleasure to thank Dr. S. V. Desikachar, Sri. A. V. Shankara Rao and Prof. Rama Prasad who have obliged us by giving their considered opinion of this book.

Finally, we thank Sri. M. Y. Ghorpade, Minister for Rural Development and Panchayat Raj, who has added to the value of the work by his learned Foreword.

LIST OF SKETCHES, MAPS AND PHOTOGRAPHS

Sketches

Maps

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ABBREVIATIONS

ARIE *Annual Report on Indian Epigraphy.*

Arthasastra *Kautilya's Arthasastra* (Tr) R Shamasastry.

Buchanan Francis Buchanan, *A Journey from Madras through the countries of Mysore, Canaras and Malabar.*

EC *Epigraphia Carnatica*

EC(R) *Epigraphia Carnatica* (Revised Edition)

EI *Epigraphia Indica*

Francis W.Francis, *Bellary Gazetteer*, 1903.

HAS *Hyderabad Archaeological Series*

JKU *Journal of Karnatak University, Social Sciences Number.*

MAR *Annual Report of the Dept. of Archaeology of the State of Mysore.*

Mitakshara *The Mitakshara on Yajnavalkya* (Tr) by J.R. Gharpure.

QJMS *Quarterly Journal of the Mythic Society*, Bangalore.

Report of Wilks Report on Interior Administration - Reserves and Expenditure of Government of Mysore.

Rice I Lewis Rice, *Mysore and Coorg - Gazetteer, 1877.*

Rice II Lewis Rice, *Mysore - A Gazetteer,*, 2 Vols. 1897.

SII *South Indian Inscriptions.*

Wilks *Wilks' History of Mysore*

WRDO Water Resources Development Organisation.

1

INTRODUCTION

Storages

Rivers and lakes constitute for mankind, the primary source of water for his needs. However, these constitute very much less than one per cent of the available water on the earth at any given moment[1]. The problem of management of such a scarce resource is difficult. The difficulty is made worse by the vagaries of rainfall. Sometimes, we have too much water when we do not need or too little when we need. Floods and droughts are age-old problems. In recent years, they have become more acute with the growth of population and deforestation. One of the ways of alleviating or mitigating this problem is by conserving water in storages. Such storages can be underground like wells or on the surface like ponds, tanks or large reservoirs.

Tanks in South India

Tanks are a peculiar feature of the southern peninsula. The geographical conditions of North India are different from those of South India. Large areas of North India are covered by perennial rivers, which carry the monsoon water during the rainy season and the melted snow during summer. They traverse fertile alluvial plains. The necessity of building tanks or reservoirs for irrigation did not arise and construction of canals directly fed by the rivers occupied

a prominent part of the irrigation plan. The old Jamuna Canal, the Ganga Canal and the canal system of the Punjab rivers are proof of this organisation. Further, the construction of wells was easy and hence we find references to wells or *kupas* in this area since the Vedic times.

Tank irrigation is prominent in the semi-arid parts of Western & Central India viz., Rajasthan and Malwa and the entire southern India. Until the beginning of this century and particularly till the beginning of development under the Five Year Plans in 1951, irrigation in southern India was largely tank irrigation. Tanks are concentrated in the Telangana region of Andhra Pradesh, old Mysore region of Karnataka and in the eastern parts of Tamil Nadu. The scope for development of well irrigation in southern India is limited on account of the presence there of hard granites and gneisses. Tank irrigation covered more than eighty per cent of the irrigated area in Karnataka, till recently.

Objects of the Study:

In this study, we are primarily concerned with small reservoirs or tanks. We have not dealt with large reservoirs or big dams, wells or ground water except incidentally. In Karnataka, Andhra Pradesh and Tamil Nadu, even now thousands of old tanks exist. But they have become ineffective because of the breakdown of the traditional mechanisms for maintaining them. Recently, Governments have attempted to construct new tanks and renovate old ones. But such efforts are insufficient or unsatisfactory. Formerly, construction of tanks was mostly a private enterprise which was carried out under the overall supervision of the village community,

which rewarded the entrepreneur with land in the *ayacut* (command area). The entrepreneur was moved by the motives of profit for himself and his progeny and also by altruism. The village community, through its officers, distributed the tank water to the beneficiaries to their entire satisfaction. All these practices of the past need study. This is one such attempt. Here we trace the history of tank irrigation from prehistoric to our own times. Not only do we trace the rise and decline of tank irrigation in Karnataka, we also try to understand how our ancestors tackled the problems of construction, renovation, water management and finance in relation to tanks.

The lesson we should learn from the history of tanks, is that unless the beneficiaries and the *panchayats* are associated with the construction and restoration of tanks, it is not possible to solve the problem. Before we proceed further, let us see how the tanks can contribute to improve our irrigation facilities.

Relevance of Irrigation Tanks

In the first place, it is necessary to find out if there are any alternatives to tanks. These alternatives are major irrigation works and exploitation of ground water. We will consider them one after the other.

Big Dams:

It may be asked if instead of restoring thousands of old tanks, would it not be better to build a few huge dams which will solve the problem more efficiently. In areas

where it is not feasible to build tanks, major irrigation works are inevitable. Also, in areas prone to scarcity, which cannot be provided water except by transporting it over long distances, building of large reservoirs and construction long canals are necessary. But huge reservoirs and long canals which were considered to be a panacea to our water needs have created more difficulties than they have solved. They have become a huge financial burden. However, in spite of their defects, where huge dams are the only answer, they have to be constructed, bearing in mind their defects and making attempts to lessen them.

Ground Water:

Another solution to the problem of water scarcity has been the exploitation of ground water. This has been tried in Gujarat, Tamil Nadu and other places. But it has led to unexpected developments. One is that the water table has gone deeper and deeper and because of this development it is only the affluent who can take advantage of this facility[2]. One remedy for this has been found in Tamil Nadu. That state has found that recharging of ground water through percolation ponds is possible[3]. It may be suggested that instead of constructing new percolation ponds, which will serve only one purpose, namely, recharging of ground water, restoration of old tanks will improve both watertable and irrigation.

In addition to their well recognised and well known role in irrigation and water supply, tanks perform other essential services such as control of floods and droughts, increase subsoil water, help aquaculture, and finally keep

the environment neat and clean. We will now deal with these aspects.

Flood Control:

Of these, how the reservoirs act as checks for the flood waters and regulate their flow has been amply demonstrated by many projects. One of the most famous is the Tennesse Valley Authority in America. On the same model in India the Damodar Valley Authority has been established to curb the virulence of the floods caused by the Damodar river. What these huge projects have done by way of flood control has been done by innumerable tanks for centuries in South India. The grave neglect of traditional sources of irrigation like tanks, in recent years has increased the run-off in their upper catchment and created floods in the lower reaches[4]. Restoration of tanks will solve this problem to a large extent.

Drought and Maintaining Water Table.

The second and third services namely their services in times of drought and in increasing sub-soil water have been described by the Irrigation Commission of 1901 in the following words,

> There can at least be no question of their value as protective works. In a dry year, no doubt, many fail, but the good things they do in ordinary years is of material assistance to the cultivators in tiding over a bad year, and even in the driest year, they assist in maintaining

the level of the sub-soil water. Three-fourths of the wells are directly or indirectly dependent on them[5].

Fisheries:

Another of the benefits conferred by tanks is that they provide scope for the development of fisheries in their beds. Aquaculture has not received the much needed research effort and Government - backing that agriculture has received, though the country has vast stretches of potential areas for successful aquaculture. Inland fisheries have an important role to play in India's economy in augmenting food supply, generating employment and raising nutritional level. The Bangalore Rural Zilla Parishad has successfully used the tanks for developing inland fisheries. The income from this source has been used to maintain the tanks in a good condition, besides earning a revenue for the Zilla Parishad.[6]

Greenbelt:

Other services which tanks and their surroundings, viz., the vegetation all round, perform cannot be ignored. They bring down the temperature of the surrounding areas and add to the beauty of the neighbourhood. They are nature's greenbelt. Vegetation anywhere and on the shores of the tanks as well has great ecological value. Grass not only binds the soil but also provides organic matter. It is the quickest and finest binder of soil against wind and water erosion. It is also the most efficient retainer of rainwater. It can trap silt and prevent it from washing away. Planted around the contours and left

alone, certain types of grass like Vetiver, form hedges that encourage the entry of water into the soil rather than flow down the slope into the streams and rivers[7]. Such hedges are inexpensive to maintain.

Tanks - the life of the people:

Till the end of the nineteenth century at the latest, the tanks made the villages self-sufficient in food for men and cattle and produced much of the wealth of the State, provided insurance against conditions of scarcity and floods, maintained a high water table which enabled wells to have water close to the surface, prevented soil erosion and kept the surroundings cool and beautiful and free from ecological problems. In short, in the words of the Irrigation Commission of 1901, the tanks were the life of the people[8]. This may sound utopian. But this is the picture which emerges from the report of the Irrigation Commission of 1901 which is based on the experience of British engineers, agricultural experts and revenue officers and public workers who were all well acquainted with Indian conditions.

When that Commission reported, the situation was favourable for the wells and in some districts like Bangalore and Kolar, water was three to four feet from the surface. The situation is very bad now and the water table has gone to hundreds of feet below the surface. How it has happened and what can now be done to improve the situation is the purpose of our enquiry. Before we proceed further, let us acquaint ourselves with the sources for the study of tank irrigation in Karnataka.

Sources

Archaeology:

The sources for the history of tank irrigation in Karnataka are archaeological explorations and excavations, inscriptions, literary works, writings of foreign travellers and Government or State documents. The archaeological explorations and excavations have established that the Chalcolithic and Megalithic people were the earliest to build reservoirs in pre-historic South India. A reservoir built by the Chalcolithic people has been discovered in Inamgaon near Pune and is assigned to about 1500 B.C.[9] The Megalithic people who succeeded them lived near hills and collected rain water falling down the slopes of the hills in reservoirs[10]. It is possible that many ponds now found in Andhra, Karnataka and Tamil Nadu were the creations of the Megalithic people who came to occupy South India soon after 1000 B.C.

Inscriptions:

While explorations and excavations have revealed only a few reservoirs, the inscriptions which are to be found in thousands throw light on the existence of innumerable tanks from about 300 B.C. to about 1800 A.D. From the few examples which follow, it is easy to see how useful the inscriptions are for the reconstruction of the history of our tanks. Some inscriptions, though found outside Karnataka, have also been made use of in our work because they are indirectly connected with this State. For example, the Junagadh inscription of Rudradaman of 150 A.D. is the earliest in Indian History which gives full details

about the history of a reservoir which existed for centuries. Its picture of how a cyclone destroyed a reservoir is a classic[11]. This reservoir was first constructed in about 320 B.C. by the Mauryas who also ruled over Central Karnataka for over a century and it is possible that the people of Karnataka learnt or improved their knowledge of constructing and maintaining the reservoirs from the Mauryas.

The Porumamilla record of 1369 in Cuddapah district of Andhra Pradesh is the only inscription which is like a handbook for builders of tanks. This reservoir was constructed in the reign of the second Vijayanagara ruler, Bukka[12]. His successors followed these very principles of construction in the Karnataka part of their dominions; hence this inscription is as relevant for our study as it is for irrigation in the rest of South India.

Coming to the inscriptions in or near Karnataka, those found at Adoni[13], Banavasi[14], Chandravalli[15] and Talagunda[16] are useful in fixing the antiquity of reservoirs in this State in historical times. A Munirabad inscription has described the canals from the Tungabhadra near Hospet in a poetical way, besides mentioning a lower and upper canal[17]. Two inscriptions in Betamangala near Kolar give the history of a famous tank in that place which has existed for over 1000 years[18]. A Holenarasipur inscription of 1310 A.D. gives the amount of the total expenditure incurred for constructing a tank[19]. An inscription at Bolakyatanahalli (Hassan district) describes the requirements for desilting a tank[20]. The Rajagundlahalli inscription from Kolar district describes the technique followed and materials used in the construction of tanks[21]. A Hampi inscription of minister

Lakshmidhara describes how he was motivated to build tanks and dig wells by the lullabies sung by his mother while feeding him with milk[22]. A Timmalapur inscription found in the tank-bed says that the water in that tank should be of a man's height; probably if it exceeded that limit other tanks connected with it would be affected or the safety of the tank would have been in jeopardy[23]. Thus, details pieced together from hundreds of inscriptions found in Karnataka tell us about every aspect of the construction and maintenance of tanks and their different parts such as the bund, its shape, material used in its construction, sluices, waste-weirs, the depth of water necessary in the tank, the motives for their construction, finances necessary for construction and requirements for maintenance.. Above all, most inscriptions give the correct date of the construction or the renovation of the tank.

Literary Sources:

As regards the literary sources, there was a body of tradition in ancient and medieval India which goes by the name of *Vrikshayurveda* which deals with plants, their diseases and remedies. It also deals with reservoirs. One of the most important texts embodying this tradition is the *Krishisukti* of Parasara which Lallanji Gopal ascribes to about 1000 A.D.. The *Lokopakara* (1025 A.D.) and *Rattamata* (c 1300 A.D.), both in Kannada, contain the same traditional information.

The instructions to be found in the Porumamilla tank inscription and *Krishisukti* support and supplement one another and between them contain the knowledge our

ancients had about the construction of tanks.

There are other categories of ancient Indian literature which incidentally throw light on our subject. For example,Kautilya's *Arthashastra* (c 300 B.C.) says that the king shall construct dams or reservoirs filled with water either perennial or drawn from some other sources, or he may provide sites, roads, timber and other necessary things to those who construct reservoirs of their own accord[24]. It is significant to note that Kautilya knew the rain-gauge. He writes about the construction of a special *kunda* or tank of definite dimensions with opening of the size of a cubit of the middle length towards the sky to serve as a rain-gauge or *varsha-mana*[25].

That the construction of a tank should be looked upon as of fundamental importance for the prosperity of society as a whole is clear from Vijnaneswara (c 1100 A.D.), the author of *Mitakshara* who says, "The construction of a dam to a waterflow should not be stopped by the owner of the field even though it destroys another's land provided it causes only a little injury and is productive of much benefit to many"[26]. Thus our textbook writers on agriculture and economics and lawgivers realised the importance of irrigation and brought it home to the people.

Two lexical works in Kannada *Abhidhana Vastukosha* by Nagavarma (12th century) and *Abhinavabhidhana* by Mangaraja (early 15th century) contain verses which give terms used to describe different water-formations. These explain the meanings of the same terms used in contemporary inscriptions and are therefore invaluable aids to our understanding.

Amuktamalyada of Krishnaraya in Telugu emphasises the importance of irrigation in the following statement : 'When a State is small in extent then both virtue (*dharma*) and prosperity (*artha*) will increase only when tanks and irrigation channels were constructed"[29].

Foreign Travellers :

Though a large number of foreign travellers visited South India and Karnataka in the ancient and mediaeval periods, only two of them have written on irrigation. Of these, Domingos Paes wrote in c.1520 and Fernao Nuniz compiled his chronicle of Vijayanagar in c1535. Both of them describe the construction of the tank in the new capital built by Krishnaraya and which is now known after him as Rayarakere. But for their description we would not have known the enormous efforts put in by Krishnaraya in constructing it. The account of this tank will be found in Appendix 6.

State Documents :

While inscriptions are our major sources for the study of tanks in the ancient and mediaeval periods, in the modern period, their place is taken by State documents. The most valuable of them is the Journal of Buchanan relating to his journey from Madras through the countries of Mysore, Canaras and Malabar. The Journal is a report submitted to the then Governor-General of India, Marquis Wellesley, on the state of agriculture, irrigation and antiquities in Mysore, Canaras and Malabar. His journey in Mysore and Canaras took place between 1800 and 1802. His Journal contains very valuable information regarding

existing tanks, their maintenance and the agricultural and irrigation practices. The next important source of information is the report made by Col.M.Wilks, in 1804 on the interior administration - the resources and expenditure of the Government of Mysore. Apart from other details, it gives us the area under cultivation and irrigation in Mysore. A very valuable source of information relating to the number of tanks existing, some details of the construction practices, the condition of the existing tanks and irrigation under them, is the report of Major Sankey, Chief Engineer, Mysore (1866). Equally important sources relating to irrigation in the southern Maratha country (Kannada areas of Bombay Presidency) are the reports of Col. Playfair, Superintending Engineer for Irrigation, in 1866. His account of Madag-Masur tank which he restored in 1866 is given in Appendix 4.

The next source of information are the District Gazetteers of Mysore State (now Karnataka) and those published by the Presidencies of Bombay and Madras. Of these, the *Gazetteer of Mysore and Coorg* by Lewis Rice is an outstanding source of information. These Gazetteers are authentic sources for knowing the state of irrigation in the nineteenth century in Karnataka.

The administration reports of the Governments of Mysore, Bombay, Madras and Hyderabad are another important source. Reports relating to Mysore are available beginning from 1862, whereas the same is not the case in respect of the other areas. Equally important are the Annual Season and Crop Reports, Census Reports and the Survey Settlement Reports published by all the three Governments.

The Famine Commission reports of the 19th Century, the *Report of the Indian Irrigation Commission* (1901), the *Report of the Bombay Irrigation Committee* (1938) and the *Report of the Irrigation Commission* (1972) are authoritative sources dealing with the development of irrigation. Of these, the *Irrigation Commission Report* of 1901 is the only source which surveys for the first time the irrigational problems of all parts of Karnataka and since we have very little material in this regard about Bombay-Karnataka and next to nothing with regard to Hyderabad-Karnataka, its usefulness cannot be underestimated.

The Revenue Manual of Mysore, the Tank Registers of Mysore, the various Irrigation Acts and rules of Mysore, Bombay and Hyderabad are other important sources.

Of all the different kinds of sources considered so far, inscriptions and Government records stand out. Inscriptions are in thousands and the material that we want from them has to be unearthed and pieced together. Government records run into thousands of pages and are readily available. Of these Buchanan's travelogue, Sankey's reports, Rice's Gazetteer and the Report of Irrigation Commission of 1901 illumine the material which is found in inscriptions in an imperfect manner or in bits.

Tanks

Classification of Tanks :

. To understand the importance of tank irrigation in history, it is necessary to have an idea of the different

kinds of tanks and their parts. Inscriptions describe tanks as *kere, katte, sagara, samudra* and *tataka*. They also describe them as *hiriyakere, heggere, piriyakere* - all meaning big tanks, and *chikkakere*, a small tank and *kannegere*, a virgin (new) tank. But none of them gives us any inkling of their size or the area irrigated under them. Even the memoirs of the survey of Mysore State conducted during the period 1799-1806 which gives us a list of *keres, kattes,* and *kuntes,* fail to tell us the size of these tanks. No explanation is given to indicate the basis for the classification of these works.

We however come to know their meaning from an unexpected quarter. Francis Buchanan who travelled through the length and breadth of Mysore during 1800 tells us that a small reservoir which supplied water for cattle to drink was called a *katte* and a large reservoir used for watering of lands was called *kere*[28]. And he further tells us that a tank formed by digging a square cavity into the ground was called a *kunte*[29]. Buchanan, however, does not indicate the distinct size leading to such classification. Perhaps such a clear distinction was not available and each area had its own nomenclature.

Another classification of tanks adopted is to describe them as river-fed tanks and rain-fed tanks. River-fed tanks are described as drawing their water from an *anicut* (dam) built across a river and supplying water to a series of tanks and channels. The Maddur *anicut* rebuilt during 1862 and the channel taking off from the *anicut* feeding eight tanks below it, is an instance of a river-fed tank system. The rain-fed tanks are a series of reservoirs connected with each other and formed by impounding the

drainage from the catchment area above by means of long embankments thrown across valleys, or by short embankments thrown across gorges. Most of the tanks in Karnataka belong to this group.

Yet another classification, adopted by Major Sankey, is to describe them as village tanks and terminal tanks. Village tanks are small tanks serving the needs of a single village. Terminal tanks are big and are constructed in a valley at the point where it joins the main river valley. They are the last in the series of tanks in a system[30]. They are also called *Doddakere* or *Piriyakere*.

Some of the old tanks have the suffix *samudra* or *sagara*. Though this suffix was to denote that they were large like oceans, such a nomenclature appears to be based only on the fancy of the builder and was not an indication of its being very large.

Parts of a Tank

Catchment Area

Rainfall is the source of all water used for irrigation. Rain which falls on the ground is held back from flowing away immediately by the vegetation existing on the ground. Some portion of this water infiltrates into the ground. A portion of this is absorbed by the roots of the plants and the rest penetrates into the ground storage. The portion of the rainfall which flows along the ground or surface runs into small valleys and water from such small valleys

joins together to become a stream or a river. It is on building a barrier or bund across such streams that we construct a tank.

Water from the hill slopes or ridges flows into the valleys. The area which contributes the flow of water to the stream at any location is known as the drainage or catchment area of the stream at that location. The catchment area of a tank is the area of the rainfall which contributes to the flow in a stream at the site of the tank. Since only that portion of the rainfall, which is not absorbed by the vegetation and does not infiltrate into the ground results in the flow over the ground, the quantum of water reaching the tank site or the yield of the river at the tank site is related to the area of the catchment and the amount of rainfall occuring in that area.

Tank Bed:

When a tank bund is built across a stream, the waterflow in the stream is arrested and it accumulates at the tank bund. The maximum level at which the water is allowed to stand in the tank is the full tank level and the area over which this water stands is the waterspread of the lake. Commonly this is also calledthe tank-bed.

Command Area:

The extent of land situated between the canal system of a tank and the river or the valley upto which the canal water can reach by gravity is known as the command area. Such command areas may include roads, village sites and high mounds. The command area excluding such areas

is the irrigable command or the *atchkat* or the *ayakat* of a tank or any irrigation work.

The Bund:

The most important feature of a tank*(kere)* or a reservoir is the bund or dam. Normally all our tank bunds are earthen bunds, since earth is easily available in abundance. The dimensions of the old tank bunds are mostly related to conditions of the site and the need for safety. Safety perhaps was not a critical consideration because very few dams were large enough to cause any threat to life or property.

The stability of the bund depends on the stability of the earthen slopes and the foundation. Generally, good hard foundations were selected and the side slopes were based on local experience. The width of the base of the bund was large and it depended on the side slopes. The top width of the bund was relatively small and adequate to accommodate the passage of men and cattle. A few tanks which have a very large width at the top of the bund exist. Such a large width is not required from considerations of stability. This was perhaps provided because the bund across that river served as a means of communication from one bank to the other.

Wind blowing over a large sheet of water in a reservoir or a tank gives rise to high waves. The impact of these waves, if left unprotected, can damage the earthen bund. The earthen bund of a tank is protected on the upstream or water face with a piling up of large stones on the entire slope of the bund. The revetment stones protect the bund

from the wave action of water.

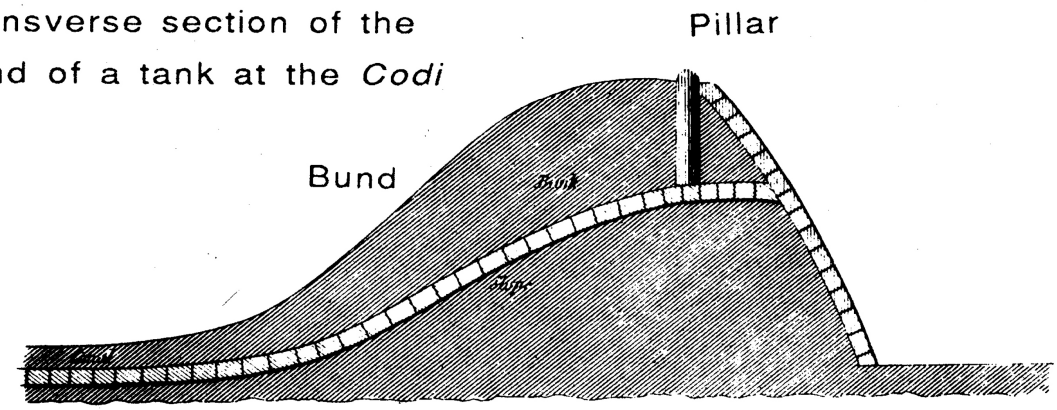
On the downstream or rear slope of the bund, as a protection from the erosion that could occur due to heavy rain to the earthen bund, protective grass covering or turfing is provided. In some old tanks, stone revetment is built for the rear slope as well.

Canals, Sluice and Waste-Weir:

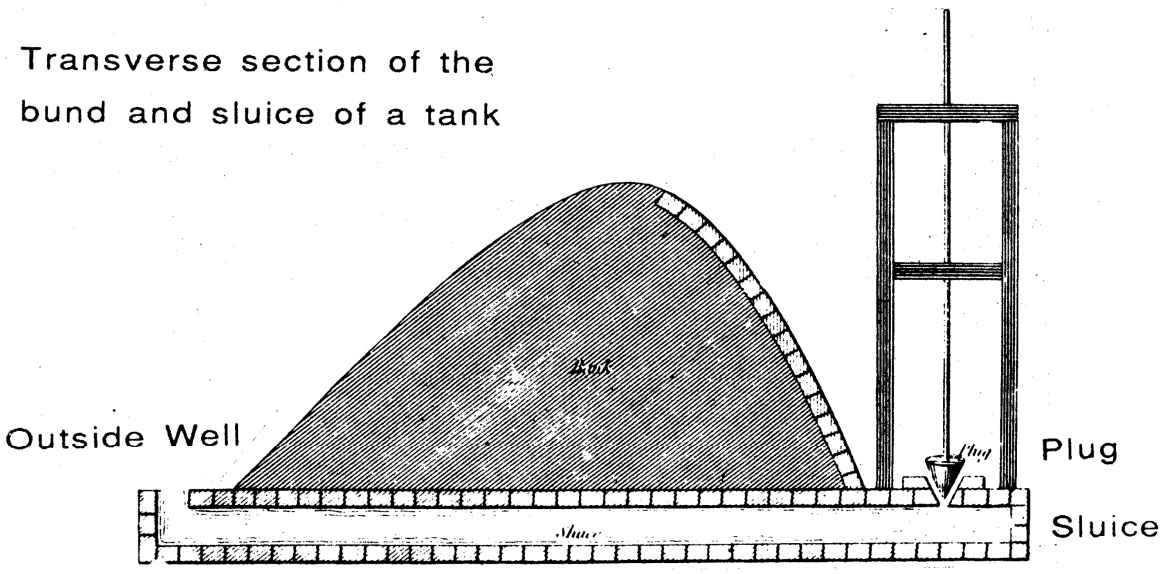
The water stored in a reservoir reaches the fields through a canal system or earthen ditches. Water from the tank is allowed into the canal by the operation of a sluice. The sluice was opened or shut previously with the operation of a wooden plug. In the 20th Century, the wooden plug has been replaced by a steel gate. The sluice which is located on the upstream side is approached from the top of the bund by a narrow foot-bridge. Earlier, as seen from old tanks, the sluice was approached by swimming across the waterspread. The sluice is connected to the canal, which is located on the downstream side, through a tunnel built through the earthen bund. The tunnel was a masonry structure in the old dams. In the dams now built it is an arrangement of concrete pipes.

A tank or reservoir is built to store a particular quantity of water. Any excess storage is liable to overtop the earthen dam resulting in a breach of the bund. Hence, provision is always made for allowing the surplus water to flow down without causing any increase in the designed storage. This portion of the bund which allows free passage to surplus water is the surplus escape or waste-weir or *codi*. The surplus water flows down and joins the course

Transverse section of the bund of a tank at the *Codi*

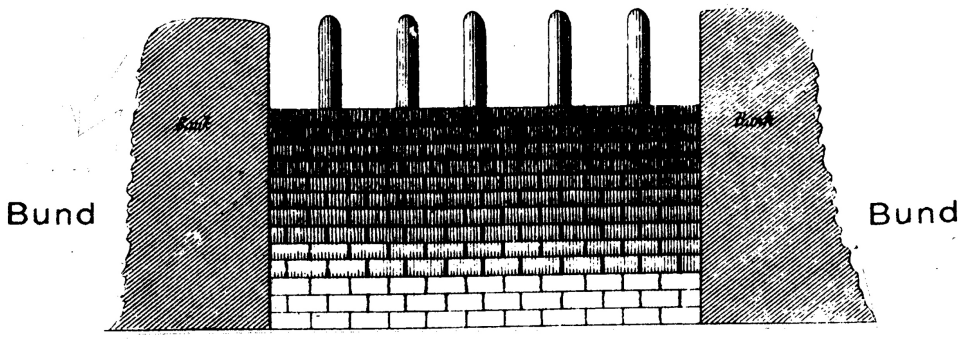


Transverse section of the bund and sluice of a tank

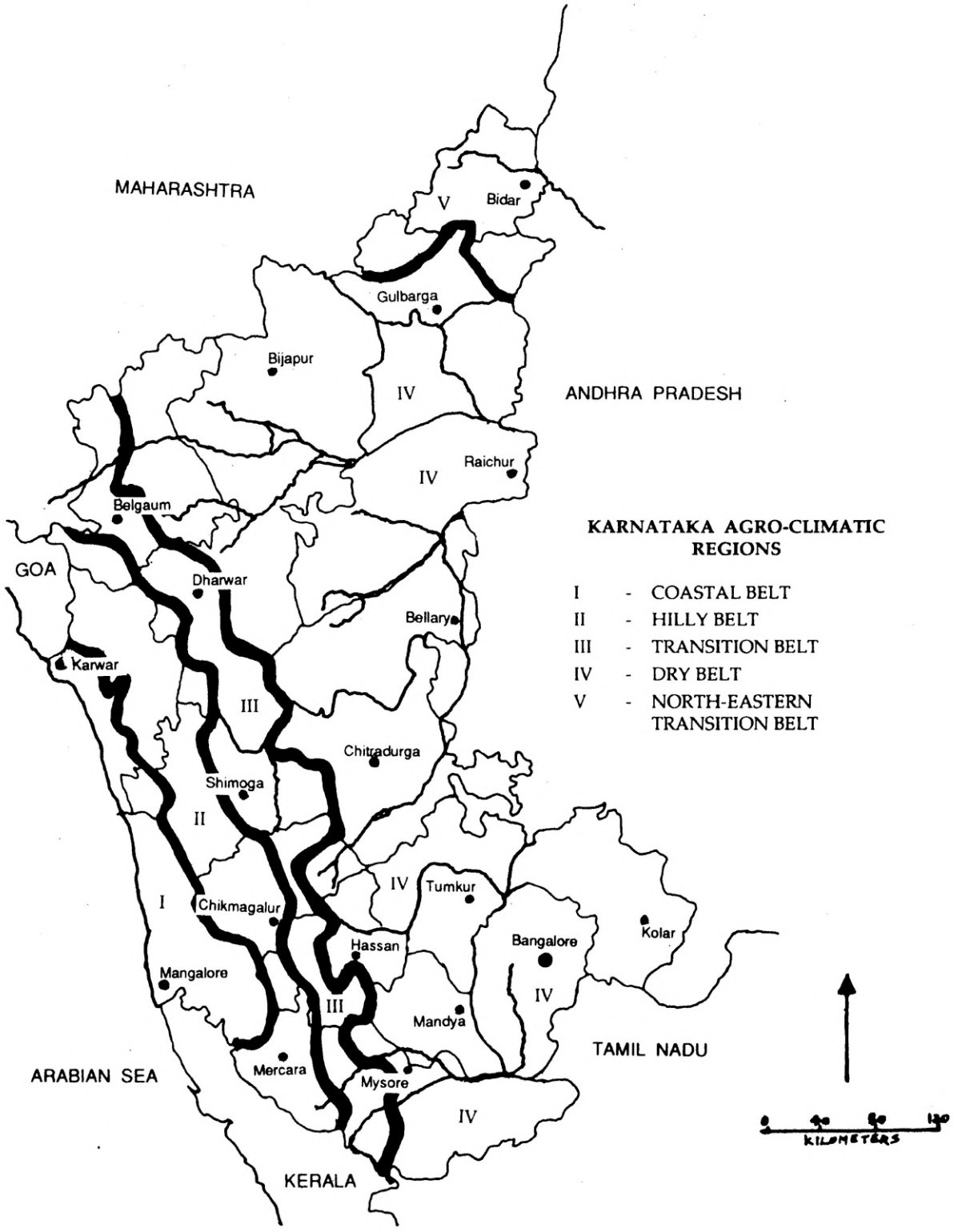


Views of the *Codi* of a Tank

Pillars on the *Codi*



Parts of a Tank as seen by Francis Buchanan - 1800


MAHARASHTRA
V
Bidar
Gulbarga
Bijapur
IV
ANDHRA PRADESH
Raichur
IV
Belgaum
GOA
Dharwar
Bellary
Karwar
III
Chitradurga
Shimoga
II
IV
Tumkur
I
Chikmagalur
Kolar
Hassan
Bangalore
Mangalore
III
IV
Mandya
TAMIL NADU
ARABIAN SEA
Mercara
Mysore
IV
KERALA
KARNATAKA AGRO-CLIMATIC REGIONS
I - COASTAL BELT
II - HILLY BELT
III - TRANSITION BELT
IV - DRY BELT
V - NORTH-EASTERN TRANSITION BELT
KILOMETERS

of the river below the dam.

After acquainting ourselves with the parts of the tank, we must know where tanks are necessary. This is explained by the agro-climatic conditions of Karnataka.

Agro-climatic Background

Agro-climatically Karnataka can be broadly classified into five regions -

i) the coastal belt

ii) the hilly belt or *malnad*

iii) the transition belt,

iv) the *maidan* or *bayalsime* or dry belt and

v) the north-eastern transition belt.

Coastal Belt:

The coastal belt is a narrow strip of land between the Western Ghats and the Arabian sea. This belt is about 300 kms in length, 8 to 20 kms wide in the north and about 40 to 80 kms wide in the south. It receives an assured monsoon rainfall of 3000mm to 4000mm. The Western Ghats which run from north to south are from 800-1000 metres high above sea level. Kudremukh, the highest peak, is 2072 metres above sea level. The Western Ghats offer a barrier to the monsoon clouds and hence heavy rain occurs on the seaward face of the Ghats. Beyond the

Ghats, the rainfall diminishes. The heavy monsoon rains in the coastal belt have fostered the growth of dense evergreen forests. The entire district of Dakshina Kannada and the area to the west of the Ghats in the Uttara Kannada lie in this belt. The rainfall decreases very rapidly as one proceeds eastwards from the crest of the Ghats. Within a distance of 50 km, from the crest, the annual rainfall is less than one fourth of what it is at and near the crest of the Ghats. Without the Western Ghats existing fairly close to the coast directly in the path of the monsoons, the heavy rains would not have occured; the west and the east flowing rivers would not have been there and Karnataka would have been a completely semi-arid or arid area[31]. The rivers in this belt are small and are all west flowing. Prominent among them are the Kalinadi and the Sharavathi in the north, the Netravathi and the Gurpur in the South. Level plain land is limited here and therefore agricultural activity is restricted. The soils are mostly red laterite and coastal alluvium. Coconut, arecanut, cashewnut, fruits and other perennials are extensively grown.

Hilly belt

The hilly belt is a long narrow mountainous area of 40-60 km in width to the east of and parallel to the coastal belt. Rainfall ranges from 1000mm to 3000mm and is reliable. Almost all the important rivers - the Kaveri, the Hemavathy, the Bhadra, the Tunga and the Malaprabha - take their origin in this region. The districts of Kodagu (Coorg), parts of Chikmagalur, Shimoga, Uttara Kannada, Dharwad, Belgaum and small parts of Hassan lie in this belt. The soils are generally red clay loams and laterites. The main crops are paddy, spices and plantation crops

such as coffee.

In the coastal and hilly areas which together constitute about 8% of the total cultivable area of the State, the rainfall is heavy and assured. The arable land available is limited, and mostly consists of alluvial plains along the seashore, the banks of the rivers and the narrow valleys among the hills. Most of the area is watered by unfailing streams. In some places, soil is a stiff moisture-holding-clay. In the coastal belt, one crop of rice is grown on these lands. The crop depends on the rainfall either on the field or on rain water brought from the lands by small ditches. Sometimes dams of earth, stones and branches of trees are thrown across the streams and the nearby lands are watered. The dam is removed at the close of the dry season or left to be swept away by the floods. For this reason very few storage works exist in this belt.

Transition belt:

The transition belt is a narrow strip of about 20 to 40 km in width lying between the hilly belt and the dry belt. Rainfall ranges from 600mm to 1300mm. It varies widely from place to place. Parts of the districts of Hassan, Chikmagalur, Shimoga and Mysore in the south and parts of the districts of Dharwad and Belgaum in the north lie in this belt. The red sandy loams and loamy soils predominate in the south. Black clay and red sandy loam soils are found in the north. The main crops grown are paddy, sorghum, pulses and sugarcane. Cotton is also grown in the northern area.

The transition belt constitutes about 15% of the total

cultivable area of the State. In the western parts of Belgaum, and Dharwad which lie in this belt and mostly to the west of the Poona-Harihar road, the annual rainfall ranges from 600 mm to 1300 mm. In the south-western parts of Mysore and Hassan, parts of Shimoga and Chikmagalur districts which lie in the southern part of this belt the annual rainfall ranges from 600 to 1000 mm and varies widely from place to place. In areas of lower rainfall, irrigation to supplement the rainfall is necessary. Small storage structures across the valleys have been constructed. Paddy and sugarcane are grown under these irrigation works.

Dry Belt:

Excepting for the north-eastern transition belt in Bidar and a small area in Gulbarga district, the rest of the State (about 72% of the cultivable area of the state) lies in the dry belt. In the dry zone, the rainfall varies very widely from place to place and ranges from 800 mm to less than 400 mm in many areas. Deep black soil predominates in this area, except for the southern area where the black soils are intermixed with red sandy loams. The principal crops gown are sorghum, millets, pulses, chillies, oil seeds and cotton. In the southern area, paddy and sugarcane are also cultivated. The northern parts of the dry belt above the Tungabhadra are fed by the Bhima, the Ghataprabha and the Malaprabha - all parts of the Krishna river system. The districts of Gulbarga, Bijapur, Belgaum, Dharwad and Raichur lie in this region. The central portion of the dry belt, which consists of the districts of Bellary, Chitradurga and Tumkur, lie mostly in the Vedavathi basin. The western area under southern portion of the dry belt, which

consists of Mysore, Mandya and Hassan districts, lies in the Kaveri basin. The eastern area of this belt, which consists of Bangalore, Kolar and parts of Tumkur districts, lies mostly in the Palar and Pennar basins. Only the southern portion of the dry belt receives rains both from the south-west and north-east monsoons.

The dry belt which constitutes the major portion of the cultivable land is prone to frequent droughts. The earliest recorded failure of rain in this area is the great Durga-Devi famine. It began in 1396 and is said to have prevailed over the whole of India, south of the Narmada, and to have lasted for nearly twelve years. This famine was caused by the total want of seasonal rains. In 1419, again, due to failure of rain, there was famine throughout the Deccan and Karnataka. Ahmed Shah Bahamani (1419-1431) increased the pay of his troops and opened public stores of grain for the use of the poor. In 1420, again there was failure of rain. The years 1472 and 1473 are described as seasons of exceptional distress. No crops were sown for 2 years. Many died and many left the region. In the third year, when rain fell there was scarcely anyone left to till the soil[32].

The number of rainy days in this belt is less than 40 and in the central region (Bellary and Chitradurga) it is as low as 29. (A rainy day is taken as a day on which a rainfall of 10 cents (2.5mm) or more is recorded). Hardly 10% of the rainy days have a rainfall of 25mm or more[33].

Even the major rivers like the Tungabhadra, the Malaprabha, the Ghataprabha and the Bhima have practically no flow during the summer months. Other minor streams

flow only during a few days in the monsoon. Further, the terrain north of the Tungabhadra is mostly flat affording little scope for putting up storage bunds across the valleys. Irrigation is practised along the banks of rivers and in small patches close to villages watered largely by wells. For these reasons, even to this day, irrigation tanks existing in the northern area of this belt are few. The diversion of the waters of the Tungabhadra for irrigation by putting up small bunds across the river was conceived and executed in a large way for the first time by the Vijayanagar rulers from the 14th century onwards. There is no evidence of similar works on the Ghataprabha, the Malaprabha, the Bhima or the Krishna in ancient times.

Unlike the northern dry belt, which receives rain solely from south-west monsoons during the four months of June to September, the southern belt receives rain during a period of six to seven months. The terrain with its many small hill ranges affords scope for the construction of storage reservoirs.

Unlike in the northern dry belt where the soils predominantly are deep to medium black, which are susceptible to water-logging if continuously irrigated, the soils in the southern belt are mostly red loams which produce no ill effects from continuous irrigation.

Together, these factors resulted in the construction of a large number of irrigation tanks in the southern belt. In the words of Major Sankey, who devoted his attention to systematic repairs of tanks in Mysore State,

To such an extent has the principle of storage

> been followed in this area that it would now require ingenuity to discover a site within this great area suitable for a new tank. While restorations are feasible, any absolutely new work of this description would within this area be certainly found to cut off the supply of another, lower down in the same basin and to interfere with vested interests.[34]

North-Eastern Transition Belt

The north-eastern transition belt which receives an annual rainfall between 800 to 900 mm consists of mostly Deccan Trap soil. These soils mostly are black clay with poor drainage. The river Manjra and its tributary Karanja drain most of the area in this belt. *Jowar*, maize, cotton and chillies are grown in the wet season. Pulses, maize and oilseeds are grown in the dry season. Due to the existence of very few streams and valleys, construction of small storage tanks has not been resorted to and most of the irrigation has been around wells.

Ground Water:

In areas where construction of tanks is not feasible, and wherever ground water is available within easy reach, this has been used for irrigation. The occurrence of ground water is determined by the nature and properties of the geological structure. Geologically, Karnataka is composed mainly of igneous and metamorphous rocks of Precambrian age either exposed at the surface or covered with a thin mantle of residual and transported soil. In general, the rocks are termed as crystalline and hydro-geologically they are called hard rocks. The principal rock types are

granites, gneisses and schists. In the northern parts of the State, they are either covered by horizontally disposed lava flows of the Deccan Trap (basalt) piled up one over the other or at places by sedimentary formation of Kaladgis[35].

The igneous and metamorphic rocks are weathered to depths of as much as 30 metres in places, the depth depending upon such factors as rock types, topography and climate. The deepest zones of weathering are generally beneath the broad valleys becoming thinner on slopes. Hydrologically, all hard rock types are unsuitable for ground water development except for the joints and fractures which enable the rocks to hold and transmit some water. Studies have shown that among hard rocks, basalt is the best aquifer and next come granite, gneiss and schist.[36]

In the dry zone, where the average annual rainfall is 700 mm and less, there is little surplus water to constitute ground water storage. The probable percentage of rainfall contributing annually to ground water recharge for this area has been assessed to vary from 3 to 5 per cent.[37]. The recharge takes place during the months of continuous and heavy rainfall. In most of the months, the small amount of rainfall received is fully accounted for by evapotranspiration. For these reasons, the development of well irrigation has generally been limited to coastal and malnad areas. In the dry zone or areas of low rainfall, there is little vegetation, the rock and soil surface remains bare, and in such areas where rocks are weathered and broken up at the surface, where the joints are open and not sealed by clay, whatever little rain that falls on such surface is immediately transmitted underground. In such locations, wells are dug and irrigation flourishes.

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Note: In this and succeeding chapters, wherever B.C. or A.D. does not follow a date, the date should be taken to refer to A.D.

2

ANCIENT PERIOD

Prehistoric Period

This chapter discusses the origins and then examines the part played by the rulers, their officers and their subjects in the promotion of tank irrigation in ancient Karnataka, i.e., from prehistoric times to the foundation of Vijayanagar in 1336 A.D. The origins of tank irrigation in South India in general and Karnataka in particular can be traced to the prehistoric man. Even after he discovered the secrets of plant growth and turned into a cultivator, the prehistoric man depended entirely on rainfall, which was abundant in his habitat. When his numbers increased and he had to migrate to lands which had lesser rainfall than in his original abode, he developed the technique of storing the rain water, to satisfy his requirement in the low-rainfall or non-rainy days. Like the beaver, he built small dams across the brooks using sticks, leaves and mud. During heavy rains, the dams were washed away and he rebuilt them. He diverted the stored water to his fields by excavating small ditches. Where he could not so divert the water, he lifted it manually to his fields.

The earliest example of a water reservoir in the Deccan is to be found in Inamgaon near Pune. Its embankment-wall measured 240 metres long and 2.2 metres wide and

it was built of rubble set in mud mortar. It was provided with an irrigation channel connected to a close by river. It is dated about 1500 B.C. and it is said to belong to the Chalcolithic period[1].

The successors of the Chalcolithic people in Deccan and South India were the Megalithic people. These people chose their habitats near hills. They collected rain-water coming along the hill slopes in reservoirs by means of bunding the valleys. The arable lands made fertile by the water of the tanks supported the people. Perhaps they were the first to grow rice in this part of the country. It is likely that the Megalithic people spread over parts of Maharashtra, Karnataka, Andhra and Tamil Nadu and built reservoirs in all these parts[2].

The Mauryas

Historical times begin with the rule of the Mauryas all over India (about 320 B.C.). By that time, tank construction had attained a high level of excellence. This is exemplified by the Sudarshana lake at Junagadh in Saurashtra. The inscription of Saka Rudradaman of 150 A.D. gives the history of this lake from the Maurya to the Saka times. It was constructed by Pushya Gupta, the Governor of Chandragupta Maurya. Tushaspa, the Governor of Ashoka, built canals to it. In the time of Rudradaman, whose Saka Dynasty succeeded that of the Mauryas in Saurashtra, there was a huge storm which breached this dam and the waters of the Sudarshana lake escaped through the breach, leaving the tank-bed empty. *Sudarshana* became *Durdarshana* or the beautiful became ugly in the words of the poet-author of the record. Rudradaman repaired this breach

and claims that he made the dam three times more strong than before and *Sudarshana* the beautiful looked even more so *(Sudarshana tara)* than before. He says that he did this by spending money out of his own pocket and not by demanding taxes, forced labour or presents from his subjects, throwing light on the way that such public works were sometimes constructed earlier[3]. The history of this dam which extends from the time of the Mauryas (320 B.C.) to that of the Guptas (450 A.D.) is enough to show that the Mauryas could build reservoirs which lasted for over 750 years. The Mauryas ruled in Northern and Central Karnataka and from them, their successors in these parts, the Satavahanas, must have learnt the art and science of construction of tanks and canals.

Satavahanas and Chutus

The Adoni, (Kurnool district) rock inscription[4] of Pulumavi III of the Satavahana dynasty is engraved on a rock lying between two villages Mycadoni and Chinna-kadaburu. The object of the inscription was to record that Grihapati Samba excavated a tank near the place of the inscription in the village Vepuraka belonging to the military officer Kumaradatta. Vepuraka was said to be in the division of Satavahanihara belonging to *Mahasenapati* Skandanaga. The village and the tank mentioned in the inscription cannot be identified.

The Satavahanas were succeeded in Karnataka by the Chutus. The Banavasi (Uttara Kannada district) stone inscription[5] of the Chutu prince viz., Vishnukada Chutu-kulananda Satakarni located in the Madhukesvara temple says that "the daughter (not named) of *Maharaja*, the blessed

mother of the *Yuvaraja* Sivaskandanagasri caused a *Naga* to be engraved, a tank to be dug and a *vihara* to be constructed. *Amatya* Skandasati was the supervisor of these works". The tank mentioned in this record cannot be located.

Early Cholas:

Before proceeding with the history of tank construction in Karnataka, let us divert our attention for a moment to the neighbouring Tamil Nadu. There, in the early centuries of the Christian era, a leap forward was taken in irrigation by the Early Cholas who carried out a plan to control a river at the head of a delta. Their method of dealing with the delta land for purposes of irrigation has been followed everywhere. They built the great 'Grand Anicut' on the Kaveri as also the main channels for irrigation. Legends attribute to Karikala Chola the construction of the flood banks of the Kaveri[6]. He is also credited with the construction of many irrigation tanks[7].

Kadambas

Coming back to Karnataka, the Satavahanas and the Chutus were succeeded by the Kadambas in the Deccan or North Karnataka and the Gangas in South Karnataka. We may now review the activities of these rulers from about the middle of the fourth century to about the middle of the sixth century A.D., when the early Chalukyas of Badami (Bijapur district) became the dominant power all over the Deccan.

The first Kadamba ruler Mayura Varma (c. 350 A.D.) says that he constructed the tank at Chandravalli near

Chitradurga in Central Karnataka. This is one interpretation of his inscription on a boulder near the tank[8]. According to another interpretation of the same record[9], he is said to have restored it, in which case, the history of the tank construction in Karnataka begins much earlier. While there are earlier mention of tanks in records in Mycadoni and Banavasi we do not know their location. The Chandravalli tank is the earliest one about whose location there is no doubt. Further, this tank is one of the old tanks which has been recently restored and made use of and is thus an object lesson in making use of earlier tanks by the present-day people. This is exactly the lesson which this treatise wants to drive home to our people viz., when building new tanks, priority should be given to the restoration of old ones which have been built with much care and where success is assured.

The second Kadamba tank is recorded in the famous Talagunda inscription of Kakusthavarma (c.430-450)[10]. It speaks of the construction of a tank in Talagunda (in Shikaripur taluk of Shimoga district) in front of the Pranaveswara temple. The record also says that the Satavahanas worshipped in that very temple. It is very likely that the tank may have already existed in the Satavahana times and if that were so this would be the earliest tank in the history of Karnataka, about two centuries earlier than the Chandravalli tank mentioned above.

The third Kadamba tank to be mentioned here is the work of King Ravi Varma (c.485-519). He excavated a big tank called Guddatataka. A big tank exists at the entrance of Gudnapur and it is one of the biggest in the Uttara Kannada district; obviously, it is the same as the

Guddatataka excavated by the Kadamba ruler. The record[11] is undated and is placed in the early 6th century A.D. This tank is unique in our history because it is in existence for over 13 centuries and has been used continuously. The village Gudnapur is named after Guddatataka and it is 5 miles north-west of Banavasi. Gudnapur must have been an extension of the capital Banavasi in its heydays under the Kadambas and this huge tank must have supplied water to the capital and for irrigation in the surrounding areas.

Early Gangas

The contemporaries of the Kadambas in South Karnataka or Gangavadi were the Gangas who were equally interested in providing irrigational facilities to their subjects. The Melkote plates[12] of Tadangala Madhava-varma (6th century) refer to the existence of certain tanks. The details of the lands granted provide an insight into the irrigation facilities existing then. The inscription records :

(1) the irrigation of certain wet lands simultaneously from two tanks and

(2) six *Khanduka vapas* of land yielding two crops in a year, and ten *Khanduka vapas* situated close to Raktatataka (Red Tank) yielding a single crop in autumn.

Irrigation of two crops - one in autumn and another in summer - from a tank indicates the supplementing of tank irrigation by drawing upon the underground water

during summer and the existence of a system of highly developed agriculture.

Likewise, the Hoskote plates[13] of the period of Avinita, relating to the 6th century, indicate the existence of garden land growing sugarcane under a tank. The Devarahalli (Nagamangala taluk) copper-plate of 776-77 of Sripurusha, a Ganga ruler, granted Ponnalli, whose boundaries indicate that there were six tanks[14]. This is the first example of the existence of so many tanks near one village in South Karnataka in the second half of the eighth century.

Early Chalukyas

The Early Chalukyas of Badami ruled in the Deccan and South India for about two centuries from the middle of the the sixth century A.D. to the middle of the eighth century A.D. They have left behind them only a few records relevant for our purpose. The Anugode plates[15] of the Chalukya ruler Vikramaditya (670A.D.) record the grant of rice lands below a tank. The Shiggaon plates[16] of Chalukya Vijayaditya (c.707) speak of the boundaries of the gift village Guddigere (now Gudageri, Dharwad district) and tell us that in the south there was a lake called Venna, in the west lay the lake Kupera, in the north-west was the lake Kodi, in the north was the lake Pulivara and in the north-east were the lakes Matkere and Arsal. The boundaries of the other gift villages of Khapatti and Patali contained the Kurulehalla tank. Kanpur, another gift village, had a lake called Mahishivata to its north and Puli lake to the north-east. The mention of so many tanks near one another in the beginning of the eighth century

attests to the growth of the tank system in the region of South Dharwad.

Rashtrakutas

The ninth and tenth centuries saw the rise of the Rashtrakutas in the Deccan and South India. The Gangas became their subordinates and both constructed or encouraged the construction of a number of tanks. The Kesarabhavi inscription[17] in Hungund taluk of Bijapur District records the construction of a tank and its sluice by Amoghavarsha or during his reign in 837. The Huvinahipparagi inscription[18] of Bagewadi taluk, during the period of the same king in 862 registers the existence of two tanks. The Chinchli inscription[19] of Gadag taluk during the same reign registers the gift of a tank by a private individual. The same record dated 872 A.D. speaks of water-tax or *Neeruni sunka* (a tax for maintenance or for the use of water).

The Gangas continued to promote the construction of tanks. The Saligrama grant[20] of Rachamalla (819 A.D.) relates to a land transaction in a village near Yedatore (Krishnarajanagar). The grant records the existence of 14 tanks in the boundaries of this village. They are :- North-east - Gamagudda tank, east - Goldsmith's tank, at some distance Sigegere tank, then the Washerman's tank, then the canal from the Mahakamra tank, Maikonta tank,; then Tondikere tank, then the southern end of Nidugatti, then Naukkigere, then the southern end of Tenandakagere, and then Siri-kkigerega tank, then the southern part of Nallar tank, then the southern part of Madavadi tank, then the southern part of Komara tank.... thus it is bounded".

Apart from the large number of tanks in one village, the names of some of the tanks are worth noting. These are the goldsmith's tank and the washerman's tank. These mean that the two communities lived in separate localities and had their separate tanks. It is also possible that the Goldsmiths built their own tank. The Keregodu-Rangapur grant[21] of the same ruler in Tiptur taluk indicates the existence of five tanks in the boundaries of the lands granted. The Galigakere inscription[22]of Yedatore (Krishnarajanagar) records the existence of five tanks.

The tenth century inscriptions register a further increase in the construction of tanks by the Rashtrakutas and their subordinates, the Chalukyas and the Gangas. Of them, the following are noteworthy:-

1) The Basavannahalli inscription[23] of Satyavakya Permadi, a Ganga Chief (908 A.D.) registers the grant made to a temple of two *Khandugas* of *Neermannu* (lands getting water from rain) and two *Khandugas* of *Maduvinamannu* (lands getting water from wells and tanks).

2) The Baragur inscription[24] (920 A.D.) of Sira taluk records the construction of a tank by a woman Naranabbe. It was restored in 1886 and again in 1901. It irrigates 250 acres.

3) A record of Govinda IV from Bankapur of 929-30 A.D.[25] refers to the assignment of fines and taxes(*prayaschitta dakshina* and *pasumbe pana*) to a local tank called Kondaligere. The same record speaks of Kaliyur as a place of splendid tanks.

4) The Betamangala inscription[26] in Bangarpet taluk of C.950 records the restoration of the breached tank of Vijayadityamangala, now known as Betamangala. This Betamangala tank was perhaps built earlier by Vijayaditya, the Bana King, and was restored in about c.950. The tank appears to have breached again and was restored in 1155 by Sokkimayya, a senior general of Vishnuvardhana the Hoysala prince[27]. The *Mysore Gazetteer* says that this tank bund was 5100 ft long, 30 ft. high and 105 ft. wide at the base and 9ft wide at the top. This tank irrigated 580 acres[28]. It breached again in 1903 on account of heavy rains and was restored by the Mysore Government. This tank is presently reserved for water supply to the town of Kolar Gold Fields.

5) The Hirekogilur copper-plate grant[29] of the Chalukya chief Rajaditya (c.951) of Chennagiri taluk related to grants of two villages. Their boundaries list four tanks. Of these, Jaliga a large tank, perhaps relates to Jajur village, where a large tank exists even now.

6) A Tumkur inscription[30] (c.955) records the granting of certain lands under the Tumkur tank. This tank exists even now and irrigates about 800 acres.

7) The Karya inscription[31] in Nanjangud taluk (c.968) records the construction of two tanks, Desikere and Periyakere.

8) The Kudatini inscription[32] of the reign of Rashtrakuta Krishna III records the gift of 62 *mattars* of wet land under the tank. The Kudatini tank is an existing

tank. It is curious to note that most of the tenth century tanks mentioned above are still going strong. This speaks highly of the strength of their construction and periodical repairs.

The Chalukyas of Kalyana

The Golden Age of Tanks (973 - 1336)

The period from the last quarter of the tenth century to the thirties of the fourteenth century (roughly about 350 years) formed the golden age of tank construction. It was also the age for the founding of innumerable new villages and *agrahara* villages for settlements of scholars and building in them tanks, *satras* or rest houses and temples. In fact, all the institutions, *agrahara, satra* (rest house), tanks and temples were interrelated. When a village was formed, the primary requisite was water supply and if a river was not nearby, it was taken care to see that a tank could be constructed in that village. Whenever a tank was constructed and after its construction was over, as something like thanksgiving, a temple was built close to the tank. Sometimes when a tank breached, the temple provided funds for its restoration. It also took a leading part in providing irrigational facilities because temples owned large areas of land. The institution which was in overall charge of all these organisations was the self-governing village or town assembly, an association which flourished in this period as never before or after, in the history of Karnataka. Leadership was provided to it by the *Gaundas* or village headmen. The towns also had representative

institutions called *Nagara* or *Sreni* and their leaders were known as *Nagarasresthi* or *Pattanasresthi*, who also took a leading part in building temples and tanks. For groups of villages or *nadus*, the leader was *nadagaunda*. Many times, these groups or *nadus* were formed to facilitate irrigation from a common source. Popular participation in the construction and maintenance of irrigational facilities was at its highest in this period (973 - 1336).

Kalyana Chalukyas

The Chalukyas of Kalyana ruled over Deccan and parts of South India for a period of nearly two hundred years from c.973 to 1184. The reigns of the founder Tailapa II (c.973 - 977), Jayasimha II (c.1015 - 44) and Somesvara I (c.1068 - 76) and the later rulers accounted for 50%, while the single reign of Vikramaditya VI accounted for the remaining 50% of the construction of tanks. In this period of tremendous building activity, the districts of Dharwad, Bellary, Chitradurga and Shimoga in Central Karnataka benefited most in the construction of tanks. The Chalukyas issued a large number of records and many of them refer to the existing tanks. Most villages had tanks which are mentioned in the records. Here are a few examples.

A record from Kotavumachige[33] in Dharwad district of about 1010 A.D. is one of the earliest Chalukya records referring to a tank. It mentions a tank called Devimgere. For its repair, fines levied in the village, *dasavanda* or one-tenth of the income from the land, and escheat of persons dying intestate were to be made use of. The Mantur inscription[34] of c.1041 of the reign of Jayasimha II records the construction of Rattasamudra by the *mahajanas* of Mantur.

Somesvara I (c.1068 - 76) confined his construction activity to Dharwad district and in this he was surpassed by his son and successor Vikramaditya VI. An inscription at Nandavadige[35] (Bijapur district) records the construction of several tanks and temples by one officer called Bhavana Gandhavarana in the reign of Trailokyamalla or Somesvara I. The places where they were built were to be found all over North Karnataka, viz., Kalyana, Annigere, Mulugunda, Kolvuge, Nandapura, Kohalli, Mandalagere, Belgali, Banavasi, Karividi, Navile, Nandavadige and Peruru. Probably, he had served in or near all these places. The Morigere inscription[36] also of Somesvara I (Bellary district) of 1046 refers to the procedure followed in respect of construction of tanks. First, the land where the tank was to be constructed was purchased. In this instance, the land was purchased from one Mallipayya.

Vikramaditya VI

In the period of Chalukyas of Kalyana, the reign of Vikramaditya VI, as already noted, witnessed the largest number of construction of tanks. Only a few examples can be cited. His younger brother Nolambadhiraja Jayasingha, according to the Morab (Navalgund taluk) inscription[37] of c. 1077, renamed the local tank as Nolambasamudra and granted land for its maintenance. A Halebennur inscription[38] of Vikramaditya VI of c. 1080 refers to a longstanding breach of a tank named Tambasamudra. The *mahajanas* (scholar-citizens) of the place requested the governor Tamba to renovate it. The governor renovated it through one technician Jakkigosi and named it after himself and also provided for its maintenance. This shows that normally the repairs and maintenance of tanks were

the responsibility of the local assembly and only when it pleaded its inability that the higher authorities were requested to help. The Munirabad inscription[39] of c.1088 refers to a unique construction of a canal from the Tungabhadra with a network of subcanals for the improvement of the Pulige village. This network is compared in the record to the threads drawn out after cutting asunder the lotus stalk. The record also refers to the low-level canal and high level canal. The Hulige village is situated about two miles below the modern Tungabhadra dam. The old *anicut* still exists and the Hulgi channel is connected to distributaries one and two under the left bank canal.

Fleet's comments on the ruins at Kattegeri[40] in Badami taluk reveal that the technique of planning a system of tanks had reached a high level of development.

> The system of tanks at Kattegeri was formerly a huge one. First, there is the small tank in the west of the fort. Secondly, there is a larger tank on a slightly higher level which could if repaired when full include the preceding in itself formed by an embankment running to the south from just below the south-east corner of the fort. And thirdly, about a quarter of mile away to the south-west of the preceding and on a lower level, there are the remains of a larger embankment, now breached and quite useless which when in repair evidently formed a tank of very considerable area. This must be the large big tank referred to in the inscription.

This system of constructing a chain of tanks at different levels evidently was meant to arrest floods apart from

providing irrigational facility. This is the first description of a chain of tanks of a very early period.

The last record[41] of this dynasty relating to tanks quoted here belongs to Somesvara IV in 1184. It refers to a gift of the tax called *Pannaya Sunka* to the tank of Gonasamudra at Dambal for dredging and repairs in stone and wood of its sluice. The gift was entrusted to the sixteen *setties* (merchants) who constituted the municipal body of the place. This is an existing tank and one of the biggest in Dharwad district.

The Santara principality in Shimoga District was a part of the Chalukya empire. A Santara record[42] of c.1062 from Mahur refers to the construction of Santagere by *Pattanaswami* (Mayor) Nokkayya. He was one of the ideal *pattanaswamies* or mayors of Hombuccha (Humcha) the capital of the Santara principality. The record describes him as an ornament to the face of the citizens and a cause of prosperity to the entire Santara kingdom. Apart from the tank of Santagere, he built tanks called Molakere, Pattanaswamigere and Talavindagere. It is said that this *pattanaswamy* made the Ugure stream enter the Pagi-mangala tank at Saulanga at a cost of 100 *gadyanas*. No other contemporary mayor surpassed his record in improving irrigational facilities.

A good number of tanks are referred to in inscriptions of the Chalukyas particularly from Dharwad and Bellary districts. How rich the areas were in the distribution of water resources is clear from the records which refer to some places as filled with tanks. Some of these places were Marthur, Nargund, Rishyasringa, Naregal, Posevur,

Huli, Terdal, Alavandi, Belgali and Alandi. Some of the regions or *nadus* like Banavasi and Belvola are also described in the same manner.

Bagali and its tanks

In addition to these general descriptions of the areas where tanks abounded, we may quote the specific example of the town of Bagali in the Harapanahalli taluk of Bellary district, to show how the people provided themselves with tanks. The earliest mention of a tank is in a record[43], of Rashtrakuta king Indravallabha (10th century), in which, one Badamma made the gift of what appears to be a village for the expenses of a tank. In 1068 A.D., one Mahadevayya made a gift of 12 *gadyanas* for the tank Piriyakere (a big tank) which as the name indicates was the largest tank in the place[44]. In 1107 A.D., *Dandanayaka* Barmarasa granted to the *mahajanas* one *gadyana* per month out of the *pannaya* tax of Balguli (Bagali) for the repairs of the same tank viz., Piriyakere[45]. In 1115 A.D., *Dandanayaka* Tikkabhatta made a gift of income from tolls for the repairs of Piriyakere[46]. In an inscription[47] found in the Kallesavara temple, which is undated, one Chikka-gaunda received a gift of land for having repaired the Piriyakere. In the same record, one Bachagaunda, gave another gift of land to the same tank. Apart from the tank Piriyakere, three other tanks viz., Kanchamayagere, Begeyarakere and Kappurugere are mentioned in a record[48] of 1108 A.D. In 1188 A.D., the *mahajanas* of Balguli made a gift of land to a tank called Lalabbeya Daseyanayaka's tank[49]. This would be the fifth tank. All these five tanks in one town were constructed and taken care of by the local residents, who were assisted by the local officers and headmen, who generously endowed

them with gifts of money and land, during a period of two centuries extending from about the beginning of the 10th century to the end of the 12th century.

Virasaiva Saints

The *Virasaiva* reformer Siddarama decried the practice of constructing temples and preached that the construction of tanks and channels was more useful. But he did not stop at merely exhorting his followers. He himself took the lead in the construction of a huge tank in Solapur which is even now useful to the people. He flourished in the second half of the 12th century[50]. Another tank associated with the *Virasaiva Saranas* (saints) is the Tripurantaka lake at Basavakalayana (Bidar District) at a distance of 5 kms from it. On the bank of this magnificient lake there is a temple of Tripurantakesvara. A Kannada epigraph found here records that one Basava, a royal washerman of the Chalukya King Tailapa III made a grant to the saint Madivala Machayya[51].

Water supply to capital Kalyana

There is no doubt that this tank was constructed in the times of the Chalukyas of Kalyana and must have supplied water to the capital besides being useful for irrigation. A stream near Basavakalyana is even now known as Chulki *nala* which obviously is a corruption of Chaluki (Chalukya) *nala* or canal. This also must have supplied water both to the capital Kalyana and its neighbourhood. We have already seen that Bhavanagandhavarana an officer of Somesvara I (c.1068 - 76) built a tank in the capital Kalyana according to his

inscription at Nandavadige (Hungund Taluk).

Great Cholas

The contemporaries of the Chalukyas of Kalyana in South Karnataka were the Cholas. They ruled over a part of this area for one and half centuries. They confined their constructional activity to the districts of Kolar, Mysore and Bangalore. Rajendra I (1012-44 A.D.) initiated this activity. A few examples are the following. A record from Malurpatna[52] of 1014 A.D., says that the inhabitants of Malalur gave permission to irrigate the lands granted to a local deity. The temple authorities were given the right to levy a fine of 50 *kalanjus* of gold on those who obstructed to this arrangement. The following records of Rajendra I refer to either construction or renovation of tanks. A record of 1000 A.D., from Hebbani[53], Kolar district, refers to a breach of a tank and its repair by a *gamundar* (headman) and the Nolamba family granted rice-land to a private individual for its maintenance. A record from Malurpatna[54], refers to a grant by an assembly of Vandur of land as *devadana* or gift to a deity exempt from taxes. They also permitted those lands to be irrigated from the local tank. The next great Chola ruler after Rajendra I was Kulottunga. In his reign, Chola rule in Karnataka came to an end, when Vishnuvardhana, the Hoysala annexed Gangavadi to his kingdom in 1116 A.D. This brings us to the Hoysala contribution to the growth of tank irrigation in Karnataka.

The Hoysalas.

Foremost Tank Builders

The Hoysalas ruled over south Karnataka for most of the time, from the close of the eleventh century to about the middle of the fourteenth century. But at the height of their power from the end of the 12th century for some years, they ruled over the whole of Karnataka. They were the greatest builders of tanks in Karnataka in the ancient period. Vishnuvardhana (1108 to 1152), Vira Ballala II (1173 to 1227) and Vira Ballala III (1282 to 1342) were the most active and their reigns saw much activity in this sphere. As regards the distribution of tanks in the different districts, Hassan district where their capitals, Belur and Dorasamudra or Halebid lay, comes first and is followed by the districts of Chikmagalur, Tumkur and Mandya, in that order. Chitradurga and Kolar occupied the lowest positions. An example may be given to show the personal interest taken by the Hoysala rulers in encouraging the irrigational activities of their subjects. The Hariharapura inscription[55] of Krishnarajapet taluk (1322 A.D.) states that, in 1310 A.D., Ballala III donated to Harihara Bhattopadhayaya three hamlets. The latter gave them to 126 *mahajanas* on the understanding that the *mahajanas* would construct a dam and canals. These were completed by 1322 A.D. Then the king again visited Hariharapura and saw the dam and the canals and apparently being satisfied by them gave Harihara Bhattopadhayaya and the *mahajanas* the income of certain taxes for their maintenance.

The Capital Region

It was natural that the capital region received the foremost attention of the rulers both for water supply to the capitals, Belur and Halebid (Dorasamudra) and the irrigation of the surrounding areas. Writing about the irrigational facilities in Belur taluk in which Halebid also lies, the *Mysore Gazetteer*[56] of 1897, says,

> The Yagache and the smaller streams falling into it supply several small channels. The Bomdihalli channel from the main stream runs for 4.50 miles on the right bank ending near Belur. The Kittur channel drawn from a minor stream in the north-west has a length altogether of 15 miles to the west. The Maddighatta channel, 8 miles long, is taken off from another small stream in the south. There is an old ruined dam at Ranagatta, apparently designed to carry water from the river to the Halebid tank, by a large channel, called Sangidevar Kalve, the embankment of which is 15 to 20 ft high in some places.

Since both Belur and Halebid were capitals of the Hoysalas, we can safely attribute the irrigational works mentioned above to them. This surmise is supported by a record of about 1300 A.D.[57] found near Halebid which speaks of a channel drawn from Elachi (Yagachi) river. The inscription says that all people may bathe in it and bears the signature of Rajaguru Vishnu Upadhayaya. Mackenzie says as follows,

> In order to have a sufficient supply of water for the capital and for the cultivation of land surrounding it, it is said, that the waters of Yagache, the river which flows by Bailur (Belur) were brought by channel into the capital. The story is supported by the remains of a deep cutting near the 16th milestone of the Hassan-Belur Road. The depth and the size of the cutting as it now stands proves that this was no mean work and the whole scheme does credit to the engineering skill of those days.... A portion of the aqueduct by which the water was more immediately brought to the capital is to be seen in a garden outside the southern wall[58].

Besides the canals from the Yagache to supply water, both the capitals had a number of reservoirs. At Belur, according to an inscription[59] of 1148 A.D., Bittideva and Madikabbe constructed Hoysalasamudra and renovated several tanks. Another inscription[60] from Belur of 1196 A.D. says that Samanta Mara constructed a tank called Santasamudra and Brahmasamudra at his own cost. Students of Kannada literature are familiar with Kereya Padamarasa who formed a trio with poets Harihara and Raghavanka. The epithet *Kereya* or tank, he got because he built a tank in Belur in the reign of Narasimha Ballala and it is called Vishnusamudra[61]. Thus Belur was well supplied with tanks constructed by its public-spirited citizens at their own expense.

Like Belur, Halebid, besides getting water from the Yagachi, also had a number of tanks. One of the earliest tanks here was constructed by king Vinayaditya in 1062 A.D. One of his records[62] says that he constructed a sluice

to it and granted land for its maintenance. Another tank in Halebid or Dorasamudra is now known as the Halebid Tank. An inscription of 1136 A.D.[63] refers to its construction and calls it Piriyakere or the big tank. On the bund of this tank, there is an inscription[64] of 1140 A.D. which registers a grant of land under Hiriyakere for the Siva temple. No Siva temple exists, but dismantled remains of a temple are found in the tank-bed. Buchanan saw this tank in about 1800 A.D. He says that it was in the centre of the capital and "watered a great deal of fine rice-ground much of which is planted with sugarcane"[65].

Neighbourhood of the Capital

There is a small town known as Banavar, 18 miles to the northwest of Halebid. In Hoysala times, it was a flourishing trade centre. It owed this pre-eminent position to a family of merchants from Kerala. This family of *Chettis* or merchants carried on trade by ships and supplied horses, elephants and pearls to the Hoysala rulers. Kammatachetta Setty of this family enlarged a small tank in Banavar and built a new one called Kanakanakere in the name of his son. He also enlarged another tank called Banchikatti[66]. Arsikere is close to Banavar to its south. As its name, which means Queen's tank, indicates it has an old tank built in the 11th century, to which in 1190 A.D. land was granted for the maintenance of its waste-weir[67]. Bommanahalli is a small village now, near Arsikere. But in Hoysala times, the village is described as being filled with clusters of groves, with well-filled channels, with large tanks like seas, surrounded with growing crops, with crowds of people and splendid temples[68].

To the north of Banavar is the modern town of Kadur. In that taluk, there is a small village called Keresanthe or Vishnusamudra. Both the names mean that the place was known by its tank[69]. An inscription of 1159 A.D[70] speaks of lands being granted under the Hirekere (big tank) of Keresanthe for a temple in the village. Hirekere or big tank means that there were smaller tanks in the village. Keresanthe appears to have become Vishnusamudra agrahara when the tank Vishnusamudra was constructed there in 1182 in the reign of Vira Ballala II[71]. An inscription of 1250 A.D.[72] in the same place says that Allaladeva, son of a great merchant Madhavi Bhattarya made a grant of 200 *gadyanas* for the tank of Vishnusamudra or Keresanthe *agrahara* and the interest of 30 *gadyanas* a year was to be spent by the *mahajanas* towards the repair of the tank sluice and channel mouths. That such essential arrangements for maintenance lengthened life of the tanks for hundreds of years is proved by a record of 1550 A.D.[73] which says that 100 *kambas* of wet land with a growing capacity of one and half *khandugas* under the Keresanthe tank were granted for some charity. This proves that when periodical repairs were undertaken the tanks continued to serve for centuries.

But the most picturesque tanks near Kadur, built in Hoysala or earlier times were the twin tanks of Madagadakere and Ayyanakere. They are very important from the point of view of construction and attractive from the point of view of location. The first of these called Ayyanakere or Doddamagadakere is formed 4 miles northeast of Sakkarepatna by an embankment thrown across the river Veda, where it issues through the only outlet in the surrounding hills a gap of about 1700 feet in width at the

south-eastern foot of Sakunagiri. It is a beautiful expanse of water, about 7 miles in circumference and dotted with several islands. Four channels are drawn from it irrigating about 300 acres. The other tank called the Madagdakere or Kadur Madagadakere has been similarly formed by embanking the sister stream the Avathi at a point where the two hills called Sivanagiri and Hagrikangiri so nearly meet as to form a natural basin. The bund is 1,200 feet long[74].

The two streams viz., Veda and Avathi which issue out of these lakes join near Kadur and form the river Vedavathi.

Hoysala Officers

Kadur, Banavar and Arsikere are to the north and west of Halebid, the capital. Similar descriptions of tanks on the remaining sides of the capital can be given but space forbids. It was not only the capitals and their neighbourhood which received the attention of the rulers and their officers in the matter of the provision of irrigational facilities. The Hoysala officers cared as much for other regions also. One officer called Veeradeva built a town called Veera Ballalapura in 1186 and he constructed in or near it the following four tanks - Rudrasamudra, Ganga-samudra, Achyutasamudra and Veerasamudra[75]. Another outstanding minister in this respect was Perumaledeva *dannayaka*. His munificence was visible in different parts of the kingdom. For example, in 1269 A.D., in the reign of Narasimha III, Perumaledeva spent an enormous amount and constructed at Bellur[76], (Mandya District) Allalasamudra, Avveyarekere, Tagarchekere and channels and formed

wet lands and saw that there was an assured supply of water. He also secured the cooperation of local leaders for this purpose. Two of these, Tambiyanna and Tiruvengada Perumal, the *nambiars* or priests on the one hand and the *mahajanas* on the other entered into an agreement. According to it, the *nambiars* relinquished their dry lands which came in the way of the channels and exchanged in lieu of wet lands below the channels and agreed to pay towards *bittuvatta* (maintenance) 4 hanas per *khanduga* as *nibandha* (contribution) every year and also to pay to the officers and the *gaudas* or headmen fixed sums of money to ensure permanent supply of water. Another agreement[77] was made in the same place regarding tenants, exemption from taxes, payment of house-tax, educational facilities, worship, feeding etc. All these arrangements would come under development of the command area. This indicates that along with the construction of a tank, arrangements were also made for the development of the command area of the tank.

Tank construction appears to have become a passion in certain families as in the following instance. The Bovi-gondalahalli inscription[78] of Chintamani taluk of 1100 A.D. records that Vikkirama Gaunda, a big landlord, built a tank and a sluice. It is further stated that his other sons and their children also built tanks. It is possible that building tanks was also a business-like proposition and that this business trait ran in the family who specialised in it.

But certainly there was the other motive which was equally strong in certain other families such as serving God through tank construction or earning merit by doing so. *Hiriya Dandanayaka* Gangappayya won a great victory

in the battle of Kanagale for his master Vishnuvardhana who was mightily pleased with this victory and asked his general to name the reward of his choice. The humble officer requested the king for giving him a village, where he could construct a tank, the water of which could be used by him for worshipping his patron-god and offering of food in charity out of the regular agricultural products ensured by the irrigated cultivation under that tank. He could have asked his master for any reward. That he chose to ask for a village where a tank could be constructed which would be useful for worshipping his God shows that the religious motive in constructing tanks was equally strong[79]

Humble Builders

Apart from kings and their officers, even ordinary people took the initiative in promoting the construction of tanks. The Amarapur inscription of Sira Taluk (1100 A.D.)[80] records that Betta Rachayya, a watchman built a tank and constructed a shrine. Another similar example of a humble individual who promoted the construction of a tank is the following. The Madudi inscription of 1195 A.D.[81] records that the tank of the place was built by an elephant driver (*Mavuta*).

While it is difficult to pinpoint the motive when an individual constructs a tank, there can be no such doubt when a religious leader or saint does so. The Moti Talav at Tonnur, about 16 kms northwest from Srirangapattana, is said to have been built or repaired by the great Sri Ramanujacharya when he stayed in Melukote. It was then known as Lakshmisagar. A more elaborate account of this

famous tank appears later in this work in Appendix 1.

The inscriptions of the Hoysala period are very informative about the arrangements made for desilting the tanks. They also give a break-up of the expenditure involved in constructing a tank. In the general chapters which follow the historical chapter, full use is made of this information.

The Seunas

Contemporary with the Hoysalas in South Karnataka, the Seunas or Yadavas ruled in North Karnataka and Maharashtra. There are very few of their inscriptions which are related to tanks. A couple of them are noticed here. A record from Dharwad[82] of Yadava Singhana (1242 A.D.) refers to a new tank or Hosakere built in that place. The second one refers to Bennihalla, a small stream, existing even now and a village tank called Herurtataka or tank of the village Herur. This information is found in an inscription also of Yadava Singhana of 1242 A.D.[83]. The boundaries of the village Herur are described as follows. It is on the left bank of the river Venna (Bennihalla). The gift land and village tank were situated to the south of Kusugal, north of Kundagol, to the east of Hubli and west of Bennihalla. All these places are known by the same names even now. But the tank mentioned is non-existent, because Kusugal is notorious for water scarcity. Mudgal, a town in Raichur district, is described as a place of tanks in a Yadava record[84].Another record of 1250 A.D. of Yadava Kanhara from Kurumbetta[85] (Mamdapur in Belgaum district) describes it as a place filled with tanks.

Rattas of Saundatti

This family, feudatories of the Yadavas in Belgaum district, ruled in Belgaum city also. Two of their records both of 1204 A.D. refer to the tanks in this city. One of them refers to a road leading to Aneyakere[86] (Elephant's tank). The second one belonging to the same place and date refers to Heggere or the big tank. Fleet has identified this tank with the existing large tank to the north of the fort of Belgaum along the east side of which a road goes to the village of Kanbargi[87].

The Yadavas and Hoysalas were succeeded by the rulers of Vijayanagara whose contribution to the promotion of irrigation in Karnataka will engage us in the next chapter.

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13. *MAR* 1938, No.1, p.88.

14. *EC* VII (R) Nagamangala 149.

15. *MAR* 1939, No.30 pp 129-137.

16. *EI* XXXII, 1957-58, pp.317 ff.

17. *SII* XI, i. No. 7 p.4.

18. *Ibid.*, No.9, p.5.

19. *Ibid.*, No.15, p. 10-11.

20. *MAR* 1942, No. 75, p.208-231.

21. *MAR* 1919, No.67, pp.27-30.

22. *EC* IV, Yedatore 65.

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28. *Rice II*, p.119-25.

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30. *EC* XII, Tumkur 5.

31. *EC* III(R), Nanjangud 282.

32. *SII* IX, i, No.65.

33. *EI* XX, No.6.

34. *SII* XI, i, No. 74.

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47. *Ibid.*, ii, No. 710

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51. *Bidar Dist. Gaz.*, 1977, p.554.

52. *EC* IX, Channapatna 127.

53. *EC* X, Mulbagal 208.

54. *EC* IX, Channapatna 132.

55. *EC* IV (R), Krishnarajpet 11, p.10.

56. *Rice I*, P. 738.

57. *MAR* 1911, p.51, para 110.

58. *Ibid.*,

59. *Ibid.*, 1937, No.,28.

60. *Ibid.*, No. 26.

61. (Ed.) R.R.Diwakar, *Karnataka Through the Ages*, p.467 and *QJMS* VII (1918) p.100.

62. *MAR* 1929, No.12.

63. *EC* V, Belur 17.

64. *MAR* 1937, No. 32.

65. *Buchanan, III*, p.391.

66. *EC* V, Arsikere 22.

67. *Ibid.*, 85.

68. *Ibid.*, 118.

69. It is interesting to notice that according to *Supplement to Mysore General Census*, - 1871, Appendix - G-, there were 1233 villages in Mysore State with their names ending with *Kere, Gere, Kunte, Sagara* and *Samudra* denoting the importance given to tanks.

70. *MAR* 1945 No. 9.

71. *MAR* 1925, No. 64.

72. *EC* VI, Kadur 92.

73. *MAR* 1944, No. 8.

74. *Rice, II* p.370.

75. *EC* V, Belur 7 - 175.

76. *EC* VII (R) Nagamangala 83.

77. *Ibid.*, Nos.73, 74 and 76 and intro. pp. cv and cvi.

78. *EC* X, Chintamani 9.

79. *EC* I, (R) No. 558 p.341.

80. *EC* XII, Si 33.

81. *EC* V, Arsikere 150.

82. *Karnataka Inscriptions,* IV No. 48

83. *EI* XXXIV, No.7, cp[.

84. *HAS* 18, No.16.

85. *EI* XIX, 27A.

86. *EI* XII, 3A.

87. *Ibid.*, and Fleet's Note, p.25.