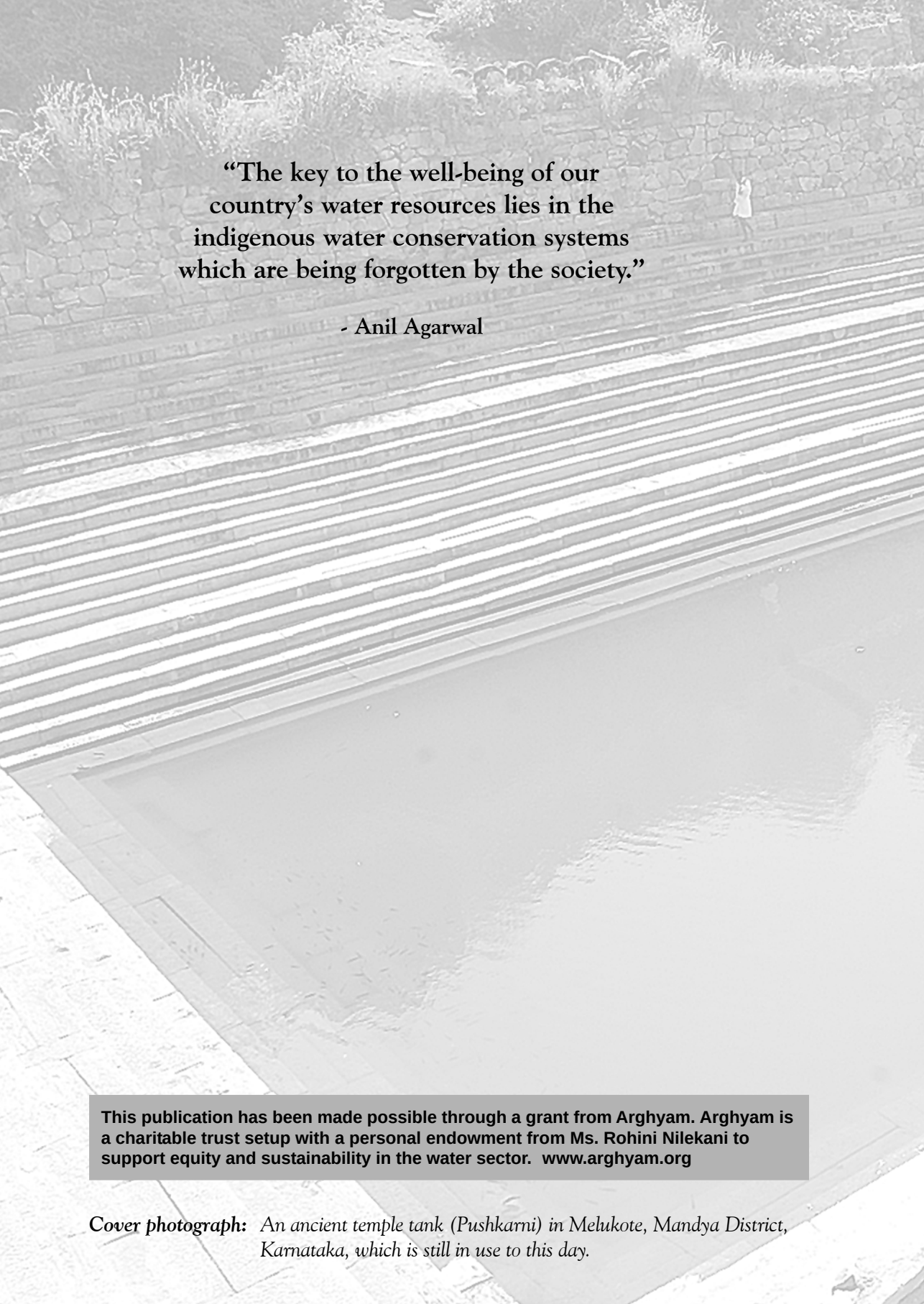
Watermāma

A collection of traditional practices for water conservation and management in Karnataka

Editor
Sandhya Iyengar

cdL



"The key to the well-being of our country's water resources lies in the indigenous water conservation systems which are being forgotten by the society."

- Anil Agarwal

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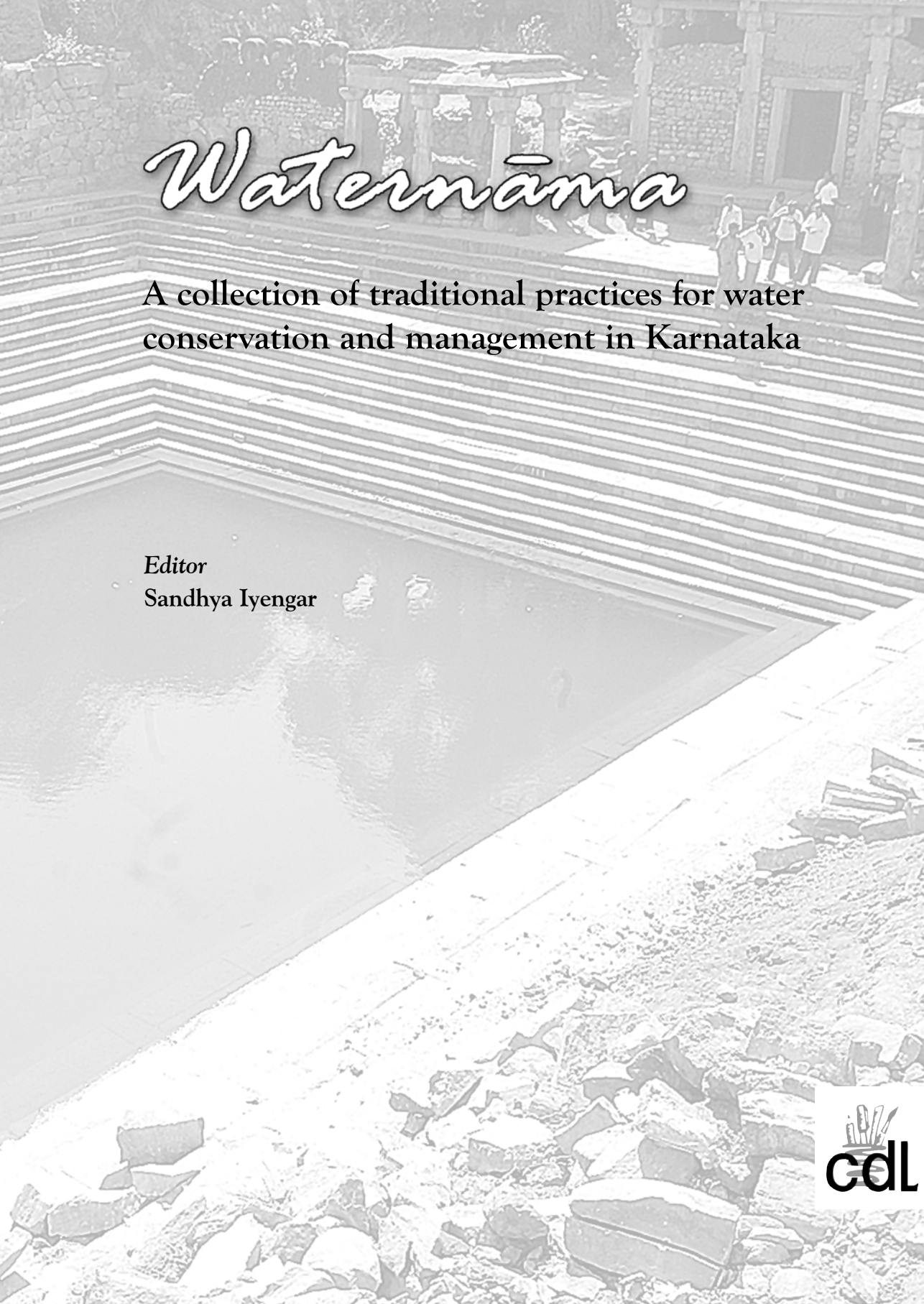
Cover photograph: *An ancient temple tank (Pushkarni) in Melukote, Mandya District, Karnataka, which is still in use to this day.*



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"Even in the 25th century, Rajasthan will continue to use only indigenous methods of water conservation. The knowledge they have gained through experience is revered. Any attempt to introduce non-indigenous technology is bound to fail."

Anupam Mishra
Well-known writer on indigenous methods of water conservation

Translated by: Vatsala Iyengar

Nashisuttiruva Neerina Gnana
Karnatakada Paramparika Jalasamrakshana Vidhanagalu
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Communication for Development and Learning
11/A, 7th Cross, 17th Main
Koramangala 6th Block
Bangalore 560 095
Tel: 080-25503481 Telefax: 25524192
e-mail: cfdal@dataone.in
www.cdlblr.org, www.waterjournalism.org

Dedication

This world, which has been created by the angels of Ashwini has aquatic creatures, terrestrial creatures, aerial creatures and many other creatures. Let them all partake of the available water on earth and be satisfied and blessed.

- Atarvaveda

Sometimes one man's belief and conviction in community resources can be a source of tremendous inspiration……

We dedicate this book to the memory of
Sri Sanjoy Das Gupta I.A.S. (1954 – 2005)
whose vision and insights have been instrumental in creating a new approach to water management in the state of Karnataka

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Foreword

Water will determine if India becomes wealthy or remains poor. But the management of water is not simply about building more dams, or laying pipelines to take the water to our cities and then pipelines to flush the waste from our homes. The management of water is about building relationship of society with its water, so that we can understand the value of each raindrop and understand that unless we are prudent, indeed frugal, with our use of this precious resource, there will never be enough water for all.

Water management is then about society and its ability to build technologies to maximise the use of water and more importantly, technologies to share water with all. It is for this reason that we must re-learn the water-wisdom of the past. In the late 1990s, CSE published its book Dying Wisdom: The Rise, Fall and Potential of India's Traditional Water Harvesting Systems, which documented the extraordinary wealth and ingenuity of its people living across different ecological systems to manage water. The systems ranged from ways of harvesting glacier water in the cold deserts to delivering water with precision over long distances through bamboo drip irrigation systems in the northeastern hills of India.

The kundi of the hot desert of India incorporates the simplest of technologies for powerful impact. Rain is harvested on an artificially created piece of land, which is sloped towards a well to store precious water. The water maths is equally simple; As little as 100 mm of rainwater harvested on 1 ha of land will collect 1 million litres of water in this structure. On the other hand, in the other regions of the country, people harvested flood waters.

In other words, People had learnt to live, with the excesses of water, and with its scarcity. They all worked on the principle of rainwater harvesting in a country, which gets rain for only 100 hours of the 8760 hours in a year. They knew that all the rain of the year could come in just one cloudburst. The solution was to capture that rain and to use it to recharge groundwater reserves for the remaining year. The answer ultimately was to use the land for storing and channelising the rain — over the ground, or under. Catching water where it falls and when it falls.

But there is so much more to learn. Each region needs to be documented; each system needs to be understood and each practice needs to be disseminated so that it can become policy. This publication by Communication for Development and Learning (CDL) is part of this discovery of true India. This publication will build our knowledge so that we can build India's water security.

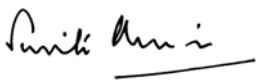
Let us be clear. This quest is not academic. India is today desperately in need of answers to resolve its water crisis. The country faces a critical challenge is improve the productivity of agricultural lands. It is clear also that even after years of investment in surface irrigation systems, over 60 per cent of India's land remains rainfed and roughly 80 per cent of irrigated by groundwater. It is therefore clear that water

management will need to be distributed across the country. In other words, we will need to capture rain, where it falls, over vast parts of the country so that we can provide local water security and recharge every well.

In this challenge, water can turn a large part of the country's currently parched lands into productive lands, reduce poverty and increase incomes where it is needed the most. Localised water management is a cost-effective approach and more importantly local water management – harvesting and storing water where it falls – can only be done through community participation.

The effort by CDL to document indigenous knowledge teaches us humility. This publication recognises and respects the wisdom of people, living on the margins of survival. It is an effort, which rewards the knowledge of the illiterate engineers and managers of water, who have been discounted in formal knowledge systems of the world.

It teaches us that we who are the 'literate' are often the most 'resource illiterate' of the country. It teaches us that the movement to build water literacy must begin with us. We must discover the 'magic' of this country, so that we can help build a better tomorrow, together.



Sunita Narain

Director
Centre for Science and Environment
New Delhi

Introduction

We first got the idea of doing a book on indigenous water management practices when we were engaged in tracking the coverage of water issues in the regional language newspapers in Karnataka state. This was an integral part of the 'Water Journalism' project. Analysis showed that of the 920 newspaper articles on water that appeared in a 3 month period, as many as 63% were on distress situations. These stories were related to scarcity, mismanagement and stress.

True, water scarcity was a harsh reality of life, but were there no options, we asked? How did communities meet their water needs before state government took over management of conservation, supply and distribution?

There was enough evidence to show that left to themselves, people were not only able to conserve and manage their water resources equitably, but also meet the local needs through community-owned systems of management. Each of these unique systems based on the local environment ensured that individual needs were met through an equitable management of the collective resource. Water was truly a community asset.

The idea to explore and document the traditional systems of water management emerged from this background. The first step however, was to identify and document these practices. This publication compiles information on 20 traditional practices of water management that exist, or indeed used to exist, in different parts of the state. Each of the articles looks at the practice, its methodology and the impact that this has had. Collectively this reveals the tremendous richness that exists in the indigenous knowledge systems within the community.

This compilation was first published in Kannada in March 2006. To our delight the book has been sold out The second edition of the book is in progress.

However, it is important to stress that this publication and documentation of practices is not an end in itself. The real objective rests on the hope that this information can create a reorientation of the approach to water management. If this mindshift can lead to an appreciation and revival of the traditional knowledge base once again, it is then that this book will have served its purpose.

We would like to acknowledge the support of National Foundation for India who have encouraged the concept of 'Water Journalism' as well as the contribution of Arhgyam who have supported the translation and printing of the English version. Our thanks are also to Vatsala Iyengar who undertook the translation of the articles. We are also grateful to the small but sincere team at CDL who have worked to put this publication together under very demanding schedules.

Shangon Das Gupta
Executive Director

Editor's Note

Mr. Rajendra Singh of Rajasthan, Mr. Chennabassappa Shivappa Kombli of Ranebennur and Mr. Mallanna Nagaralla of Hungunda are some of the first few names that come to mind when we look at indigenous methods of water conservation. Each of them, as well as several others, have been instrumental in bringing this rich heritage into the mainstream approach to water management.

Documenting indigenous methods of water conservation is today a stark necessity. The cultural value of water is fast being lost in the politics of water management. Steady commercialization is increasingly eroding all human values attached to water. Where is all this is leading to, is a question mark? But one thing is certain, that is, a water crisis is impending in the future. In order to avert this, we must revisit and learn from the practices used in the past. Select water conservation methods can then be adapted to the present day situation.

The publication 'Waternama' is a compilation of some of the amazing traditional practices of water conservation and management that were practiced in the state of Karnataka. The 20 articles in this publication showcase a whole range of diverse techniques to overcome drought, water storage, water percolation, rejuvenating structures, lessons on tank rejuvenation, skills of water distribution and the interventions of the Rajas and Sultans for water conservation. The Jotte, Jarukattu, Gundavarthi, Talaparige, Sisandra, Bhavadi, Tukadi, Damaasha are also some of the other practices that have been included here.

The common thread that links these articles is the involvement of the community in evolving techniques for water conservation which was based on the local geographical conditions and which could meet the local needs in an equitable manner. While each of these articles is complete by itself, we do believe that each practice has scope for further research.

While these practices are important, what is as relevant to appreciate is the fact that this book contains only a few of the innumerable indigenous methods which are practiced in Karnataka. While researching on the different methods, we learnt of Orategallu, Gunda of North Karnataka, serial tanks of Chitradurga, pristine tanks of Naragunda-Navalagunda, Abbis, Kalyanis of Malnad, and other such practices which, for various reasons we were not able to document.

The value of this book has increased through the contributions of experienced writers. We appreciate their response to our request and thank them for their efforts.

As the Editor, I enjoyed reading the content of each article. The diversity was appealing. For giving me this opportunity I am thankful to Ms. Shangon Das Gupta, Executive Director, CDL and all my colleagues. It is my hope that this book will be the precursor of many more such initiatives.

Sandhya Iyengar
Mallikarjun Hosapalya

Tanks of Karnataka

A historical perspective

Vatsala Iyengar

Historical records highlight the fact that rulers in India have placed utmost importance to the construction of tanks. The rock inscriptions as well as Kaifiyats confirm this. The Puranas too uphold the significance of the tanks. This article draws attention to the relevance of the experience in history.

From pre-historic times, the rain dependent state of Karnataka has been witness to continuous efforts by the rulers and the people to set up efficient systems to harness and collect water. In fact, during the Bronze Age and the Megalithic Age, the people of South India were regarded as leaders in constructing water-harvesting systems, especially at places where rivers were not present.

Historical evidence indicates that as early as 300 B.C. the communities of Karnataka knew the technique of constructing tanks as well as were aware of the importance of maintaining them. Thousands of inscriptions in the post-Mauryan period detail out information on canals, bunds, depth of water, costs for construction and in fact, every aspect of tank construction. To cite some examples:

- A rock inscription of the 4th century which is in the reign of the Kadamba King Mayura Varman describes a tank built by the king in the village of Chandravalli in Chitradurga District.
- Another inscription of the same dynasty record details of a tank built near the Pranaveswara Temple of Talagunda in Shimoga District.
- An inscription in a place that is presently in Andhra Pradesh is considered to be a handbook on the construction of tanks during the rule of the Vijayanagara king, Bukka.
- The Munirabad inscription near Hospet describes in a poetic manner the canal dug from the Tungabhadra River to construct a tank.
- Another 1,000-year-old inscription found in Bethamangala of Kolar District testifies to the existence of a tank there.
- An inscription found in the Venkataramana Temple to the east of Rajagundlahalli in the same district details the method of construction and the materials used.
- The 1371 Bolakyatanahalli inscription in Arakalagudu, Hassan District describes the financial contribution given by the community of Nanjapura village to maintain the tank. It also states that four bullock carts were

given by the villagers for this purpose. The inscription further stipulated that the tank beneficiaries bear the cost of the bullocks, the stoppage-pole, iron and oil needed to run the carts.

- According to the 1310 Holenarasipura inscriptions which belong to the reign of the Hoysala King Viraballala, the Prime Minister, Madigadeva Dandanayaka, purchased four villages after paying about 2,300 gold coins as toll offering to God Padumaleswara. The king issued a letter in this regard and also recorded that certain taxes levied on the citizens be dropped. The subsequent portion of this inscription quotes the tank built by the Prime Minister in the name of his wife, Mayidevi Damnnayiti, at a cost of about 3,060 gold coins.

And the Kaifiyats say....

There is interesting information regarding tanks and ponds in the Kaifiyats of the State. Some of the unusual cases of people who constructed tanks were documented in the Kaifiyat, such as :

- The cowherds of Kokkasamudra in Bellary District built a tank and erected an image of a dog there
- A dancer built a tank in Yagati
- A prostitute in Nagamangala sacrificed her life for the sake of the tank
- A call-girl called Sringeri made a generous contribution to renovate a tank
- The watchman of a village constructed a tank and temple.

- Unable to witness the plight of his elephants, a Mahout built a tank for their benefit.

These are only selected cases. There are many more instances documented in the Kaifiyats which highlight the generosity and social awareness exhibited by people belonging to all classes and communities which provided water to the parched lands and relief to the communities.

Apart from the inscriptions and Kaifiyats, numerous 'hero stones' also reflect the sense of sacrifice exhibited by the people for the welfare of others. For instance, at the time of constructing the tank in Akkinalu village, Chennamma, the eldest daughter-in-law of the village chief came forward to sacrifice her life as an offering as the tank failed to yield any water. Pleased with her devotion, the Water Goddess gushed forth, flooding the entire area. Caught in the force of the sudden gush of water, Chennamma lost an arm. She subsequently came to be worshipped as a village deity by the name *tholgai* Chennamma.

A royal duty

While commoners built small water bodies for the benefit of the community, kings and rulers undertook large irrigation works as part of their religious and social obligations. They provided incentives to build tanks in new settlements, made land grants, and even exempted taxes for people who built tanks. The royal families provided generous financial support towards building tanks and temples. This was also evident when the rulers set up Brahmin colonies called Agraharas where a tank was built along with a temple. Many of the Brahmin settlements were named after the tanks which were constructed for use by the temple as well as for the welfare of the people.

In history records, construction of tanks witnessed a golden era during the reign of the Kalyana Chalukyas (973-1336). Of the total number of tanks built during this period, 50 per cent of them were constructed under Tailapa II, the founder of this empire; the rest were built by the subsequent kings including Vikramaditya IV. These tanks provided immense benefits to the regions of Dharwad, Bellary, Chitradurga and Shimoga.

During the rule of the Hoysalas, who were considered master builders, the regions of Hassan, Chikamagalur, Tumkur and Mandya enjoyed plentiful water, thanks to the rulers. These tanks were so expansive that they were often compared to the seas and named as Hoysala Samudra, Vishnu Samudra etc. These kings had also decreed that the citizens should spend an annual amount of 30 *gadyanas* towards the maintenance of the canals and outlets of the tanks.

Apart from the Hoysalas, the rulers of the Rashtrakuta, Ganga, Chalukya, and Vijayanagara Empire also gave high priority to the construction of these water bodies.

The travellers say...

Foreign travellers Paes and Nuniz have given a graphic description of the massive tank built by Krishnadevaraya of Vijayanagara. Paes says: "…*The king made a tank there, which, as it seems to me, has the width of a falcon-shot (an old piece of artillery). It is at the mouth of two hills, so all the water which comes from either side collects there. Besides this, water comes to it from more than three leagues by pipes that run along the lower parts of the range outside. This water is brought from a lake, which overflows into a little river. The tank has three large pillars handsomely carved with figures; these connect with certain pipes from which they get water when they have to irrigate their gardens and rice-fields. In order to make this tank, the king broke down a hill, which enclosed the ground occupied by the tank. In the tank, I saw so many people at work. There must have been 15,000 to 20,000 men who looked like ants. One could not see the ground on which they walked; there were so many men. The king portioned out this tank among his captains, each of whom had the duty of seeing that the people placed under him did their work, and that the tank was finished and brought to completion. The tank burst two or three times, and the king asked his Brahmins to consult their idol and find out the reason why it burst so often. The Brahmins said that the idol was displeased, and desired that they should make a sacrifice, and should give him the blood of men and horses and buffaloes. As soon as the king heard this, he forthwith commanded that at the gate of the pagoda, horses, buffaloes and the heads of 60 men should be cut off. This was done at once.*"

Nuniz, in continuation of this description says, "*This king also made in his time a lake, which lies between two very lofty Serras. But since he had no means for making it, nor anyone who could do it, he sent his people to Goa to ask the Governor to send some Portuguese masons. The Governor sent him Joao della Ponte, a great worker in stone. The king explained to him how he wanted to tank to be built. Though it seemed impossible to this man (mestre, modern maistry), nevertheless he told the King that he would do it and asked him to have lime prepared. To this the King laughed, for in this country when they build a house, they do not understand how to use lime. The King commanded to throw down quantities of stone and cast down many great rocks into the valley, but everything broke into pieces. All the work done in the day was destroyed each night. The King, amazed at this sent for his wise men and sorcerers and asked them what they thought of this thing. They told him that their idols were not pleased with this work, and that unless he spilt the blood of men or women or buffaloes, that work would never finish. So the King sent to bring hither all the men who were his prisoners, and who deserved death, and ordered them to be beheaded there. With this, the work advanced. He made a bank across the middle of the valley, so lofty and wide, that it was a crossbow shot in breadth and length, and had large openings (sluices); below it he put pipes by which the water escaped, and when they wished to they could close these. By means of this water, they made many improvements in the city, and many channels using which they irrigated rice-fields and gardens, in order to improve their lands. He gave the people lands which are irrigated by this water free for nine years.*"

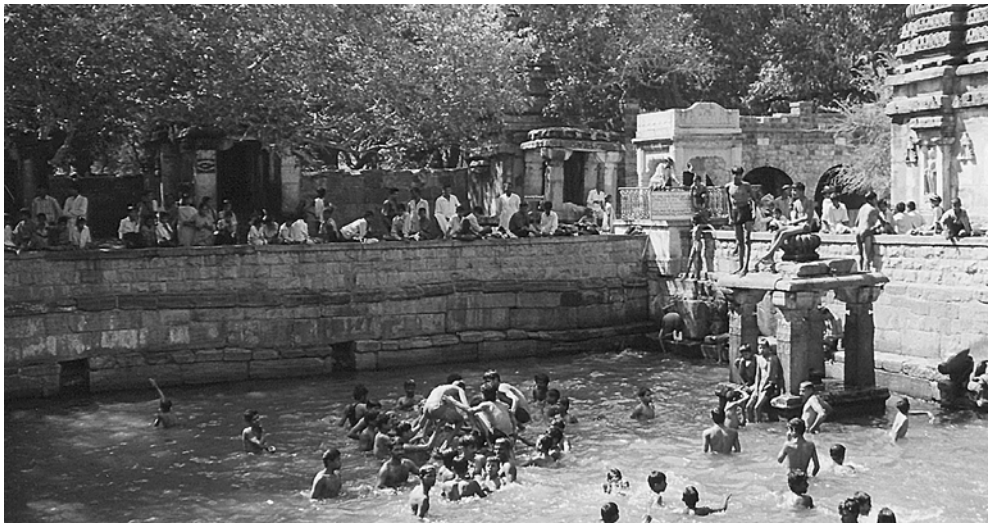
Individual responsibilities

In more recent years, during the era of the Wodeyars of Mysore, there are instances of land grants being made to individuals on the condition that they used a portion of the land for a tank which they would build from their own resources. For instance:

- A land grant was made to Narahari Shastri on April 11, 1761 for his livelihood. He committed to build a tank to help the community and several generations thereafter.
- Two villages were given to Lakshmi-Nidhitirtha of Gopanahalli. However since the tax to be paid for very high, the condition was laid that if they constructed a tank, the tax would be two *varahas* per 10 *khandugas* of Devadaya lands. Thereafter, for wetlands, the tax was fixed at one *varaha* per 10 *khandugas*. Furthermore, income from two *khandugas* of wetlands and two contractual lands was exempted and this money was diverted to maintaining the tank.

And the scriptures state...

Ancient texts also have several references to tanks. Arthashastra, while upholding the importance of tanks, has specified that a king must build a water source that does not dry up during the year. If he is not able to do so, as an alternative, he should provide the land and other essential material to anyone who voluntarily offers to build a tank. The text has also laid down some stipulations for those who are not able to do this directly, but wish to participate. For instance, anybody who stays away from any kind of cooperative work should provide workers and bullocks for the work and should bear a part of the expenses; but he should not expect any returns. In addition, it lays down that the natural flow of water from a higher tank to a lower one should not be stopped unless the lower tank has been rendered



useless for three consecutive years. Those who indulge in such a practice should be punished. Those who draw water before turn or those who prevented water flow into other fields or those who emptied the tank should be penalised, states the Arthashastra.

Agni Purana avers that a person who constructs a tank receives 100 million times more merit than those who perform the ritual of *Ashwa medhayagna*. Such a person also goes directly to heaven in a fine chariot. Furthermore, since cattle and other animals drink water from the tank, the person who builds a tank is absolved of any sin in life. Gifting water through construction of a reliable water source was also considered to be more meritorious and more important than having 1000 sons.

As per the Agni Purana, Sundays and Tuesdays are considered to be inauspicious days to dig a tank. Several stars of the constellation and conjunction of planets are considered to augur well for the construction of a tank. This Purana has also specified some rituals while laying the foundation for the tank. As Lord Vishnu is considered to be the embodiment of water, his image as well as that of Varuna, the rain God, are worshipped. The scripture states that a rectangular or octagonal or circular pole should be erected at the centre of the tank, prior to which gold and fruits are placed at its base. For a tank, 20 hand-lengths should be dug and 25 hand-lengths for a pond at the point where this pole is placed alongwith chanting of hymns.

Water collected in the tank was also sacred. Gautama Dharma Sutra, a treatise, says that people should not defecate in these waters nor should they enter the water wearing footwear.

From the pages of literature

The tank is not regarded as a mere source of water; it has also been the fountainhead of inspiration for art and literature. Vriksha Ayurveda, a work by Surapala gives details about reservoirs and tanks while different literary works in Kannada also have traditional knowledge about tanks. A work by the Vijayanagara king Krishna Devaraya in Telugu language proclaims that both righteousness and economy will be augmented only when irrigation canals and tanks are built.

There are tanks and Pushkaranis that have created a world of art through depictions of scenes from Ramayana, Mahabharata, Bhagavata and other epics on the pillared halls used as bathing ghats.

Water for worship

Water is an absolute necessity in the Hindu mode of worship and almost all the rituals use offering of water to the deities, sipping of water, and personal anointments. All these require an extensive use of water. As a result, most, if not all major temples of Karnataka have built a tank or the Pushkarani next to the temple. In

cases where there is a river or stream nearby, water is drawn from this source through canals.

Some temples have the Sanctum Sanctorum in the middle of the pond and have a small bridge from the bank to the premises. Several such temples can be found along the coastal region, the prominent ones being Madhva Sarovar of Udupi, Mahadevalaya of Kumbashi, Chaturmukha Basadi of Karkala, Anantha Padmanabha temple of Kasargod, among others. Madhava Vijaya, a text says that Ganga Bhagirathi, the river goddess manifests herself in the Madhava Sarovar once in every 12 years. Stone platforms were built around this pond in the 16th century in order to strengthen the structure.

The Chamundi temple near Mysore also celebrates the *Teppotsava* after Dussera in a water body called Devikola atop the Chamundi Hill. The Koti Thirtha pond in Koteswara of Coondapur Taluk is in an area of 4.5 acres and is the largest tank in the entire belt. It is the focal point for many festivals held by the temple and the people here believe that holy waters are found here.

The tanks of Karnataka were classified on the basis of their size and accordingly were called a big tank or small tank, while new tanks were called virgin tanks.

Through the concerted and continuous efforts of the citizens, rulers, feudal lords, landowners, communities received several centuries, even at the end of the 19th century. 60 per cent of the region of a total area of 27,269 square miles continued to enjoy the benefits of tank water. Major R.H.Sankey, the Chief Engineer of Mysore during the colonial rule says, "Unless there were exceptional circumstances, water

from the tanks spread over 16,287 square miles and was not allowed to overflow. To such an extent has the principle of storage been followed that it would now require some ingenuity to discover another site within this area that is suitable for a new tank."

A recent press report states that Bangalore once boasted of 596 tanks to provide drinking water to the city, and that this the number has dwindled to 64. Two historic tanks in the city are dying and on the verge of drying up; groundwater levels have fallen and floods are becoming a common feature during monsoons.

This situation is not limited to Bangalore. It is a well-known fact that the other parts of Karnataka face a similar situation. It, therefore, becomes the prime duty of the public and the administration alike to appreciate the practice of our ancient rulers regarding the construction and management of tanks and ponds and learn from the pages of history and tradition.

Vatsala Iyengar is a senior writer and has worked as a newsreader and translator for All India Radio. She has to her credit extensive research work on the temples of Karnataka that have been published by the Government in three volumes.

Water Traditions

The Malnad story

Shivananda Kalave

The Malnad region is home to hundreds of stories on water harvesting. While each is different, one is more interesting than the other. However, it is unfortunate that this knowledge is quickly being forgotten. This article contains information about some unusual, but fascinating water conservation practices of this area.

About 35 years ago, the Shiliga tribe of Uttara Kannada District built an embankment on the Dabbehalla tank at Sirsi. About 125 feet in length and eight feet in height, this structure stands erect even today and ensures availability of water all through the year. Constructed using local material, it is strong enough to withstand the onslaught of rainwater during the torrential monsoons.

And yet, there have been instances in recent years where dams built using concrete and iron have been reduced to rubble during heavy rainfall. Such dysfunctional concrete constructions erected by the Government costing lakhs of rupees can still be found in almost every village.

So, how did an ordinary embankment, built by the unlettered Shiligas, score over the modern dam?

This is a practice born out of traditional experience called *Jarukattu* in Kannada. The name suggests its dual role – allowing free flow of floodwater during the rainy season and allowing water to collect in pits in summer. This embankment, which closely resembles the check dams of the plains, is a system where irrespective of monsoon or summer, a certain volume of water always stands in a pit and the excess water flows down from the higher slopes.

The outer portion of the embankment is structured in a manner to ensure that the force of the gushing water jumps over the obstruction and runs down the slope. In order to ensure that the stones do not break away from each other, each stone is joined to the other very securely without the use of cement or iron. Mud and leaves are applied to the insides of the embankment to prevent the seepage of water.

For this, local resources that are available have been used. The base of the embankment is 15 feet wide and as the construction tapers towards the top, the

mouth is only four feet wide. Some portion of the sediment that flows along with the water during heavy rains sticks to the insides of the embankment. The gushing water carries the excess sediment over the embankment. Thus, over the years, the possibility of sediment accumulation is almost negligible. The greater the difference in height between the water collected in the embankment and the place where it falls down into the stream, the faster will be the flow of the flood water. Thus, even in the rainy season, the water does not cross the bank to enter the agricultural fields.

After finding the exact spot in the stream that facilitates the flow of water to the fields, the embankment is erected at a specific elevation. A natural rock bed is the ideal location for the construction of such a dam. In the Malnad region where areca nut and paddy are grown, it is beneficial if the streams flow at a depth of about 8-10 feet lower than the fields. However, due to the force of the water cascading down the hills, soil erosion increases and this could create a situation where the stream flows in a moat that is 40 - 50 feet below ground level.

Since the bank of the stream mainly has agricultural land, it would not be possible to restrict the flow of the stream flowing at such a depth as any bund or bank will be redundant. Only the *jarukattes* are beneficial as they deposit the sediment on the floor of the stream and store volumes of water. Technically speaking, check dams are not suitable for Malnad and engineers say that these get washed away due to the force of water. Such dams are of value only in the plains.

There are several examples of villages here that still derive benefit from the *jarukattes*. But unfortunately, the tradition and skill of erecting *jarukattes*, which are models of water and soil conservation has declined.

Land partition and effective water systems

In Malnad, at a time when people depended only on tank or stream water for irrigation, agricultural families follow a unique system of water utilisation called as *Niru Bari* while getting their land shares. In this, when a family split and 4-5 brothers were given their shares of land, the village committee would not agree to allotting land to one person at only one place. The hidden agenda behind this was good water management and mutual co-operation in sharing nature's gift of water. If one person is given land in only one place, he becomes possessive about water and may withhold flow of water to the lower fields owned by one of his brothers, thus

causing distress to the family. Instead, if he were allotted one portion of the land at a higher level and another portion at a lower level, any disruption created by him in the flow of water, would affect his own field in the lower level.

This methodical system of allowing water to flow from one field to another is called *Niru Bari*, meaning availing water turn by turn. Everybody is committed to the unwritten rules of *Niru Bari* based on a principle where a defaulter is denied water. As a result of this, everyone in the village has to cooperate, because unwillingness to do so would only invite trouble for them.

The tradition to develop agriculture wherever water was available, continues till date and in turn fosters co-operation by intelligently sharing river or stream waters for agricultural purposes.

Water drenching

Traditionally, with the onset of winter, the farmers of the village erect a mud embankment to the canal of the plantation by using banana stems and areca strips. During summer, in order to maintain the greenery in the fields, flowing water is embanked. This is the fruit of traditional wisdom.

In the Karavali region, a special method of water drenching is undertaken by containing water in canals. In order to do this, a rope is tied between two areca trees and part of the rope is allowed to hang. The broad spate that grows at the bottom of the bastard sago tree (*Caryota Urens Lin*) is attached to a rope. At the end of this is a container used to scoop the water out and drench the field.

Even before the crack of dawn, the bare-bodied human machines are at work. As the water gushes in, the sound created by its gurgles is a delight to the ears. Each time the spate is lifted, about 10-15 liters of water flow out effortlessly. This practice entails constant labour for seven months in a year and helps maintain the green of the plantation. The embankments built for water drenching are helpful in groundwater conservation as well.

The bastard sago trees that help in water drenching have an amazing relationship with irrigation. These trees are normally found in evergreen and semi-evergreen forests. The dense vegetation and water sources of the valley are the main support for agriculture in the region. Forests are a boon to Karavali. However, due to the destruction of forests, there is a grave danger of water scarcity.

In 1980, three villages, Mururu, Kallabbe and Hosada of Kumta Taluk collectively spread over 400 acres of areca cultivation. The area had only about 50-60 irrigation pumps as farmers undertook construction of hundreds of embankments in their plantations. In 1996, records show that the same 400 acres had as many as 450 pumps! Even marginal farmers had to install pumps for their water needs for if not, then they would have to witness the death of their crops. In earlier times, as soon as the monsoons ceased, preparations for irrigation would commence and

embankments were constructed to irrigate the lands. But today, the situation is such that only electric pumps are used to draw water from open wells. Since traditional methods are on the decline, only wires have spread their tentacles all over the plantation.

Water tradition as documented by Buchanan

In the town of Bhatkal, on the northern bank of Sankadahole, the villagers built eight mud embankments between November 17 and December 16 every year, by themselves. Buchanan, who travelled through the forests and valleys of the Western Ranges and visited Bhatkal on February 18, 1801 observed this. This rare document informs us that the farmers of Bhatkal knew how to stop the running water about 200 years ago! Buchanan was in Sonda in Sirsi on March 13, where he recorded the method of irrigation through the building of bunds for the main canals of the plantation and providing water to the areca crop in summer. A reconnaissance journey undertaken in 2001 along the same route as that of Buchanan found that even today Bhatkal and Sonda follow similar methods of water conservation.

Jaarukatte, Adike dabbe kattu, Balekunte kattu, which were constructed using local materials and resources continue to be used in some places.

The Kadambas, who ruled over Malnad, built a 165-acre tank near Banavasi in the fourth century. This is the second tank in the history of Karnataka's water harvesting systems, signifying that kings and rulers conquered water sources before conquering a town. Sonda in Sirsi was called Sudhapura and by 1763 A.D. about one lakh people lived in an area of about 3-4 kilometers. The kings of Sudhapura who built this town on the banks of the Shalmala River did not depend on the river for all the basic requirements of water; instead they implemented several schemes for harnessing rainwater.

An inscription of 1558 by Svarnavalli states that Arasappa Nayak of Sonda, while praying for progeny, constructed many temples and also tanks and ponds as part of his endowment. In another instance, there is the story of a beautiful stone tank called Muttina k*ere*, built near the Jain monastery. Legend has it that Bairadevi, wife of an ailing Jain king prayed to God for her husband's recovery and vowed to build a tank at a cost equivalent to her pearl nose ring. As her prayers were heard, the tank was her votive offering. The tank is nearly 1000 years old but is still in a pristine condition. It is rightly called "Pearl of a Tank", as even in the summer it is full of water.

It is a common practice to construct temples and monasteries and build a tank next to them. There are many such instances of tank constructions that vary in size and the volumes of water that they hold. For instance, next to the Jain monastery was the Muttina *kere*, next to Mantrika monastery was the Akka-Thangi *kere* along with Mundage *kere*, near the Gadige monastery there was the Neerulle *kere*, near the Vadeeraja monastery there was Davalgange,Hayagriva *kere* (Kote *Kere*),

Svarnavalli *kere* etc. Starting from the Hayagriva *samudra*, which spread over five acres, many tanks have been built spreading over 2-3 *guntas* in the valley.

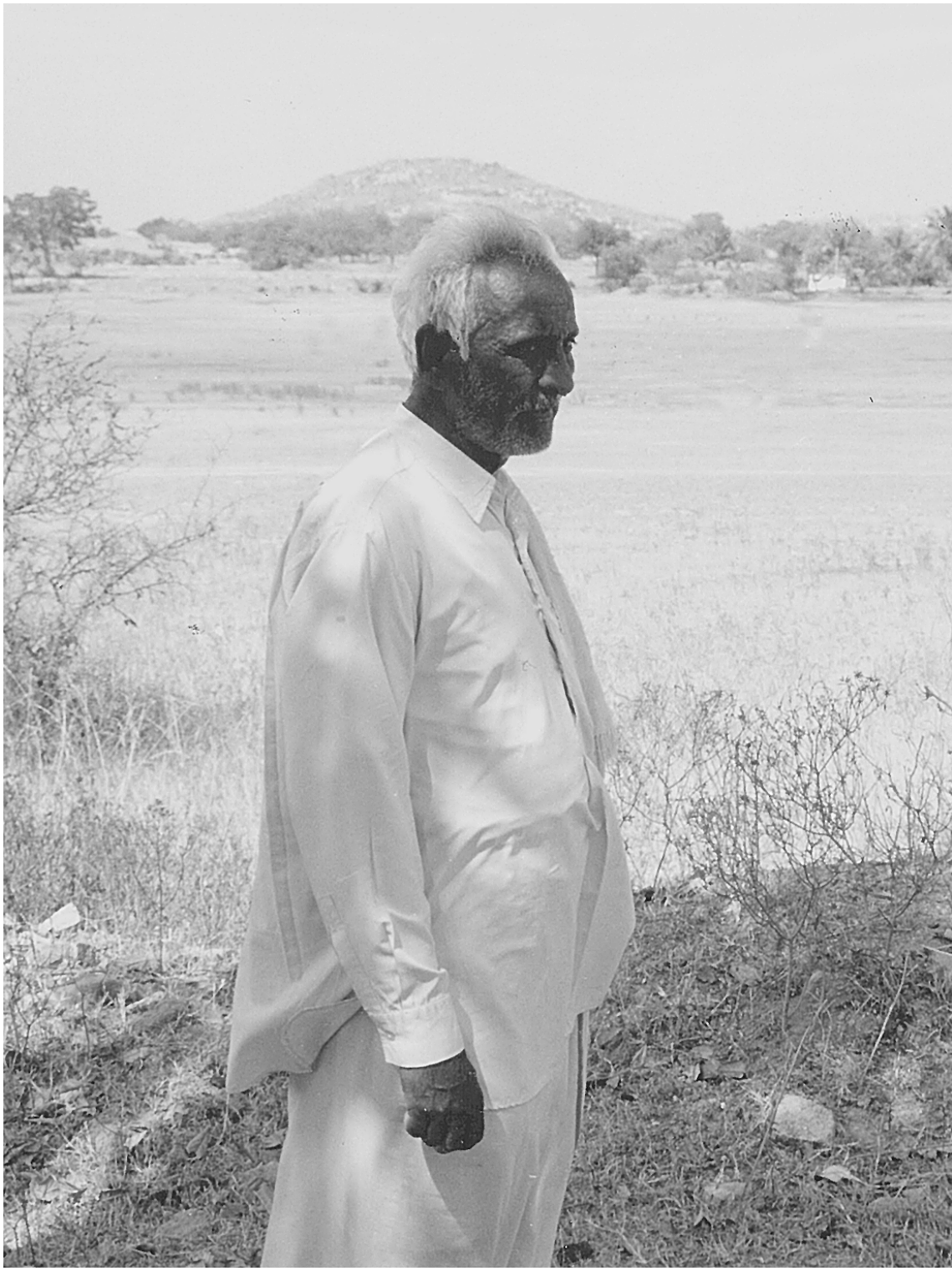
Jainism was prevalent in Sonda in 8-9th century A.D. Apart from the tanks built by Jain Kings, between the 14 – 17 century, the Veerasaiva rulers also continued the tradition of tank construction. Arasappa Nayaka, at the instance of Srivadiraja, the pontiff of the monastery, dedicated a temple to Lord Venkataramana and built a unique tank in front of it. Situated in an area of 1.5 acres, the tank has stone steps all around. On one side is a suction tank to absorb rain so as to augment the ground water level. Traces of moats that carried the rainwater can still be found in the forest. The Mahanta monastery that came into prominence during the rule of the Virasaivas has two springs called *Akka-Tangi* tank. To the south of the monastery is a 5—6 acre tank built four centuries ago. This has a special system called *Onake Tubu* to supply water consistently to the gardens and houses and it could also irrigate lands up to a distance of about two to three kilometers through mud canals. Now, the tanks are filled with silt and a waterweed called *"Mundage"* has spread all over the tank.

In 1763, when Haider's army seized Sudhapura, the royal family fled to Goa in disguise. History states that Haider looted pearls, gems, diamonds and other precious gems and jewellery. But what he could not rob was the water wealth provided by the kings, ministers and soldiers of Sudhapura for the welfare of the town and the nearby villages! After the downfall of the kings, the population of the town decreased and the water sources, due to lack of maintenance, were ruined. Sudhapura that had a population of one lakh 250 years ago now has only 2,000 people. Until 1858, it was the *Taluk* headquarters of Sirsi, but today it is an obscure village.

What about its water wealth? The tanks are filled with silt and when summer comes, the water problem comes back. Ratnakara Heggade of the Sodha Awareness Forum says that the water wealth can be restored, if traditional systems are revived. Today's administration is indifferent to these water sources that once gave life to an entire city. The local Hulekal village Panchayat has drilled 14 borewells and 14 open wells and yet, is struggling to provide water through pumps. The ancient water sources, which always ensured adequate water fell to decay.

History has recorded that water conservation is not new to Malnad. In fact, it has been in existence for over 1,600 years. In the inscriptions and records of the travellers, there are many success stories of water welfare. But all these water conservation traditions undertaken with people's participation fall on deaf ears in the cacophony created by speeches, governmental circulars, popular programs and subsidy schemes. All traditional water conservation methods are slipping away like the *Jarukattes!*

Shivananda Kalave is a senior writer and has a special interest in water conservation and environment. He has authored several books on these issues. He has a dedicated column in Udayavani, a Kannada daily.



Water Management

The *neeruganti* way

Dr. S.T. Somashekara Reddy

A Neeruganti is a person appointed by the community to manage water in a just and equitable manner. In order to do this, he made use of very simple, but creative methods to ensure that water was available equally to the whole community. The Neeruganti was thus a highly appreciated member of the community and recognized for his high standards of justice.

The word *neeruganti* is used for a person who controls and manages the distribution of water in the village or community tank. This person is responsible for the equitable use of water for irrigation purposes as well as ensures that this is done in a uniform and just manner.

Although it is not clear as to when this system came into force and how it was used, yet it is known that the *neeruganti* system was in existence in every irrigation system in the state till as recently as 50 years ago. Historically, wherever tanks were in existence, the *neerugantis* managed the water equitably as well ensured that the tank was maintained.

Though water management may appear to be a simple task, yet the duties of the *neeruganti* were numerous. The key functions of the *neeruganti* were to :

- ensure uniform supply of water to all fields in the command area
- determine the type of crop to be grown based upon the water available
- decide on the dates and times for supply of water and cessation
- inform everybody about the dates through beating of drums
- inform the farmers in case their crops were afflicted with pests or diseases
- ensure proper maintenance of the tank outlets
- decide upon a date to repair the tank canal
- arrange "*Ganga Pooja*" to invoke the blessings of the God for plentiful water in the tank.

Wide-ranging responsibilities

Of the wide-ranging tasks, the most important duty of the *neeruganti* was to ensure fair distribution of water to every farmer in the community, irrespective of class or creed. In fact, only the *neeruganti* had the right to decide the usage of water in the tank and its outflow pattern. No one could question him and his decision was always respected as it was believed to be fair and just in all respects. The *neeruganti*

thus, enjoyed a position of great honour and importance in the village and was recognized to display a commendable sense of justice in his work.

The faith of the farmers in the *neeruganti* system is reflected in the words of Maregowda, a farmer in Chudasandra village in Anekal taluk in Bangalore Rural district, "The tank in my village always has ample water and everyone gets a fair share of this. This is all due to the *neeruganti* system."

Though it was the duty of the *neeruganti* to manage the water, yet it was not his decision. The decision on the use of the water was made by the village leaders and the community in a joint process. The *neeruganti* had to follow the directions and implement the decisions taken by the elders regarding the use of water and the maintenance of the tank.

Creative management

The role of the *neeruganti* came into the spotlight in the more difficult cases. For instance when the volume of water was low and the command area was vast, he was allowed to design his own method to ensure equal distribution of water among the beneficiaries. Though the *neerugantis* were generally illiterate, yet their knowledge and skill in management of water was truly amazing. This was most notable in the fact that these methods provided water in a fair and equal manner to the whole community, even in times when the village faced water scarcity. This spoke volumes of their wisdom and knowledge.

Let's look at one instance: at times of water scarcity, all the farmers wanted more water to be fed to their fields in an effort to protect their own crops. This made them greedy and demanding of this resource and arguments and conflicts used to break out between the farmers and the *neeruganti.* To avoid confrontation and ill-will and yet to ensure equity, the *neerugantis* started releasing water during the night hours. This ensured that the farmers did not disrupt or interfere with the work of the *neeruganti* as yet equity was ensured.

The *neeruganti* also had several unique methods to protect crops when there was less volume of water in the tank. For example, the *neeruganti* in Thalaku village of Chitradurga District followed three different methods to assess the moisture levels in the earth:

- *Thumb level moisture:* If the water level decreased to less than quarter of the tank capacity, the thumb level moisture index was observed. In this method, the thumb was pressed into the soil. If it pierced through the soil up till the nail, it was decided that the field had enough water to sustain the crop. If not, the farmers were directed to grow vegetables that were less water intensive.
- *Weekly flow:* If the water level in the tank was more than quarter but less than half, the weekly system was brought into force under which, water was released only once a week. The *neeruganti* suggested to the farmers that

during this lean period they should grow crops like finger millet and groundnut, which required less water.

- *Light dispensation of water* : When the tank was more than half full, the amount of water was sufficient for paddy cultivation. Yet the *neeruganti* released only enough water that could cover the soil very thinly.

In general, the methods suggested by the *neeruganti* were accepted by all the farmers. Undoubtedly, the *neeruganti* was very methodical and handled situations adroitly.

And in tricky situations...

A common problem faced by the *neeruganti* was in the use and spread of the water to the lands which were further away from the tank. In order to extend the use and spread of water, the *neeruganti* decided to release the water in a way that the fields at the far end were fed first. Subsequently water was released to the fields closer to the tank. This was an intelligent system of water usage as in actual practice, the latter was seldom needed, since the moisture that seeped into the ground during the flow to the far end was in fact, sufficient for the fields closer to the tank.

In another situation, the *neeruganti* of Thalaku village followed the canal lock method to prevent farmers from letting the water into their fields on the sly. In this system, after the quota of water was allotted to each field, a clay mound was created at the mouth of the canal and the letters "Ka" and "Bi" were impressed upon the mound. This acted as a seal and those who broke it would be treated as offenders.

In yet another case, the *neeruganti* of Gatla Gollahalli of Koratagere Taluk had a unique way of distributing water when the water level in the tank was less. In these times, it was the general practice that each field received a fixed quantum of water for a specific time period in the day. However, clocks and watches were not commonly available; thus the *neeruganti* had to invent a method for timing the release of water supply. In an innovative response to the problem, he composed songs of different lengths which were ear-marked for specific time slots and periods. Thus, a big canal outlet would merit a lengthier song while a smaller one, a shorter song. He would open the canal outlet and start singing and once the song ended, so would the flow of water!

The *neeruganti* often faced a dilemma while deciding how much water should be released from the tank. He knew that he should not empty the tank by feeding the fields indiscriminately. This is where Halekere, the *neeruganti* of Parasuramapura displayed his ingenuity. He drew three images on the tank outlet – a flute at the lowest portion, a wheel at the center and a conch at the top. The flute

had seven holes and this meant that when water was at that particular level, it could be let out only once in seven days. The wheel has five radials implying that water would be made available once in five days. When the water was at the level of the conch, farmers could enjoy a daily supply. This method of coding designed by an unlettered *neeruganti* was indeed fool-proof and left no scope for any confusion or doubt whatsoever!

Ensuring tank maintenance

Alongwith managing the distribution of the water, the *neeruganti* had to ensure the maintenance of the tank as well as the canals. For this, he sought the cooperation and participation of the farmers. He made announcements accompanied by beating of the drums announcing the task to be done. It was mandatory for the community to participate. Those who ignored the call faced punishment by the elders of the village.

The case of the Bhujangayya Tank of Sakalavara village in Anekal Taluk is interesting. The bund had broken and repair had been neglected by the villagers for want of adequate money. Muniswamappa, the *neeruganti* of the tank wanted to bring this issue to the notice of Sri Jayachamarajendra Wodeyar, the then Maharaja of Mysore. When the Maharaja came for a visit to a nearby temple, the *neeruganti* placed his stick across his path and brought the problem to the Maharaja's attention. The Maharaja immediately ordered the repair of the tank. This action of the *neeruganti* earned the praise of the villagers.

In fact the *neeruganti's* stick was a symbol of power. The otherwise ordinary stick, was often used to command power and centralise authority on him. The *neeruganti* used this authority to keep a check on the behavior of errant farmers as well. No one dared to cross over the stick if the Neeruganti placed it across their path.

Though water management was the main duty of the *neeruganti,* he also actively involved himself in other farm activities – such as in the making of jaggery when farmers harvested sugarcane. These responsibilities, however, varied from area to area.

Payment in kind

Honorarium was paid in kind to the *neerugantis* through unique systems, each designed by the community. In several cases, they were given lands at the beginning, middle and far end of the command area. In addition, every farmer would give a portion of his produce to the *neeruganti* as per an agreement reached by the village elders. In some villages, the *neerugantis* were given as many stacks of harvested produce as they could carry at one time from the centre of the field to the edge of the field. The grains, which fell to the ground while paddy bundles were being transported and loaded from the field to the cart, also belonged to *neeruganti.* Similarly while transporting the threshed grains from the threshing yard, the first measure and the last measure of the grains were given to the *neeruganti* as his remuneration.

From father to son

The general practice was that one *neeruganti* took care of one tank; however if it was very huge, more than one *neeruganti* was appointed. In some cases, two or three *neerugantis* were required to manage the bigger tanks. An elder known as *Hirikara* supervised the work of the *neerugantis* in cases where there was more than one appointed.

The system was hereditary and the father passed on the baton to the son. Sometimes there were exceptions to this rule and the responsibility could be transferred to another person after a consensus between the villagers and the exiting *neeruganti*.

The *neerugantis* generally belonged to the scheduled castes, though there were some instances of people belonging to other castes, and even of women, holding the post.

Change in policy

In 1962, a uniform irrigation policy was enacted for the entire state of Karnataka and the *neerugantis* associated with huge tanks were taken into government service as *Mettis*. However, no recognition was given to the *neerugantis* of smaller tanks. Furthermore, they were also ignored when Village Accountants were appointed to each village. Thus, many *neerugantis* did not find a place in the changed village administration and this led to a drop in their status in the community.

Moreover, new cropping patterns of alternate cash crops, like areca and coconut, meant that they no longer received contribution in kind. This added to the problems of the *neerugantis,* as there was no defined system to decide their remuneration from these crops. The *neerugantis* were, thus, increasingly relegated to the background.

The *neerugantis,* who for many centuries had been regarded as central to the water management processes in the village were hurriedly displaced by a government order in 1962, when the tanks were taken over as Government property. The instinctive wisdom and knowledge that they possessed on tank maintenance was lost and they had no recognition in the new political order. This brought an sudden end to this unique time-tested system of water management.

The vast experience, indigenous knowledge and expertise of the *neerugantis* in water conservation, distribution and tank management unfortunately has been allowed to evaporate and fade away!

Late Dr. S.T.Somashekara Reddy was a Research Fellow at the Indian Institute of Management, Bangalore. He was also an agriculture and irrigation expert and highly knowledgeable about the water resources of Karnataka.

Traditional Kattas

Cradles of water conservation

Chandrasekhar Etadka

Kattas are temporary barricades erected across water sources to stem the flow of rainwater. These series of structures made out of mud and stone, ensure sufficient water for agriculture and drinking purposes even during the summer months.

Eighty five year old Sitharama Bhatt of Berkadavu village has been supervising the construction of traditional *kattas* since 25 years. He says, "Berkadavu *katta* is the largest *katta* in this area. When full, it can hold 12 crore liters of water. If this did not exist, the farmers would have faced acute water scarcity and had no choice but to migrate."

"If there is a *katta,* there is no cause for worry," opines 75-year-old Sri Madhava Bhat, the owner of the *katta* in Kudangila. "Though there is a borewell, I have not used it as I have complete trust in the *katta."*

Such efforts of water conservation have a history spanning many centuries as there have been several land records specifying regulations about the sharing of *kattas*. The farmers of Dakshina Kannada of Karnataka and Kasargod of Kerala follow the *katta* tradition. Till recently, the latter district witnessed the construction of more than 500 small and big *kattas*, every year. But this number has dwindled considerably and only a quarter of them are evident presently.

What is a *katta*?

Kattas are temporary structures in the form of barricades erected across rivers, streams and rivulets to hold back the flowing water. The entire community involves itself in erecting these *kattas.* Built out of locally available stone and mud, the *kattas* are in existence only for three or four months in the summer. But the role they play within this short period is very significant. Enormous volumes of water contained by the *kattas* soak into the soil on both sides of the stream. This moisture, which seeps into the soil, releases itself gradually into the neighboring wells for agricultural purposes. Serial *kattas* are the best methods to maintain the water level in rivers and play a pivotal role in ensuring prosperity of the farmers.

Kantappa Varkadi has noticed an increase in the water levels in tanks and wells within a radius of 5-6 km of the *katta* at Pavur. While the *katta* water extends a direct benefit to the land-owners on either side of the river or the stream, it also

contributes indirectly to the welfare of the village and the community. The water collected in the *katta*, seeps through all the crevices and permeates through the layers of soil thus, increasing the underground water level. According to Sri T.N.N.Bhattantipad, the Chief Engineer of the Kerala Water Corporation, the water gradually and continuously seeps underground even to levels where high speed boring machines cannot reach! The water sources at higher altitudes also depend on *kattas*.

Etadka - A unique example of people's involvement

Etadka is a small town in Kasargod district in the Karnataka-Kerala border. Despite the undulating landscape, the soil is mostly sandy and is made up of red laterite. The stream Sirehole encircles the town and a series of *kattas* have been erected across this stream.

The *kattas* are constructed in a series, one behind the other, and as a result of this, water collected in one *katta* adjoins the bund of the *katta* behind it. These *kattas* form the backbone of Etadka. Every year about 200 families are involved in the construction of about 24 *kattas* within an area of 5-6 km of the town. As construction of each *katta* costs over Rs. 25,000, many plans are formulated to share the expenditure and enjoy a maximum utilisation of the harnessed water. Distribution varies according to the acreage.

The *kattas* are erected using local materials but since they are temporary structures, they have to be constructed anew every year. Raising the stonewall, transporting the mud and the process of binding the mud requires about 200 labourers. Skilled labourers get higher wages. Despite this, local people also volunteer to help in the construction of the *kattas*, because they have implicit faith in the system. They do not depend on the open dams built by the Government, the reason being that over 90 percent of them leak! For example, 11 such dams near Etadka in Kumbdaaje Panchayat are dysfunctional. The reason for this is that substandard materials have been used in their construction.

The relevance of the *kattas*

According to Sri Manoj Samuel, Technical Officer, Kasargod Agricultural Science Center, an affiliate of the Central Plantation Crops Research Center, traditional *kattas* are ideal to collect water at a very low cost. Under this system, the expense incurred to collect 1000 liters of water is only 40 paise. The *kattas* of Etadka provide valuable lessons in water conservation with minimal expenditure. It would be significant to note that Mangalore University, Varanasi Foundation and similar organisations have commenced research on *kattas*.

The coastal districts of Kasargod and Dakshina Kannada receive an annual rainfall of 3,500-4,000 mm, a major portion of which occurs within a period of 20-25 days.

In fact about 65 percent occurs within 7-10 days. Most of the water rapidly flows into the sea within 24 hours. The *kattas* act as large soak-tanks and obstruct the free flow of water into the sea. This ensures that even during the non-monsoon months water is guaranteed for agriculture and drinking purposes.

Rejuvenating forgotten *kattas*

There was a time when hundreds of *kattas* were built in some areas in Kasargod and in the Dakshina Kannada Districts. As per an estimate, the ten Panchayats of Kasargod boasted of more than 500 *kattas* built by the farmers. But gradually, these numbers have declined, mainly due to lack of co-operation, lack of funds and a laissez faire attitude of the villagers. With more and more people opting for borewells, the decline of *katta* was inevitable. As a result, Etadka and surrounding areas of Kasargod witnessed an unprecedented water scarcity in 1983. The main crops of the area like coconut, areca, banana, black pepper and paddy shriveled up. The harsh lessons learnt from this drought made the community realise the importance of relying on traditional *kattas*. Several water fairs, seminars and studies by the media have opened the eyes of the people regarding the advantages of the tried and tested *kattas*. A survey undertaken by Adike Patrike (a farmers' newspaper) highlighted the futility of the modern borewells.

This belated realization not only made people rebuild the traditional *kattas*, but also to hold consultations and discussions on ways to improve them. For example,

measures like tucking plastic sheets in between the stones and the soil to strengthen the *kattas* and other such new methods were experimented with. However, information on remedial measures taken by the farmers, was not always shared, and while there have been innovations, many farmers still continue with the traditional design.

The *kattas* are now getting a new lease of life as many new structures have been constructed in Idikdu village of Dakshina Kannada. Under the leadership of Dr.Varanasi Krishnamurthy, 4-5 *kattas* have been erected. Venkataramana Bhatta of Kadinje felt extremely satisfied when a *katta* was rejuvenated after a gap of nearly 22 years. He says that *kattas* are a part of local culture and with their rejuvenation, the unity and the sense of partnership of the earlier era are finding eloquence once again.

The words of Shree Padre, water expert, are a warning to those who ignore the importance of the *kattas*. "For four months in a year, water beckons us by proclaiming that, 'I as rainfall am easily available and so, if you need me, you can store me'. For another four months, our streams, rivulets and other water bodies beckon us by saying, 'We are all yours and if you want us, hold us back'. If you do not value both these messages, you have to pay a heavy price for the next four months."

Chandrasekhar Etadka is an agriculturist and has undertaken extensive studies of the kattas of Etadka village. Writing is his hobby.

The living wells of Bijapur

Sumangala

The bavadis were the main source of water during the rule of the Adil Shahi kings in Bijapur. With their unique architecture, attractive carvings and grandeur, these enchanting bavadis were brimming with water till about three centuries ago. But these heritage structures have been vandalised and fallen into disuse.

The Adil Shahis of Bijapur, well known for their able administration and love for music, were also recognised for the excellent water supply schemes that they implemented. There is much historical evidence to show that they possessed deep knowledge about water harvesting. Infact they did not look upon water as a mere daily necessity, but also as a luxury commodity to indulge in water sports. The water was collected in the hills outside Bijapur and supplied to the inner parts of the city through tunnels to bavadis. Historians confirm that the density of population in Bijapur was so high during the reign of Ibrahim Adil Shah II and Mohammed Adil Shah II that the city probably consumed double the quantity of water it needed.

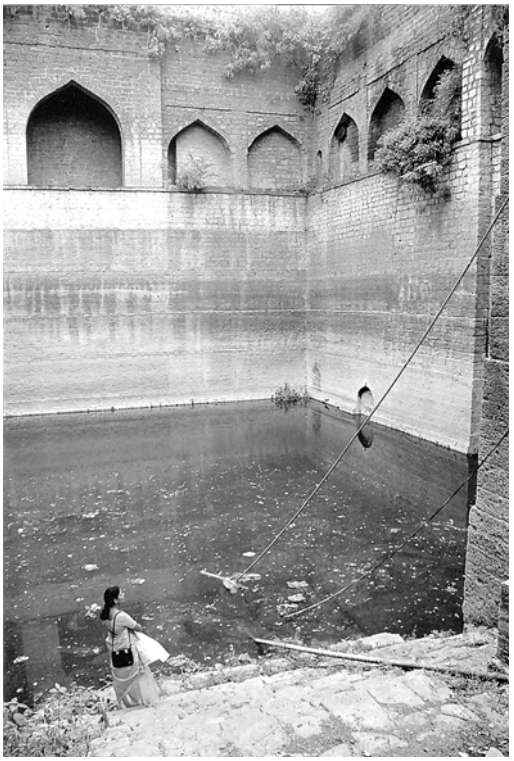
Bavadis are another term for a well. There are a number of *bavadis* here such as *Taj bavadi, Chand bavadi, Ibrahimpur bavadi, Nagar bavadi, Mas Bavadi, Alikhan bavadi, Langar bavadi, Ajgar bavadi, Daulat Koti bavadi, Basri bavadi, Sandal bavadi, Mukhari Masjid bavadi, and Sonar bavadi* etc. In fact, the list is very, very long. Of these, the *Taj bavadi* and the *Chand bavadi* are the biggest and attract tourists due to their artistic excellence. While *Taj bavadi*, with its size and grandeur, occupies the first place, *Chand bavadi* and *Ibrahim bavadi* occupy the second and the third places respectively. People of the city still use the 30 *bavadis* that exist today.

A well generally conjures a picture of a round structure with circular steps. But there is a world of difference between an ordinary well and a *bavadi*. The essential difference is in the style of construction. A *bavadi* is generally square-shaped and a passage runs along the entrance with halting rooms at its left, right and in the front. In the smaller *bavadis*, there is no passage and no halting rooms, though some have steps on the side. The parapet walls opposite the entrance are decorated with carved arches. In spite of these common features, each *bavadi* differs from the other and is architecturally significant.

Chand *bavadi*

Built by Ali Adil Shah in memory of his queen Chand Bibi in 1549, the *Chand bavadi* is at a distance of about 400 feet from the Shahapura Gateway of Bijapur city.

It measures 144 feet from the east to the west and 156 feet from the north to the south. The stone steps around the square bavadi taper down and the main door of the bigger arch adjoins the walls of the bavadi. A large arch forms the entrance and smaller arches face the *bavadi*. A four feet pathway runs parallel to the inner wall of the *bavadi*. This was probably a model for the *Taj Bavadi*, which was built subsequently.



Taj *bavadi*

Ibrahim Adil Shah, who ascended the throne after Adil Shah I, built the Taj *bavadi* in 1620 A.D in memory of his wife Taj Sultana. Termed as the biggest and the grandest of all, this *bavadi* lies to the east of the Mecca Gateway (behind the present bus stand) and has a 35-foot high magnificent entrance arch. It is 120 feet long, 100 feet wide and 53 feet deep. There are octagonal domes on either side of the main gate with a parapet wall facing the entrance. The steps that commence from both the sides of the spacious halting rooms adjoin this wall and descend till the water level. There is a six-foot wide passage on three sides of the inner wall with resting places to the east, west and south built for the convenience of the travellers. One can have a full view of the *bavadi* from the gallery, which has arches engraved with motifs.

Ibrahim *bavadi*

Ibrahim bavadi occupies the third place in terms of its size, beauty and magnificence. Situated across the Ibrahimpur railway gate, this *bavadi* is hidden behind a small compound and belies the fact that such a grand structure exists within. Almost at the entrance, there are steps to go down, and a three-foot wide passage starts midway down the steps, leading to small halting places on the left and right. The city corporation has recently fitted a pump set in the right side halting room and entry is prohibited. The entire *bavadi* can only be viewed from the left side and presents a pleasing picture with its depth, spaciousness, and the arch wall at the front. It is an architectural marvel.

Apart from the *bavadi*s mentioned above, there is no authentic information as to when and who built the other *bavadi*s.

The situation today

Of the three *bavadi*s, *Chand bavadi* is totally dry, filled with debris and is virtually used as a public dumping place. It has thus unfortunately breathed its last. At the *Taj bavadi*, people wash their vessels and clothes, as a result of which its water has turned mossy. Both the passages leading to the rear-halting place are dirty due to open defecation. Though some years ago, the City Corporation had cleaned the *bavadi* through dredging, it has again become dirty due to the indifference of the public. If suitable measures are taken to maintain the *Taj bavadi* by cleaning the surroundings, as well as the gallery, and by prohibiting washing of vessels etc., it also can be developed into a tourist attraction as well as a source of water.

In the opinion of Khazi Patel who lives next to the *Chand bavadi*, the deplorable condition of the *bavadi* is because it has not been cleaned in recent years, and thus has collected moss and lichen. Since there is hardly any water available, people use the *bavadi* as a garbage dump.

Shankar Nayak who works for the Archaeological Survey and is in charge of *Taj bavadi*, states that the City Corporation dredged it about 7-8 years ago. He adds that people sit on its steps and use the water for washing clothes and vessels, thereby polluting the *bavadi*. He is of the opinion that unless people surrounding these monuments cherish them as heritage sites and realise that a healthy *bavadi* can solve all their water problems, all efforts to revive the *bavadi* will be futile.

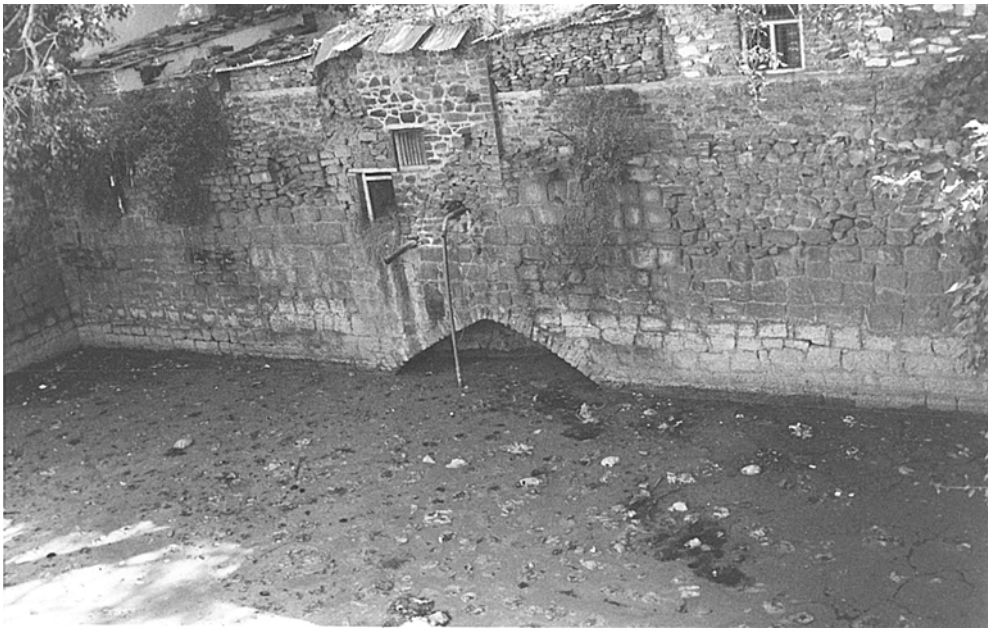
The smaller *bavadi*s

Other than the three most prominent *bavadi*s, there are several other smaller and less famous *bavadi*s. Some of these are privately owned. These are located within the city as well as well as at a short distance from the centre, at the outskirts.

Both the *Langar bavadi* and the *Ajgar bavadi* are situated in a field to the right of Ibrahim Rouza. Though small in size, the *Langar bavadi* has an attractive arch at the entrance of the well with steps leading down to the water. *Ajgar bavadi* is privately owned and in spite of being the larger of the two, it has no significant architectural value. However, the water in both these *bavadi*s is in a good condition, and hence, is used for drinking as well as for agricultural purposes.

The people use the *Alikhan bavadi* that is enroute to Ibrahim Rouza as a garbage bin. It has a mosque next door and if the authorities of the mosque were to get it cleaned, it would be useful for those who came to worship at the mosque. Next to the *Alikhan bavadi* is a borewell. Latif, a rickshaw puller, who has lived here all his life, is of the opinion that the borewell is responsible for the depletion of the water level in the *bavadi*.

The water in the *Nagar bavadi*, to the right of the Bade Kaman (the big arch), is potable and can be used for household purposes and irrigating the neighbouring fields.



There are 8-10 *bavadi*s in the Jumma Masjid area. The *Bagdadi bavadi*, adjacent to a mosque, is also filled with rubbish. The *Jhansa bavadi* in Dr. Munir Bhangi's compound is fairly big, has ample water, and according to the servant, the water does not dry up even in summer.

Not a drop of water can be seen in the *Nalabandha bavadi* and the *Daulat Koti bavadi*, which are used as garbage bins. Water in the *bavadi* behind Jumma Masjid is mossy and the place is used as a urinal. Though the condition of the *Peti bavadi* is similar, the city corporation has made arrangements to pump the water and has provided washing facilities next to the tank. *Basri bavadi* is the largest among all the *bavadi*s surrounding Jumma Masjid. Meherunissa, who lives in the locality, states that barring the summer when the water level goes down, it is used throughout the year.

In addition to this, there are several *bavadi*s in the market at the centre of the city. Of these, the water in the *Sandal Masjid bavadi, Mantri bavadi and the Mukhari Masjid bavadi* is quite good. Devotees coming to the Hanuman temple opposite the *Mukhari Masjid bavadi* throw coconut shells, flowers and other articles of puja in the passage of the *Mukhari Masjid bavadi*. The place is dirty and needs maintenance. The *Barida bavadi* is empty and so is the *bavadi* next to it on S S Road. As there are about four borewells adjacent to the *bavadi*s, the water level has probably depleted.

The *Mas bavadi* behind the Gol Gumbaz is square and has a fairly large arch. As the water here is of a good quality, it is used for the gardens of the Gol Gumbaz. The *Hasimpir bavadi* on the Station Road, the two *bavadi*s inside the Remand Home and the *Mubarak Khan bavadi* near the Mubarak Khan Mahal present yet another dismal state of these storewells of water.

Captain Syke who visited Bijapur in 1815 documented all the* bavadi*s he had seen and reported that there were 200 bavadis with steps and 300 draw-wells inside the Bijapur fort. This was after a century had passed since rule of the Adil Shahis.

The *Sandal bavadi*, *Mante bavadi* and the *Ramabai bavadi* are near the bus depot in the Nawa Bag area. The first one resembles the other square *bavadi*s. Its water has turned mossy though it continues to be used for household purposes. The groundwater level in this *bavadi* has receded, once again due to the presence of a borewell next to the mosque. The second one is like a large pit, while the water of the third one is used only for washing clothes etc. All these *bavadi*s are square and have arches on their walls.

The *Sonar bavadi* and the *Gunda bavadi* in the Minakshi Chowk area are circular. As all the used materials of the Kalika temple are thrown into the *Gunda bavadi*, the water level is not even visible.

The architecturally significant *bavadi*s are the *Taj bavadi, Chand bavadi and Ibrahimpur bavadi. The Langar bavadi, Ajgar bavadi, Mukhari Masjid bavadi, Mas bavadi* and *Ibrahimpur bavadi* are slightly away from residential areas and thus the water in them is good. As aquatic life and plants can be found in these *bavadi*s, they are in a true sense, living wells. *Sonar bavadi* contains good water despite being surrounded by houses. *Basri bavadi* is located in very dirty surroundings, yet has ample water with aquatic life.

Talabs with a difference

Another kind of water body commonly seen in Bijapur are *talabs*. *Talab* means a tank or lake, which are different from the *bavadi*s.

Begum talab is an example of the technological excellence achieved during the Adil Shahi era in ensuring water supply to the city of Bijapur. This tank, which is two miles to the south of Bijapur was built by Mohammed Adil Shah in 1651 under the supervision of Afzal Khan. Prior to its construction, his grandfather, Ali Adil Shah I had implemented the Toravi water supply scheme. When this could not meet the demands of the city for water, Mohammed Adil Shah built the aforesaid tank by making provision for the flow from the nearby Saravad and Khwajapeer streams to flow into the tank.

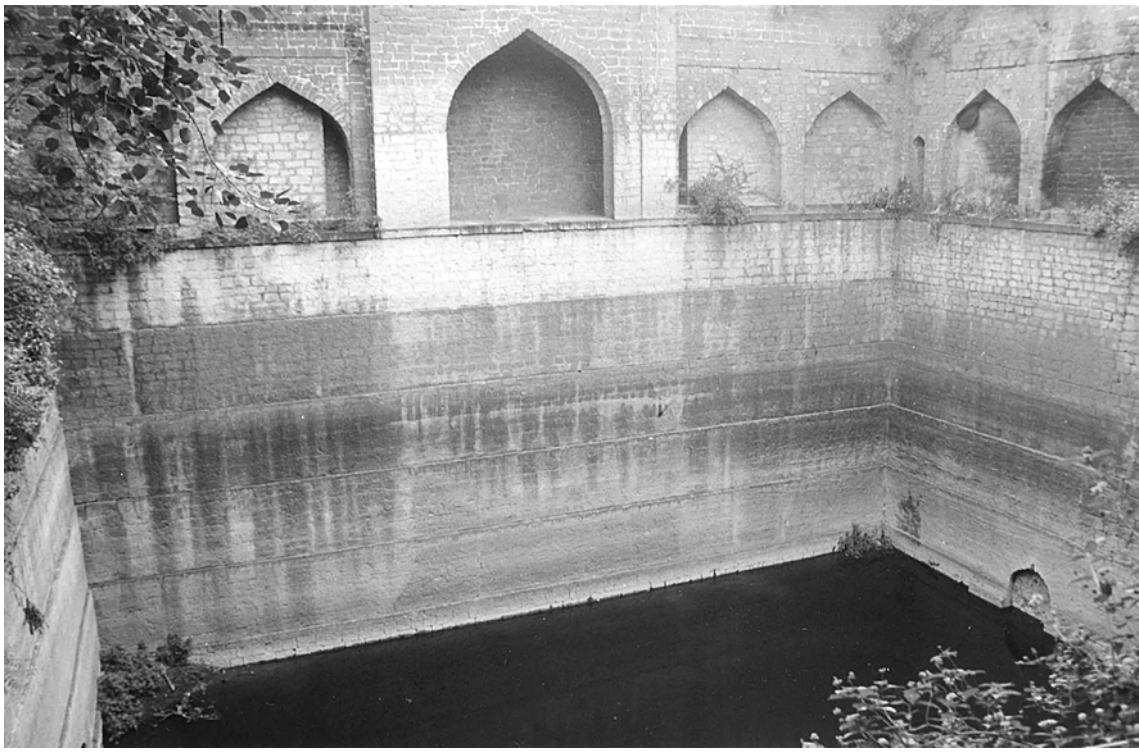
On the right hand corner of the *talab* is a small stone window offering a glimpse of an underground room, which is presently full of mud. Historical facts dating back 350 years lie buried beneath this pile of mud. During the rule of the Adil Shahis, water collected in the tanks was supplied to the city through this underground room by using clay pipes. Once it entered the fort area, it was stored in tall four-cornered water towers called *gunj*. The intention behind the erection of these towers was to ensure that dirt and slush in the pipes would remain at the bottom of the

tower thereby allowing clear and free flow of water to the top. These water towers vary in height ranging from 25-40 feet. The *gunj* in the vicinity of PDJ School near Bagalkot Cross was linked to an underground canal. A few years ago, a tap was fitted to this tower. As water is still available from the tower, it can be inferred that the underground canal is still in good condition.

The *Begum talab* maintained by the Department of Minor Irrigation dries up in summer. It has a total capacity of 25-35 million cusecs and when completely full, its outflow is 1657 cusecs. Dredging work had been undertaken about seven years ago. Vijay Halkudi, chief engineer says that the cost would be an estimated Rs1.5 - 5 crores depending upon the method of dredging, if it is to be repeated. As the tank is away from the city, sewage water does not mingle with it. In addition, there is no fear of effluents as Bijapur has no industries. Thus barring the growth of Ipomoea weeds, this talab is in a fairly good condition.

Changing times

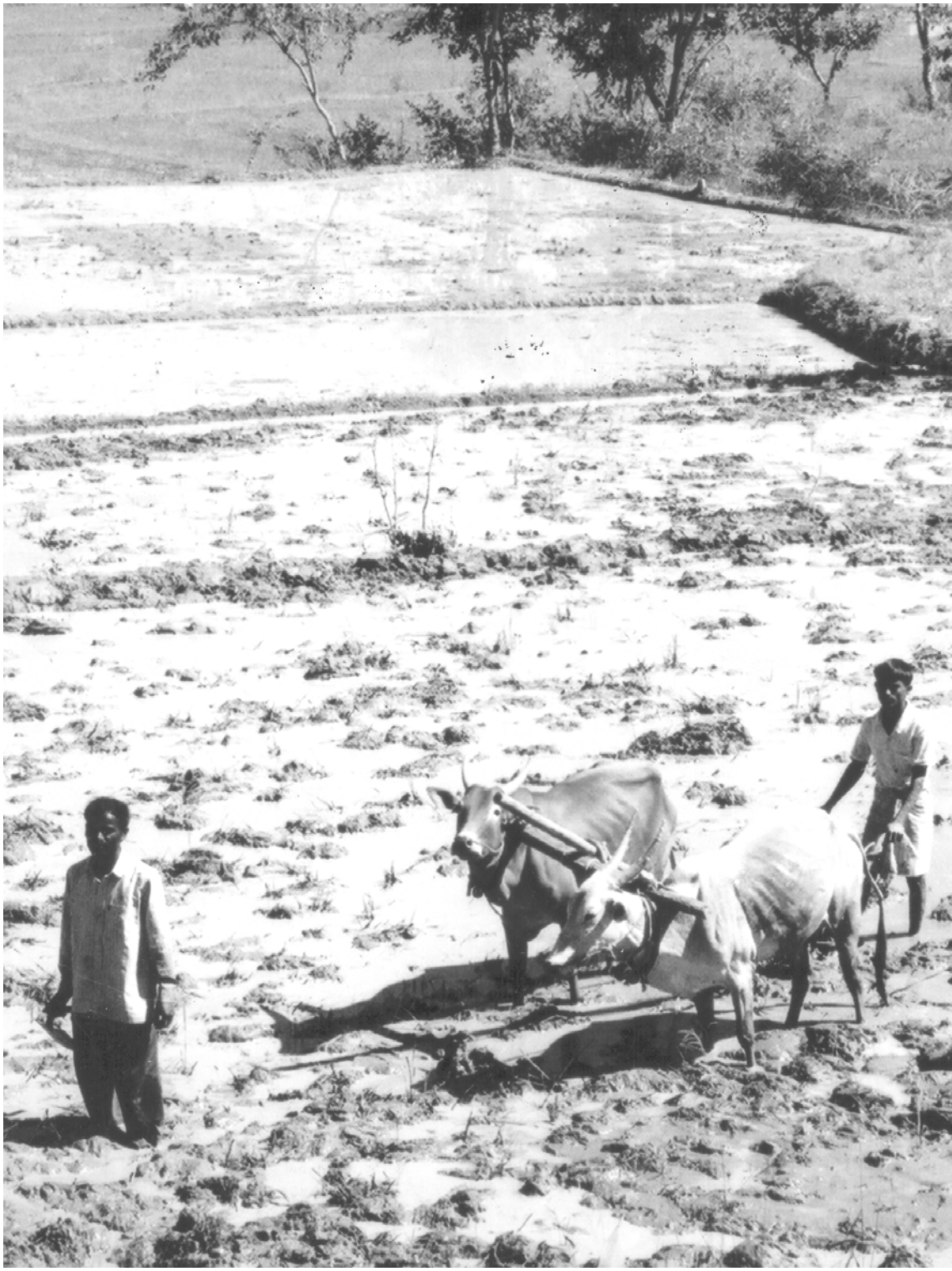
Recent years have witnessed a drastic change in the water situation and depletion of water levels. While the locals are full of praise for the rulers and philanthropists, who built the wells, the same pride is lacking for the authorities who are incharge of the maintenance and protection of these wonderful water resources. The apathy of the people who use the *bavadi*s is also shocking.



The main reason for water pollution is the vessels and clothes which are washed nearby. Alongwith this, is the immersion of Ganapathi idols, puja items like coconuts and flower garlands that are thrown into the *bavadi*s. Gutter water is also allowed to flow into the *bavadi*. Instead of getting the *bavadi*s cleaned when they are dry, the sites are used as dumping places. In addition, the negligence of the City Corporation, the Archaeological Department and the Tourism Department has resulted in encroachments and construction of buildings next to the wall of the wells. Many such factors have spelt the death knell for these traditional water-harvesting systems.

According to the local people, a significant feature of all these *bavadi*s is that they had sufficient levels of water even in summer. The *bavadi*s which have withstood the test of time for over three centuries have fallen to ruin only since the past 8-10 years. The negligence and carelessness of both the authorities and community have resulted in reducing these enchanting, living wells to garbage bins! Sincere efforts must be taken to revert to this situation and bring the *bavadi*s back to life once again.

Sumangala is a storywriter and holds a postgraduate degree in Chemistry.



Community-led Water Sharing

The *Dhamasha* System

H.A. Purushottam Rao

The word 'dhamasha' means fair and proportionate distribution of water. One of the oldest water sharing methods, this unique system has been traditionally used for agriculture to ensure a good crop to all the farmers. At times when the water level in the tank is low, the dhamasha system is brought into effect and ensure that all farmers receive a minimum quantity of water that is adequate to the crop being grown. This practice is still prevalent in some villages of Kolar District.

A few years ago, while I was browsing through the publication titled 'Tank Irrigation in Karnataka' by Neelatthihalli Kasthuri[1], a small paragraph caught my eye. It stated "*People in the areas of Doddakere and Manuganekunte of Jodampalli in Chintamani Taluk of Kolar District, participate in the dhamasha system for an equitable cultivation when the water in the tanks is less…*"

My curiosity was aroused. I wished to go to Jodampalli and make enquiries to find out more about the concept of *dhamasha*. However, I could not locate any village in Chintamani Taluk by this name. Several dictionaries that I scoured to source information about *dhamasha* yielded only equivalents such as *Dhamasi, Dhamasha, Dhamashe, Dhamashaya*, *Dhamasahi* in Hindi and *Dhamashayee* in Marathi. They all meant equitable distribution, sharing, equal portion and the like. It was increasingly becoming clear that *dhamasha* was another water distribution system in the country.

A search for more information yielded no results. The 1496 Rajagundlahalli inscription of Mulbagal had information only about the construction of tanks, their protection and management. The Porumamilla inscription[2] found in the Cudappah District of Andhra Pradesh had no information on *dhamasi.* The Gowribidanur inscription talked about a water expert named Singraya Bhat who facilitated the flow of water from the Pennar River into Penugonda. The later records such as the diary of Francis Buchanan who toured Mysore in around 1800 also had no reference to the system. Sadly none of the available records had any reference to the *dhamasha* system.

There was however, some information in an essay written by a local college student for a competition. It stated that the system was in practice in a village known as Bodampalli in Kolar district. A visit to the village endorsed the student's claim.

[1] A translation published by the Hampi University

[2] Considered a handbook on tank construction

Dhamasha, the old and traditional method of water sharing, that was till then only a reference on paper, was actually alive and practicing in this hamlet.

Brotherhood of Bodampalli

Bodampalli is a small village of about 200 families with a population of around 1,200. People of all castes including Muslims and backward communities live here. The village has a few big farmers who possess more than 20 acres of land. But none of them are big farmers in the real sense, as the entire area is rain-dependent and the rain gods often play truant. There are two tanks by the names of *Manuganekunte* and *Doddakere* adjoining Bodampalli and Chennarayanahalli villages. While the command area in the former tank is spread over 70 acres, the latter has about 90 acres.

The village has no water support in the form of either a river or a stream. The average annual rainfall in the region is less than 740 mm. Rainfall is erratic, and if the tank fills up during a year of good rainfall, it could remain depleted for the next two or three years, if the rains fail. At such times, there is acute scarcity of water for agriculture and cattle. In the years when the tank is full, it still does not have sufficient capacity to irrigate the crops. As a consequence, only 50-60 per cent of the command area can be used to grow crops. Due to water shortage, all the farmers in the area cannot cultivate their lands every year.

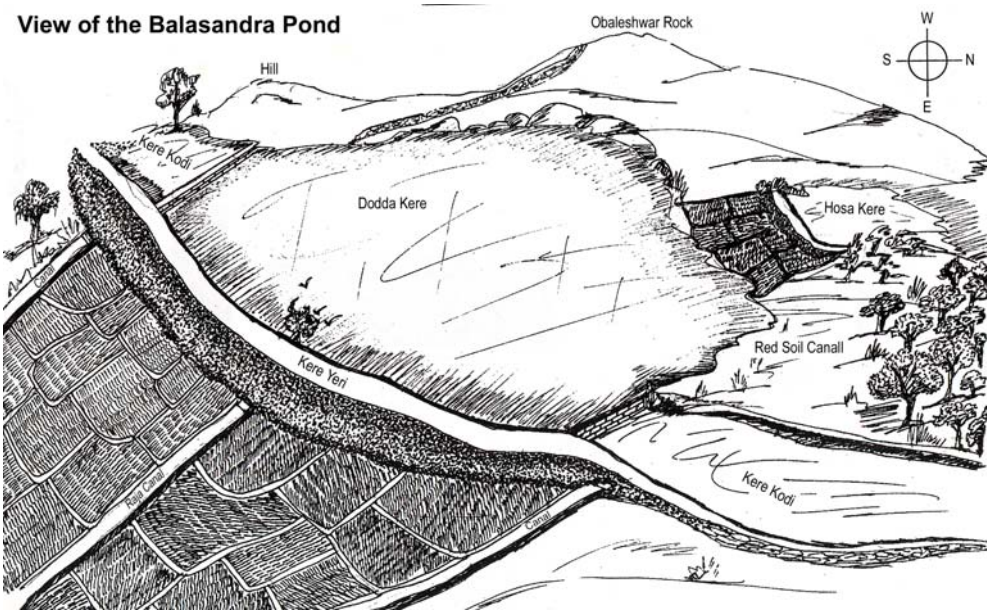
Community-led solutions

The *dhamasha* system is a solution worked out by the farmers of Bodampalli to overcome the problem. Using the *dhamasha* system, all the farmers of the command area in this region shared water during the lean period. The crops grown were also decided on the basis of availability of water, suggesting a unique method of community cultivation.

How does it work? When the rains fail, all the villagers meet as per the directions of the elders and leaders of the village to discuss the situation. Thereafter, they proceed towards the tank, examine the level of water it contains, and assess the availability for agricultural purposes. A decision is taken on adopting the *dhamasha* method and a date is fixed for its implementation. Thereafter the farmers of the command area meet near the tank on a specified day.

A very simple, but unique method is adopted to measure the agricultural land to be covered under the *dhamasha* system. The standard measurement for land is in *guntas*[3]. A senior community member measures the land by walking across it. One normal step is considered equivalent to a yard, and 11 yards in length in 11 in width is equal to one *gunta*. The beneficiaries subsequently erect temporary bunds on the land allotted to them where they are allowed to grow crops only for the specified period. This is for a temporary period and no one has any right of ownership over the land. The land continues to belong to the original owner.

[3] 40th part of an acre



Ramaswamy and Venkatappa, elder members of the community say, "The sharing is 50 per cent when the tank is full and 25 per cent when the tank is half full." For example, when the tank is half full, the portion of the agricultural land brought under *dhamasha* would be only 1/4 of the entire command area. They further add, "*Dhamasha* has, in the past been imposed on 1/2, 1/4 and even 1/5 portion of land. This is according to the quantum of available water. In very severe drought conditions, *dhamasha* has been levied on as little as 1/8 portion of the land." However experience indicates that *dhamasha* would not be possible for any land measuring lesser than this area.

This restricted portion of the land is divided and allotted on a pro rata basis to all those who have lands in the command area, depending on the individual's original land holding. Once a particular stretch of field has been brought under *dhamasha,* it temporarily becomes the other person's property, irrespective of the original owner.

The *neeruganti* system is practiced in the area, and the *neeruganti* is responsible for the systematic allotment of water. Though he works under the directions of the village committee, the *neeruganti* has to ensure timely release of water to the crops and not allow wastage.

Though disputes and rivalry are common occurrences in the village, this does not impact on the working of the *dhamasha* system. Srirangachar of the village recalls a landlord who allowed water to flow into his land in the dark of the night and most of this was wasted, "He was a loser and so were the rest of the people."

As B.V.Anjanappa a village elder says, "This system has been in practice in our village for generations. It was methodically organised even during the era of the Patels and Shanbags. This system can still continue and this will promote unity

and co-operation between the people in the village." Unfortunately, in recent years, political influences have weakened the unity among people. Owing to this, *dhamasha* has not been successful in the past decade or so. However, the system is still alive and *dhamasha* was implemented in 2003 and 2004.

Beneficent Balasandra

Balasandra is a small village in Mulbagal Taluk in Kolar district. Though it is at a distance of just 10km from the town, it is very backward, does not have a good transport system. Despite its underdeveloped state, the village has nurtured within itself the unique system of *dhamasha*, and is a role model for co-existence and co-operation in the community.

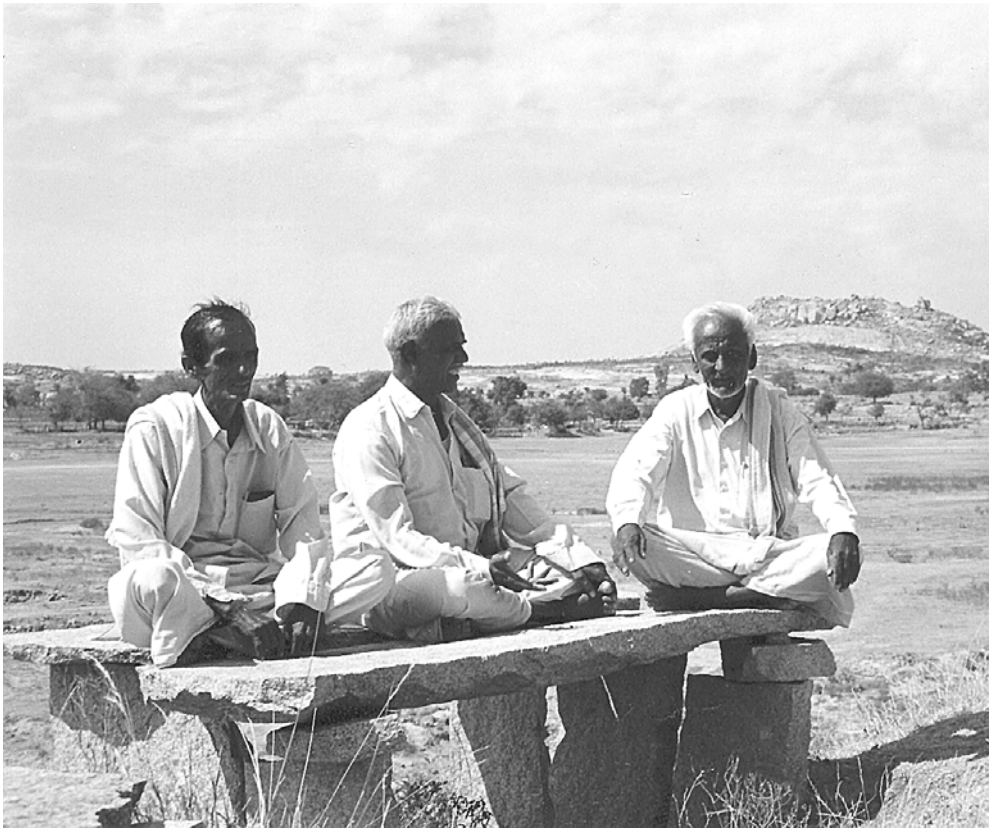
About 200 families, constituting a population of around 1,000 live here. Half of the population belongs to scheduled or backward classes. 25 families are landless and earn their livelihood by working as *coolies*. The others have small land holdings and it is difficult to find farmers who own 5-6 acres of land.

Balasandra, like Bodampalli, has two tanks. One is a large tank with a command area of 65 acres; while the other one called Hosakere has a command area of 25 acres. Sugarcane was the main crop here till a couple of decades ago, but now paddy is the major crop.

The farmers follow the *dhamasha* system for summer crops. Though the overall method is similar to the one at Bodampalli, the difference is that the land is not measured every year. Several years back, the land has been divided into small patches of equal measurement and farmers continue to cultivate on the same. There have been instances of land being given to the farmers in the village first and then allotting the excess land to the farmers of the adjoining village of Pujarahalli, though this is outside the command area too.

80-year-old B.Narayanagowda a former *patel* of the village reminisces about the *dhamasha* system of his younger days, "Ever since I can remember, this systems has been followed to the letter; it is a village tradition. The tank in the village has not dried up in the past 45 years. There was only one year when we could not cultivate the land." Unbelievable as it may sound, the unique method of water management by the villagers has ensured that in spite of being in a scanty rainfall region, the tank in the village has never dried up.

Once the land is made available under *dhamasha,* people get busy. The entire village buzzes with activity and a volunteer force of about 200 people including the young, the old and the women from all families, come forward to help. This team first undertakes repair of all the canals that carry water to the tank. Among these are the 1.5 km long right canal, the 2 km long canal from the forest to the left of the tank and the 3 km long Obaleshwara rock canal, which descends from the hills. Every year they restore the condition of the various canals that surround the tank and wherever necessary, build new bunds. In addition, they have erected



stone and mud barricades to change the course of the water flowing from the reservoir area towards the tank. Thus, the tank gets ample water and does not dry.

The people of Balasandra take special care in the use of the tank water and have set up slightly high separate banks for tank outlets adjoining the agricultural lands. This allows the water first into the fields. They do not open the main sluice at the center of the tank till the water level goes down. Thus, the question of water wastage does not arise at all. The *neeruganti* who assumes the responsibility of distributing water strengthens the system.

The appointment of a *neeruganti* in Balasandra is not heredity. He is often changed. The *dhamasha* is in force for three months and for the entire period, the *neeruganti* is supplied food by each of the beneficiary families. In addition, he gets a share of the produce as well. While the community does not know that this system has the name of *dhamasha,* it is very much a way of life with them. All families get equal share and no distinction by caste or creed is allowed.

Apart from the *dhamasha* system, there are several other noteworthy aspects that the village enjoys. No member of the community has stepped into a police station; Women work along with men in all daily chores; toddy/liquor is totally banned and the village is a role model for the neighboring villages.

The village is presently facing dangers from giant quarry machines that are breaking down the Obaleshwara rock which provides water to the tank. As the rock is blasted away, the water loses its direction and flows elsewhere. The community is mobilizing itself to oppose this.

Dhamasha is not in existence anywhere in the State of Karnataka except in Kolar. The harmony generated through water conservation by the people of Balasandra is rare and unprecedented. The fact that everybody is entitled to an equal share is unique and the populace of Bodampalli and Balasandra who have nurtured and followed this system are worthy of emulation.

H.A.Purushottam Rao is a writer and works as a first grade assistant at the Office of the Sub-Conservator of Forests at Kolar. Deeply interested in literature, environment, science and rural culture, he has published several books on these subjects.

How does Bagalkot beat drought?

Shylaja D.R

Drought proofing is a new concept added to our vocabulary, only recently. But this skill is not new to Bagalkot District. The local farmers have evolved different methods of water conservation that were unknown even to experts. Here is a close look at some methods followed by them.

Bagalkot district in Karnataka is recognised to have the least amount of rainfall in the state with an average of 543 mm. As per a government estimate, the district has suffered a crop-loss of about Rs. 1500 crores between 2002-04 due to drought conditions and water scarcity.

However, there are some villages in the district that have been able to withstand the impact of scanty rainfall and drought conditions. These are Badavadagi, Chittaragi, Ramavadagi, Karadi, Kodihala, Islampur, Nandavadagi, Kesarabhavi which are located in Hunagunda and Benakatti Taluk.

But what were these systems by which these villages are able to protect themselves from drought which had created severe adverse situations in other districts across the state? Unfortunately, there is little information known about this. Yet, experience shows that these seemingly obscure villages in Bagalkot possessed traditional wisdom which could maximise the scanty rainfall and control the onset of drought. At a local level, the knowledge can be used by neighbouring farmers, agricultural consultants and media to address the drought conditions. Infact, this traditional knowledge can be the pride of not only the district or the State, but also of the country.

Drought proofing is a new concept that has been added to the vocabulary. But this skill is not new to people in Bagalkot District. Contact with the villagers indicates that this age-old method has been nurtured and propagated over time, and the application and impact of this system has been truly amazing. The local community reflects the essence of the principle of drought proofing in very simple, and beautiful words :

- "Even under semi-drought conditions, grow 3/8th of crop" – *Mallanna Nagaral.*
- "We do not do much. We only ensure that the water does not run away; it has to take our permission" – *Hanumappa Mukkanavar.*
- "No embankment, no crop" – *Thamanna Bennur.*

A simple science

A major part of the land in Hunagunda taluk is composed of black cotton soil. Because of the sloppy terrain, erosion of the topsoil due to run-off of rainwater is common. Soil conservation is therefore of utmost importance.

In order to hold the rainwater that runs down the slopes, embankments are constructed at different levels. The aim, however, is not to stop all the water. Once the field is adequately wet, the remaining water is released into the next field. This method of outflow is called *holagatti*.

However, since the topsoil should not get washed off, the volume of water flowing down the slopes is assessed. The size and height of the mouth of the *holagatti* is calculated on the basis of the rain and the slope. This is generally constructed at a slightly higher level than the field. Stones are laid on the sides of the outlet as well as its base. These measures are followed for topsoil conservation.

At some places, the height between the embankment and the field that lies below is high. At such spots, a small well-like structure called *gundavarthi* is constructed. As the mouth of the *gundavarthi* is small, a stone is placed at the mouth of the drain at each level to retain water in the field. Once the soil is soaked to the required saturation level, the stone is removed and water is allowed to flow into the field at the next level and into the *gundavarthi* there. Thus, a small stone can help soak the entire field! The process continues till the lower-most field. While the

gundavarthis conserve water, the *holagatti* carries the excess water through the embankments.

Another step in drought proofing is to level the fields and divide them into smaller plots. The soil excavated from the fields at the higher level is used to fill the fields at lower levels. Heaps of top soil are made so that the rain dispenses this soil all over the fields; the soil remains at the surface of the fields thereafter. The advantage of leveling the land is that the top soil can spread evenly all over the field and thus ensure moisture content. In this way, maximum advantage can therefore be derived from one rainfall.

Precautionary measures

Since black soil has the property of cracking, special care has to be taken while erecting the base embankment or the *holagatti* as it breaks very quickly if the water gets into the crack. Thus, a layer of gravel or red soil should be applied to the upper portion of the embankment. Brownish coloured gravel is obtained by digging deep into the soil; this work is necessary only for newly erected embankments. Red soil is available in the nearby hillocks.

Mallanna, a farmer in Bagalkot warns that if this precautionary measure is not carried out, embankments are washed away, which leads to disaster through flooding. A lack of this precaution is the reason for the damage to the embankments. This structure can last longer if the farmers strengthen the embankments by using gravel or red soil.

The red soil that flows down till the water restores these nutrients and in addition, the manure also does not get washed away, making the land very fertile. Thus, if the flow of water is controlled and made to spread evenly to all the four corners, it will reshape itself into a single span; the land will improve and just one rainfall will then ensure a good crop. If the farmer at the uppermost level does not safeguard the embankment, the farmer at the lower level is likely to have a bumper crop with all water the nutrients and manure that overflows into his fields!

The slope of the embankments which faces the field is applied with a layer of black soil. This prevents excess water collection on the sides of the embankments. The slope is also tended at periodic intervals.

In some cases, even if the ground is leveled, the subsoil gets mixed up with the topsoil. However this problem can be rectified within three to four years, if the soil is not saline. By adding nutrients and manure, the land can be rejuvenated and made fertile. The flow of water has to be controlled and there has to be an even spread.

Presently, the JCB machine does the levelling work, completing a three-month job in just three days. However, this system cannot retain the topsoil at the top and leads to mixing with the subsoil.

A campaign that bore fruit

If drought proofing is new concept in the country, how did these people acquire this knowledge? The roots of this knowledge are contained in a treatise written by Nagabhushana Shivayogi Swamiji about 175 years ago. Based on their experiences of the past three generations, a local family of Hunagunda has been carrying out a village-to-village campaign on soil and water conservation. They have even composed *vaçanas*. Sankaranna, father of Mallanna, has spread this message by singing hundreds of his own *vaçanas* compositions. His *vaçanas* on slope cultivation and prevention of soil erosion stirred the imagination of the people. Swamijis expertise of producing a good crop with just one rainfall was popularised by Sankaranna. The people readily accepted his logic of good rain = good crop, half the rain = half the crop and quarter of the crop at times of drought.

The efforts of three generations to control soil erosion has not been in vain. Other than converting wasteland into greenland, it has also created livelihood for hundreds and thousands of families in the taluk. This method of soil conservation still continues in full swing, thanks to the campaign efforts of Sankaranna and Mallanna.

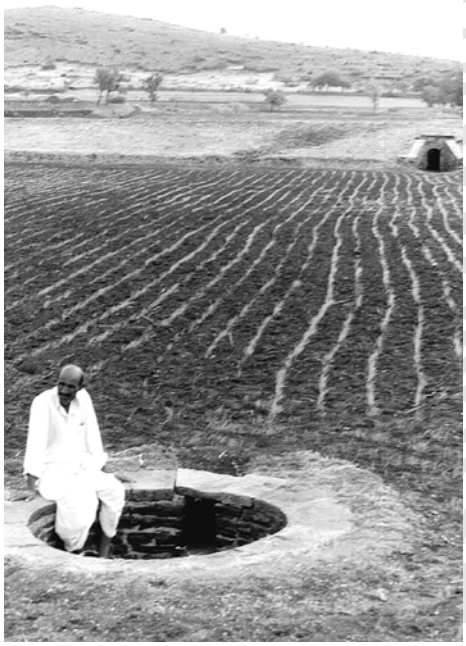
A cost-benefit analysis

There are several people associated with Sankaranna for whom drought proofing has become a skilled profession. They have worked on the construction of embankments for decades and even today are called by the farmers to take up the work. This work is the regular means of livelihood for 200-300 families in the *taluk*.

What is the annual financial worth of the soil-water conservation work carried out by these experienced hands in a year? About Rs. 30 lakhs.

And the benefit? Take the case of Mariyappa Handi who has 10 acres of land. Previously he was able to get only 2-3 bags of maize from this land. But Sankaranna improved the land a few decades ago, and, since then there has been a huge change. Even during the last season of drought, Handi's filled his granary with 10-12 bags of crop.

There are scores of other such stories across the length and breadth of the taluk. Most people with a fair financial standing opt for a base embankment and lands without these are very limited. "The system ensures that even with a little rain, some moisture is retained on the flat embankments. One can be sure of a minimum of 4-5 bags of crop," says another farmer.



There are only very few farmers in the taluk who have not had their land levelled. This is more due to the costs involved rather than a lack of conviction in the system.

The stone embankments of Benakatti

Situated at a distance of 20 km from Bagalkot, Benakatti is a small village of 900 families and with a population of about 4,000. It extends over three sq. km and presents a picture of greenery, creating the impression of being a well-irrigated area.

This is indeed surprising, as there is no river or streams nearby except for some *nullahs,* which can be identified, only during times of rain. This is because any water that trickles down a slope or a hillock is called a *nullah.* Stone embankments are built where water flows abundantly. The height and the width of these embankments are decided after assessing the extent of water flow.

The strength of the walls of the embankment is also a matter of experience. Some *nullahs,* which carry water from a catchment area of about 100-200 acres need to be very strong. Some large farms have more than one base embankment. A farmer is able to build an embankment for an area of 30-40 acres; however when the water volume is very large due to a larger catchment area, the initial expense as well as the maintenance is very high. Therefore, a farmer owning about 10 acres of land will find it more beneficial to build a second embankment for the larger volume of water.

Thamanna Bennur is a post-graduate and is a respected farmer in the village. Fondly called *Oddina Anna*, he built an embankment 15 years ago in the area. He still continues to do so and under his supervision, over 20 embankments have been constructed.

The total number of embankments in Benakatti may exceed 300 and at a rough

estimate of Rs 30,000 to Rs. 35,000 expenditure per structure, the value touches about Rs. one crore. If a farmer is unable to build it within a year, he stretches it in stages over a period of two years. "Though it is expensive to build, once built, an embankment betters life for several years," explains Thamanna. "Embankments are an inalienable part of our lives. Even the youngsters of our village are convinced that this is the foundation for life. That is why everybody evinces keen interest in keeping it up."

Traditional water and soil conservation methods are fast vanishing from most of villages and are a rarity these days. But Benakatti still nurtures its deep respect for embankments.

The new and the old

The new embankment built by Muttanagowdara Yankanagowda is all ready to face the rainwater. Though he owns a total of 16 acres (of mostly red soil), he receives an average flow from hundred acres. There are two stone embankments here and a smaller one which is quite old. The new bunds are roughly 300 feet long and about seven feet high. The width of the *holagatti* is 30 feet and the adjacent stonewalls have a thickness of eight feet. The wall tapers towards the end and at the edge, it is only two feet thick. The old bund cost Rs. 10,000 but is not functional now, while the new one costs Rs. 80,000. Muttanagowdara says that with a good crop, he can recover the capital invested on the embankment within four years.

While this is true, yet why should the mud embankments for Hunagunda be different from any other area with black soil? Do they really need the expensive stone embankments? Thamanna clarifies that here too there are some mud embankments that are adequate where the water pressure is low. If pressure builds up, these demand constant repairs resulting in a continuous expense. A stone embankment ensures a levelled field where a crop can be grown even with little rainfall, and a good crop can be obtained during normal years.

A lesson to be learnt

The drought proofing of Bagalkot provides the assurance of a livelihood to all rain-dependent farmers. The farmers probably spend more money than any other village in the country to resist drought – without any help or support from the government. In fact the government may not even be aware of this extensive work undertaken by the villagers and the prosperity they enjoy as a result of this work.

However, a detailed study and documentation about the 'do's and don'ts' in erecting the embankments, is necessary. An affordable handbook should be published and an educative documentary film will be useful. The knowledge which is an oral tradition passed on from one generation to the other should not be obliterated. In states like Kerala, where the media is very active, such pro-people knowledge would never have been relegated to the background.

The state administration, government and the developmental pundits have to realise the truth, that such drought proofing systems have been sculpted out of the soil that has witnessed centuries of scarcity and hardship and has fine-tuned itself according to the needs. Thus, sitting in air-conditioned offices of Bangalore or Delhi and thinking about the solution is not enough. These planners should mingle with the people who face these problems, take them into confidence and through research and development, solve the issues. When the common man has a proven technique to grow a reasonably good crop with just one good rainfall, this is not propagated nor rewarded. Instead, colossal amounts of money are spent in conducting seminars and research.

However, this can still be changed. Mallanna has proclaimed the importance of the embankment through his *vacana*. "A field without an embankment, is like a barren buffalo". Some farmers are fortunate to receive rainfall and topsoil from the hillocks, as well as, water from other fields, while others have to be content with whatever rainwater they are able to collect. Mallanna says with confidence, "Whatever is the case, any farmer can cultivate, if he retains rainwater and topsoil. For this the embankment is of utmost necessity."

Experienced people like Mallanna and Thamanna could probably be found elsewhere also and based on the same principle, it is possible to create soil and water conservation methods in dry lands. Minor changes can be made and with a pilot study at a few places, suitable efforts can be continued to enrich and irrigate the earth.

Shylaja D.R. is a writer with a keen interest in developmental issues. Though she hails from the rain-rich Malnad, she has devoted herself to the study of various agricultural practices in drought stricken regions.

Wealth in the Well

Poornaprajna Belur

The ubiquitous common well are found everywhere and indeed anywhere in the state of Karnataka. The well are constructed in a range of different styles and techniques. Regarded as the main source of water, rural communities have had a long-standing relationship with the water bodies in their area. This article outlines some of the different types of wells in the states and the practices and rituals associated with it.

Excavated wells that were once an inseparable part of the irrigation system and the life of farming communities have over time been relegated to the background of the social fabric of rural societies. According to data of the Statistical Department, Govt. of Karnataka, the State has about 4,00,000 excavated wells. Out of these, about 3,50,000 are used for agriculture while the rest are used for drinking purposes. These figures have not taken into account private wells and wells located in factories and individual premises. In fact records indicate that each town had a public well – the water from which was freely available to all communities. The public wells also met the water needs of travellers as well as banjaras.

Almost every town which has a tank would have about 50-100 wells. Water was drawn from these wells using traditional technologies such as picot, pulley, Persian wheel, spinning wheel etc. as well as diesel and electric machines. Paddy, millet, maize, pulses, groundnut, sugarcane, fruit, vegetables, mulberry and garden produce grew in plenty, thanks to the continuous availability of well water. Patterns show that even when tanks dried up, wells continued to be a reliable water source, a commonality which can be likened to a fixed deposit in a bank.

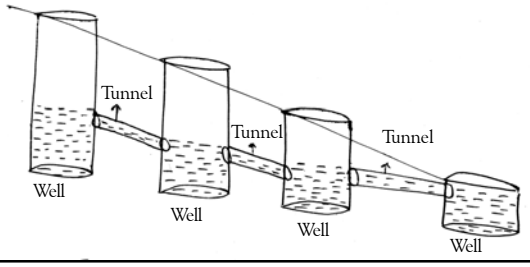
The state of Karnataka is well known for its variety of wells. Picot wells, spinning wheel wells, brick wells, stone wells, *Bavadis,* wells fitted with pre-cast mud rings, mountain wells, tunnel wells and many others are found in the state. Kolar has the largest number of open wells. Belgaum is in the second place with Bijapur occupying the third place.

The wells of Bijapur

Interestingly, though Bijapur has the third highest number of wells, it holds the first place in providing water to the largest area of land. History is replete with details of the wells built since 1620 by the Adil Shahi kings. The local *bavadis* in Bijapur are as famous as the wells. History reveals that the *bavadis* were constructed

for the royal queens where they indulged in luxurious baths and gambolled in the cool waters.

Kanat or Tank wells



A spacious tank surrounded by square stone walls with steps that descend to the water level, a passage to walk around the tank, seats for resting, rest rooms and a system to prevent the sewage water from entering the tank – are some of the intricate features of the *bavadis* of Bijapur. Despite the commonalities, each *bavadi* is different from the other.

Due to its geographical location, Bijapur is very hot in summer with temperatures reaching as high as 45^0 in the middle of the season. The *bavadis* therefore played a dual function – of providing water to the community as well as keeping the city cool.

Historical records

Captain Syke, a traveller has documented that in 1815 there were 200 *bavadis* and 300 wells in the city of Bijapur. Captain Syke's records also outline the tent wells in the villages to the north of Bijapur**.** Known as *kanuts*, these were serial wells that were interlinked in such a scientific manner wherein the last well at the lowest point received water from a number of wells along the way. This was through tunnels. The water level was ensured in all the wells and pure, clean water was available even in the last well.

Unfortunately, not much information is available about these tent wells now. The farmers of Bijapur believe that that borewells are responsible for the disappearance of these traditional wells.

Basavanabagewadi, a temple town in Bijapur district is a place of major religious significance with hundreds of temples dedicated to Lord Shiva. Each of these temples has a black stone well where the water level is not too high. The water is generally used only for the temple activities and for drinking purposes.

History states that a feudal chief called Mannesahib built 1,200 wells in the Lingasugur area. Though people in Gurugunta of Lingasugur have heard of him, no information has been chronicled on the Chief or his wells. Some elders believe that the design and structure, square shape, use of Shahapura stones, steps touching the water level and the compound built around the well and the fact that this was a public property indicate that these could have been built by Mannesahib. Though eight wells of similar design were spotted, the exact period of their construction has not been determined.

Shahapura, which is famous for its limestone has wells that are only five meters deep but water is always available here. The neighbouring village Surpura also has many wells. History states that the King, Venkatappa Nayak, was instrumental in constructing tanks and bunds, wells and water stations. He encouraged afforestation as well as initiated many measures for soil and land conservation. Even today the greenery of Surpura makes it appear that it is a part of Malnad, the land of green forests in the Western Ghats.

Wells of Bailhongala in Belgaum District that once supported extensive agriculture, primarily sugarcane, have today dried up. The farmers believe that the well water is not sufficient to grow sugarcane and therefore borewells are the only solution. The black soil of the region locally can be used to grow crops that require less water, but even for this, the volume of water in the wells today, is insufficient.

In the lift irrigation system in Haveri District, a folk tradition called Kappali is followed. A hide bag is tied to one end of the rope that slides over a spindle. The other end is tied to the wooden bar which draws the oxen. With the oxen moving forward, the water is drawn out of the well and used for irrigation.

Reviving open wells

Channabasappa Shivappa Kombali of Kakola village in Haveri District has been making sincere efforts to give a new lease of life to the dried up wells in his area. Till about 25 years ago, the farmers of Kakola were able to irrigate their lands through pulley wells. However, with the agricultural demand increasing after the Green Revolution, the pulley wells were replaced by borewells, which were installed indiscriminately all across the lands. The traditional wells gradually became redundant and the tanks went dry.

In 2002, Kombali took stock of the situation and decided to revive the traditional wells to their original state. For this, he worked closely with the community, particularly the elders in the area. The gradient of the land was surveyed and canals which channelled the rain water to the wells were constructed. The wells slowly were filled with water that ran down the slopes. Gradually, with the help of the community, he was able to revive 70 wells and construct three tanks.

However, Kombali's job is not over. He aspires to get the pulley wells back into action once again.

Folklore goes that the Vidurashwatta well has the distinction of never becoming empty even if 1000 pots of water are lifted out of it. Everyday, several hundreds of pilgrims have a bath here and water is drawn for ritual purposes. Yet the water continues to be abundant.

Dakshina Kannada has been relying on the wells for water for its plantations. However as the number of plantations have increased, so have the number of wells. The plantation owners are fully aware of the value of their wells and have ensured that these are maintained properly. They also protected the quality of water.

Refrigerated wells

The wells built within the houses of Malnad keep the atmosphere cool. These wells are also used to keep betel leaves, neem leaves and lemons fresh. Can you guess how? The betel leaves, neem leaves and lemons are filled into a bucket which is hung midway into the well using a rope. This ensures their freshness for at least a fortnight.

Sweet water

In order to keep the water sweet, people would drop a twig of a gooseberry tree into the well. This was believed to clear any muddy residue in the well water. If gooseberry was not available, a branch of the purple berry tree was thrown into the well as a substitute.

The highest number of wells and tanks were located in Kolar district, where records indicate that there were more than 60,000 water bodies. The Persian Wheel was used to draw water from over 25,000 wells. However this method cannot work if the water level is low. Unfortunately wells can no longer be seen in Kolar town. A common sight, however, is people carrying pots to fetch water from the Antaraganga hills. Wells with Persian Wheel are still active at the top of this hill as the level of water is high.

Wells within houses

According to the Economics and Statistical Department, Shimoga District has about 4,000 wells, most of which are in private houses. The Brahmins generally dug a well even before building a house. If there was no prospect for a well, they would give up the idea of constructing the house. This principle was followed by all the elders - source water, support a living. As a consequence, wells can be found in the houses at Sagar, Soraba, Hosanagara, Thirthahalli, Shimoga, Shiralakoppa of Shimoga District, as well as Siddapura of Uttara Kannada. The wells were commonly dug in the kitchen or front platform. Open space in the courtyard, inner courtyard, backyard, central courtyard and other parts of the house were also sometimes used as locations for the wells. The kitchen and

bathrooms were built close to the wells to ensure that water was readily accessible.

The depth of the wells in this area varied from 20- 60 feet and were protected from light and heat. As soon as the well was dug, it would be lined with bricks or stone and a one-meter high brick or a stone platform was raised from the ground. Recently, a well was excavated in Ulavi of Soraba which had been strengthened using mud rings. Locals call it *Kundanada Bhavi*.

The rulers of Keladi Kingdom of the area considered construction of tanks and wells as the most important social duty and constructed over 6,000 tanks. Each town has at least one or two tanks, though there are some towns with as many as 10 tanks.

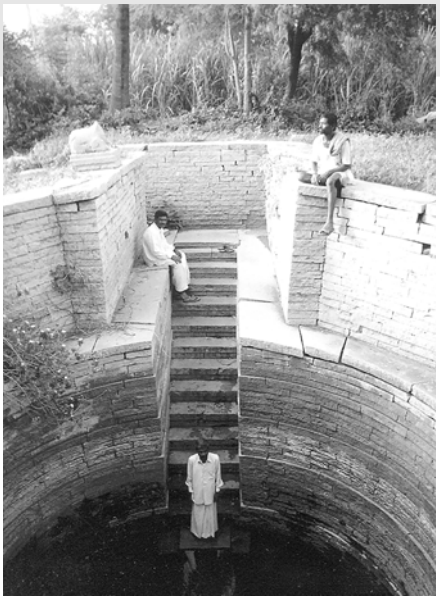
The wells of Malnad were perennial sources of water but unprecedented demand on the resource led to the installation of pump sets. The excessive consumption and demand on water along with degraded forests, inadequate rainfall and drying up of wells led to the collapse of the water cycle.

In 2002, a well at Badami dried up unexpectedly. With a depth of 10 meters and a circumference of five meters, the well had circular steps to reach the water level. The platform at the top has water-drawing wheels in three directions. The elders believe that it was the first time that water had dried up in the well in their entire lives.

Some villages like Kakola of Haveri District have constructed separate wells for each caste. The system of separate wells for each caste is also noted in Mangal village near Mandya till as recently as 85 years ago. Unfortunately in this system, the backward community does not have access to wells. Refusal to allow use of well water due to untouchability and communalism has led to riots and disturbances. Several Hindu-Muslim riots which have their genesis in the usage of the well have been documented all over the state.

Festivals with well water

The well platform of Urotti in Malnad was a place for religious festivals and brought all the womenfolk together. For instance on the first day of Diwali celebrations, the well platform was decorated with red soil, clay and Rangoli. The water was drawn from the well using a new earthen pot and once pulled up, it was decorated with a



garland of cotton flowers, fresh flowers, turmeric and vermilion powder. A lamp was placed in front of it which was subsequently carried into the house. The lamp was kept in the prayer room and worshipped for three days by decorating it with betel leaves, coconut and fresh mango leaves. On the fourth day, the water in the pot was sprinkled on the manure pit, in the belief that the manure would be enriched. A portion of the pot water was also added to the bathing water. Some people used the water for bathing on the first day itself. People felt that this ritual of using the holy water cleansed the body and the mind of the human being.

This is not an exceptional case. Water festivals were an integral part of life in many districts. Songs were also composed in reverence.

Water Diviners

Prior to digging a well, a Water Diviner who followed traditional methods to assess the availability of water was always invited to examine the site. The practices included listening to the sound of water in the ground and assessing the type of soil/earth where it was proposed to dig the well. Another traditional method was to place a fresh coconut on the palm of the hand. If water was available at a particular spot, the coconut stood vertically. The quantum of water depended upon the speed with which the coconut turned upwards.

There were other Diviners who tested for water by merely walking on the area chosen for digging the well with two sticks. They used the thumb and the index finger of both the hands to hold two long sticks and searched for water by joining the tips of these sticks. If water was divined, the sticks spun at a great speed and they could state with certainty the exact spot and the depth of water. However, this required skill and years of experience. Though there is no documented scientific proof of how this system worked, yet the failure rate was quite low.

Traditionally, digging a well was an easy job and experienced diggers could complete the work within a month. Even today, excavating a well does not require high expenditure. The cost of providing water for agriculture is also a nominal amount. However, the quality of the water has to be tested to ensure that it is potable in order for it to be of use for household and irrigation purposes.

Construction of Wells

Digging of wells requires expertise. There are several issues associated with the digging of the well and one should be knowledgeable about the entire process.

The questions that arise are:

- Is the water flow horizontal or perpendicular?
- Is it sub-terrain or is it available just below the surface?
- Where will the place of maximum availability be?
- Once the well is dug, should it be built with stone or bricks or cement rings?

The persons digging the well should know the characteristics of the particular soil and the rocks surrounding it. For some kinds of soil, the well may be round in shape and for wells dug in rocky terrain, it may be square in shape, or if the soil is red clay then the well should be lined immediately etc. All these factors have to be taken into consideration. While constructing the well, care should be taken not to obstruct the water source. All rainwater springs should join the well. The collection of water per hour has to be measured.

Like tanks and canals, wells were also traditionally used for irrigating agricultural land. Some wells provided water for a single crop, though there were many more which provided water for two crops in a year. In 2006, more than one lakh wells still have the capacity to provide water for three crops[2]. About 2,70,000 wells are less than eight meters deep. It was, therefore, recommended that the government should dig another 6,00,000 wells to irrigate an additional area of 6,50,000 hectares.

If the water is available at a higher level and the soil is hard and firm, the expenses for digging such a well are generally less. In Malnad, the cost for digging a 30 feet (eight meters) deep well and lining it with stones is about Rs 50,000.

Axes, shovels, spades, baskets, rope, spindle etc are some of the implements needed to dig a well. To draw water, picot, pulley, Persian wheel, spinning wheel as well as pump sets are the important tools. An implement called *patala garuda*[1] is used to lift the pots that happen to fall into the well by mistake.

Wells are assets of the family, of the community and of the town. It is everyone's duty to protect them and use the water economically. Once water is drawn out of the well, it cannot be put back or replenished. The area around the well should be clean, with trees and plants growing around it. Wells are a comparatively cheap source of water and if maintained properly and with care, the wellbeing and prosperity of the community is assured.

Poornaprajna is an agriculturist from Belur with a strong interest in journalism. His articles have been published in the major newspapers of the land and he is the honorary editor of Siri Samruddhi. He has published a book on wells of Kaakola titled 'Teredabhavi Marupoorana – Kaakolada Yashogathe'.

[1] A circular ring with iron hooks and can lift any vessel that has fallen into the well.

[2] This figure does not include borewells and private wells

Sand bores

A low-cost alternative to borewells

Renuka Manjunath

A sand bore is a simple and economical rural technology through which farmers utilize water available at lesser depths. Sand bores were commonly used before the advent of borewells. As they utilize water that is available at a depth of less than 30 feet, sand bores do not affect groundwater.

In earlier times, man looked skyward when faced by drought. Rain and rain bearing clouds were once the source of water. Now he looks downward and digs deep down into the earth. Today, groundwater is regarded as the answer.

Groundwater was first discovered in excavated wells. While most of these wells existed within houses and served as traditional water sources, wells were also used for cultivation in plantations and fields. Since this was the only source of water, people were economical in its use, and were careful not to drain the sources.

Wells have today been replaced with the invention of the machine which has taken groundwater to dangerous levels. With the search for groundwater becoming more serious, the use of borewells has created serious problems for agriculture, environment and the livelihood of small farmers.

Records reveal that the first borewell was dug in the country in 1954. At that time, about two months were required to drill upto a depth of 100-120 feet. The high-speed drilling machine that was first used in 1971 enabled digging of upto 300 feet a day. While this helped to support the Green Revolution, it also hid the ugly fact that the inner layers of the earth were drying up.

This method of using groundwater also caused immense harm to social and familial values. In earlier days, a joint family was quite content with a water level of 10-15 feet in excavated wells. With the excessive demand for water and the invasion of high-speed borewells, commercial exploitation of water increased. Today, the wells have gone dry and selfishness has made way for dissatisfaction.

What is a sand bore?

A sand bore is a partial solution to the problems created by the borewells. It is a water source that does not harm the environment, and is a friend of the farmer. A sand bore does not have the negative impact of borewells as it does not allow either, overuse or encroachment of water.

It is said that sand bores were employed by solders on the move to draw water from river basins. This system has various names in local dialects, though in English it is called sand bore, jack well, hand pump, in-well ring etc. Geologists call it filter point. Also known as sand sucker-well in some countries, sand bore is probably the most appropriate name.

Sand is the core ingredient for a sand bore. Sand is deposited by running water on either banks of rivers, rivulets, canals, streams and tanks. In addition, when rivers change course, they create canals where they deposit sand. Sand deposits that rise 15-20 feet above the surface are capable of retaining groundwater. In order to use the water thus retained, the sandy soil is dug up by using a manual soil borer. After fitting filter pipes, the water is drawn with the help of an ordinary diesel pump or a low horsepower motor. Sand bores get filled up with water automatically and generally provide sweet water. These are simple and economical devises as they draw water from depths of just 30 feet, and do not exert any adverse effects on groundwater.

The sand bores of Karnataka

Sand bores are in use across Karnataka and in a limited way, support the lives of small farmers in villages. They are also used as sources for drinking water in many cities, towns and settlements. Some of the places where sand bores are found are:

- Bellary, Challakere, Pavagada, Madhugiri and Chitradurga
- Hirehalla of Davanagere district
- Kakanur near Channagiri, and Jinagi
- Ranebennur, Hospet, Harihara and Shimoga
- Along the Vedavathi river bed in Parasuramapura
- Tavarekere near Sira
- Areas around Tumkur - Nagavalli, Halegubbi, Hebburu, Koratagere and Chikkanayakanahalli
- Along the Kagina, Bhima and Krishna rivers
- Benne stream of Yadgir
- Sedam area of Gulbarga
- Along the Palar and Papagni rivers

- Along the Kabini, Chikkahole and Suvarnavathi rivers near Srirangapatna, Nanjanagud and Yelandur of Mysore district
- Rural Bangalore including Tippagondanahalli, Kanakapura, Ramanagara and Devanahalli

Farmers of Tumkur say that the Hemavathi canal has restored water to the sand bores of the district. The presence of sand bores in Koratagere near Shivaganga could be attributed to the fact that the Shivaganga ranges possess ample sand deposits. Sand bores are very popular in Kasargod of Kerala as well as in the southern part of coastal Karnataka; the fishermen of Udupi and Coondapur use this water for drinking purposes.

Building a sand bore – simple and cost effective

Building a sand bore is simple and economical. No special category of professionals is required to build a sand bore as it is a rural technology involving only local labour. There could be some regional variations in the tools used, depending upon the availability of water. Some hardware shops sell specially designed instruments based on the requirements of the people of a particular region. The main tools required for drilling a bore are:

- Soil cutter
- Casing pipes (in order to filter the sand and allow only the water, these are slit with the help of axle blades; at places small holes are made and are wrapped with either plastic or coconut fibre and thus it acts as a sand filter)
- Shell - the sand lifting instrument, two clamps to stand on and take out the sand
- Hand clamps
- Chain, spanner, wires, cutting pliers, foot valves
- Small gravel stones
- Three to seven hp motor
- Diesel pumps where necessary, as an alternative to electricity

The bottom portion of the soil cutter is shaped so as to conveniently drill into the ground. Thereafter two persons soften the soil and dig it with their bare hands. Once a depth of 20-30 feet is reached, water and sand are obtained together. The shell is tied to the chain, and thumping repeatedly on the soil to lift the sand up. Subsequently the drilled PVC pipe is inserted into the cutter and is pushed till a hard rock or hard soil is reached. Sand can be prevented from entering the pipe by covering the holes in the outer portion of the PVC pipe with tiny gravel. The filter well, thus erected, is fitted with the motor and if there is a shortage of electricity, diesel pumps are used to lift the water.

New experiments for reviving sand bores

Rajanna, the proprietor of Rajendra Engineering Works of Chitradurga and his father Borethamanna specialize in digging sand bores. They have innovated to manufacture improved tools from their own lathes.

An innovative and interesting experiment was undertaken in Parasuramapura for groundwater conservation and its stability by erecting a 330 feet long, 25 feet wide and 20 feet deep underground clay barricade in the Vedavathi river bed. This barricade was built in summer by scooping out the sand till the workers hit hard rock. No cement was used, and there was no soil erosion. About 3,000 truckloads of clay were filled in the place of the dug out sand and subsequently the surface was flattened. As a result of this, groundwater levels improved over an area of nine kilometers. It is also significant to note here that the sand bores of the area too got a new lease of life.

Sand as water filter

It is appropriate to explore a little about the filtering properties of sand while learning about sand bores. In geological terms, it has been estimated that the age of sand is 450 million years. It is a residual deposit of rainwater that has been flowing down the slopes of mountains and hills. The relationship between water and sand is complementary and this co-existence has found mention in ancient texts also.

The American Water Works Association, while documenting the history of water purification, says that the search for pure water dates back to the pre-Christian era. As per the Association, Egyptian inscriptions and the *Sushruta Samhita*, a Sanskrit text, state that the concept of pure water is as ancient as man. While quoting these texts, the Association adds that unclean water has to be boiled over fire, through the rays of the Sun, by dipping a red-hot iron into the water, or through sand filtration.

Francis Bacon, who has compiled and edited ten centuries of history, has also mentioned the method of sand filtration in the 13th century. He observes that pure water can be obtained when the sand on the seacoast is dug, as the saline content

of the water that spurts out from the sand bore is retained at the bottom. As a result, the water obtained, which is filtered by sand, is pure.

An 18th century Persian scientist, Lahaire, had recommended a sand filter for each house. He had also stated that the rain water which passes through sand in the river banks and collects underground remains pure for several years.

The value of sand bores is endorsed

Devaraja Reddy of Geo Water Board says, "Water is available in sand bores for as much as eight months after just one good monsoon." He reiterates that people living near the Vedavathi River bed oppose deep borewells, as they are aware of the utility of sand bores.

Swami, an agriculturist from Nagavalli near Tumkur has been getting water from sand bores consistently for the past four years. In comparison, an adjacent land-owner has tried to draw water in vain from 22 different spots on his plantation. Even the little water he was able to get had the smell of roots in them.

Renukappa and his relative Siddaraju of Koratagere, who are adept at digging sand bores, say that the cost does not exceed Rs. 7,000 per sand bore. The cost of digging a sand bore where the quality of water is good does not exceed Rs 5,000.

As per their experience the quality of water is sand-dependent. Sweet water is extracted from sand bores with white sand, while the water that comes through darker shades of sand yields hard water that sometimes has a rusty odour. While this water may not be fit for human consumption, it can be used for agriculture.

When the top surface of the soil first yields clay and then sand, water is generally available in good volumes. Thick sand indicates more water and fine sand, as well as, medium-sized sticky sand indicates lesser quantities. "Blowing on a fistful of sand is a good way to assess water content," says Siddaraju.

Sand bores are a viable alternative to borewells, use local resources and knowledge and are widely accepted by the community. More importantly, they serve to conserve precious groundwater resources by optimizing water available at higher levels. All reasons to promote more intensive use of this technology.

Renuka Manjunath is a Bangalore-based freelance writer with a post-graduate diploma in journalism from Bharatiya Vidya Bhavan.

Jotte

A pot with a difference

Radhakrishna S. Bhadti

Traditionally used in areca-nut plantations in Uttara Kannada, Jottes are an intelligent devise which uses local material and human labour to lift water from wells and tanks. The Jotte system ensures not just economical extraction of water from the wells and tanks, but also guarantees maximum and effective utilization of the water available. Over the years unfortunately, this system has fallen into disuse.

I grew up in an areca-nut plantation in my village in Uttara Kannada. My childhood home was indeed a picturesque setting. Deep green trees pierced high into the azure blue sky. Crystal clear canals meandered through the plantation murmuring gently with the sound of gurgling waters. My brothers and I would spend many hours splashing around in these canals.

At other times, the still water reflected the blue of the skies and the green of the trees – making it a picture in tranquility and abundance. The abundance was largely due to the water which was responsible for the rich produce of the land.

I often looked for the source of the flowing canals. Where did these canals start? How did these canals always have so much water? When the tank in the house was emptied by the servants of the house, how would it fill up overnight? Puzzling questions which had only one response, *Jotte*. All the elders muttered this word when asked for an answer. But this continued to pose a constant sense of mystery.

Yet every morning, at the crack of dawn, I would hear the servants assemble the tools required for the day's work. I would wake up to the cluttering and clanking as they handled the tools. My brothers and I would tumble out of bed and with the hastily drunk rice gruel still sticking to our lips, we would run to the plantations and jump into the canals - unquestioningly.

We were not at an age when we could comprehend the intricacies of traditions, or understand a specific agricultural practice, or realise the significance of water management. Neither did we have the patience to learn about it. But the curiosity that arose while playing in the water and the questions it generated are probably finding an answer today.

Searching for answers today...

In recent years, whenever I visit my family home in my village, I am faced with sparse plantations, wilting seedlings and dry canals – all of which bear testimony to the fact that *Jottes* are no more. Have these dried up naturally? Or has it been allowed to collapse?

The planters and farmer cultivators of Uttara Kannada district devised an economical system of water usage called *jottes,* which had a double value and purpose. The *jotte* system made use of local material to lift water from the wells and tanks and feed this into canals. This ensured that a minimum amount of water would be drawn out. It did not draw upon the groundwater levels in any way, which therefore remained unaffected.

Hence, water shortage was an alien term in these regions. People lived in harmony as water sharing was worked out in an amicable manner.

What is a Jotte?

A *jotte* is a traditional device used to lift water from a well using a lever using human labour. It is a word used for a wide-mouthed copper vessel with a stringed hook at the center. A long areca tree trunk supported by two poles is used to immerse the vessel in water. With a heavy stone tied to one end of the areca trunk, the entire system works like a seesaw plank to lift water from the well. A platform erected at a specific spot of the tank is provided with an outlet to let the *jotte* down.

A man stands with his back to the tank and pulls the *jotte* before he immerses the vessel in the tank. Once the water fills in the pot, he loosens his grip and lifts the areca pole. The heavy stone tied on the other end, provides the necessary counter weight to lift the vessel. Just as the water-laden vessel comes up, the worker tilts it into the canal mouth. He pulls the *jotte* and fills it up with water again and tilts it once more into the canal. This process continues for about three to four hours. A man can effortlessly fill up the *jotte* with about four pots of water at a time and release it into the canal.

At the same time, another person erects temporary bunds made out of banana stems and sugarcane leaves to stop the water at several spots. With the help of an iron plate, he drenches the roots of the plants. Once all the nearby plants are irrigated, he moves on and undertakes the same process all over again. When all the plants near the canal are fed with water, its direction is turned towards another canal.

The *jotte* system depends solely on human labour. It requires understanding, skill and fine expertise in managing the amount of water that is drawn out and how it is used. The quantity of water to be lifted to irrigate a particular portion of the field is carefully calculated and worked out before the operations start. Yet careful management ensures that neither is there any shortage of water for the fields. Thus, the word shortage carried no meaning in places where this system was used.

The *jotte* system ensured that not a drop of water is wasted. As the water is lifted from the tank with human labour, the groundwater level is never touched. The *jotte* system does not deplete the groundwater level. Instead, only the surface water of the tank is utilized. Even after water is lifted from the tank and it appears to be empty, it fills up again the next morning, due to the rainwater which was always directed to the tank.

A common resource for sharing

In the community-centric *jotte* system, one tank was generally used as the water source for the surrounding fields, which could be owned by three or four families. Even if the tank was located in the land of one particular farmer, and though it would belong solely to the concerned landowner, yet despite this, a co-operative principle was followed for the usage of water.

Similarly, the maintenance of the tank would be the responsibility of all the users. In return, the tank owner received a fixed amount and a portion of the agricultural produce (areca) every year. As water was distributed on a rotation basis during summer, there was no room for any dispute and even if some small issues came to the fore, it was resolved through amicable discussion and compromise.

In the beginning of the year, all the farmers met to discuss the availability of water. The share that each farmer would get depended upon the expected quantum of rain and availability in the tank. People with bigger fields would get more water and therefore were charged more. If it was felt that the quantity of water was less, there would be a cut for the bigger landholders and this would continue on a tapering basis. It was, therefore, possible to conserve water till the next monsoon. This ensured there was never a shortage of water.

The special value of canals

In Uttara Kannada, canals also play a major role in groundwater conservation and moisture retention. The water that flows in the canal is naturally absorbed by the soil and cools the areas in the vicinity. In addition, the ends of these canals have fairly large circular pits where the excess water which flows into the canal collects. This excess water is absorbed by the soil.

While this is the process in summer, in the monsoon, the canal and the pits effortlessly absorb the rainwater. The canals arrest every drop of rain that falls on the plantation and drain it into the pit. Once in two or three years, the canals are deepened and

the mud is piled on either side of the banks. This is again helpful in absorbing water. The same happens in the pit at the end of the canal. Thus, the drained water joins the tank all over again.

Today, diesel pumps have replaced the *jottes* and are used widely in all the plantations. In fact electric pumps are used to empty and drain water from the tank to the maximum extent possible. Even the slush that remains as the residue is drained out and cannot provide enough water for the areca trees.

A lost practice

Today, these practices are passing into local memory. Given the change in the practices, it is likely that people have forgotten how to string the *jotte*. The change is also evident in the use of the vessels used in this system. Once regarded as the basic utility item of every family in Uttara Kannada, these are seldom seen today. In some cases, these have now been moved into the loft, while in others cases, people have converted the copper *jotte* into household utensils. Most unfortunate is the case of others who have sold off the traditional pots.

The *jotte* system which was once an inseparable part of the cultivation practices among the areca-nut growers of Uttara Kannada District is now a rare practice, and worse still, a disappearing practice. Today the system of drawing water using *jottes* has almost disappeared. As a chain reaction - nobody cares for the tank. As the tanks become extinct, the canals also dried up and have died a natural death - ending the entire process of water retention.

How then will the fields get water? Is this is nightmarish situation a product of our own creation? Do we really need modern agricultural technology in an area where indigenous traditional knowledge had once been adequate and appropriate?

No answers are forthcoming …….. and yet the gurgling canals and soothing greenery are vivid and alive in my memory!

Radhakrishna S Bhadti is a journalist with 14 years of experience in the field. He is the chief sub editor for Vijaya Karnataka newspaper. He writes for the column on water and related issues.

Tapping Water Through Tunnels

The Malnad way

Ravishankar Doddamani

Tunnels are sub-terrain passages drilled to tap clean, pure and natural water. These are commonly found in coastal Karnataka, as well as in the Malnad regions. Tunnels exist wherever tanks are found and together these form a part of the local culture and tradition.

All history text books draw attention to the civilizations such as Sindhu, Harappa, and Mohenjodaro that flourished on riverbanks. Unfortunately, there are no records of the indigenously developed knowledge and expertise of our farmers on water management. Yet experience shows that there were very powerful systems of water management in existence which met the water needs of the community. As a result, the younger generations have lost out on this rich knowledge, particularly with regard to irrigation practices. Farmers today are familiar only with borewell culture for irrigation. While it might be difficult to take them back to traditional practices, it is still necessary to build an awareness and appreciation in this direction. The use of water tunnels is one such practice that requires attention.

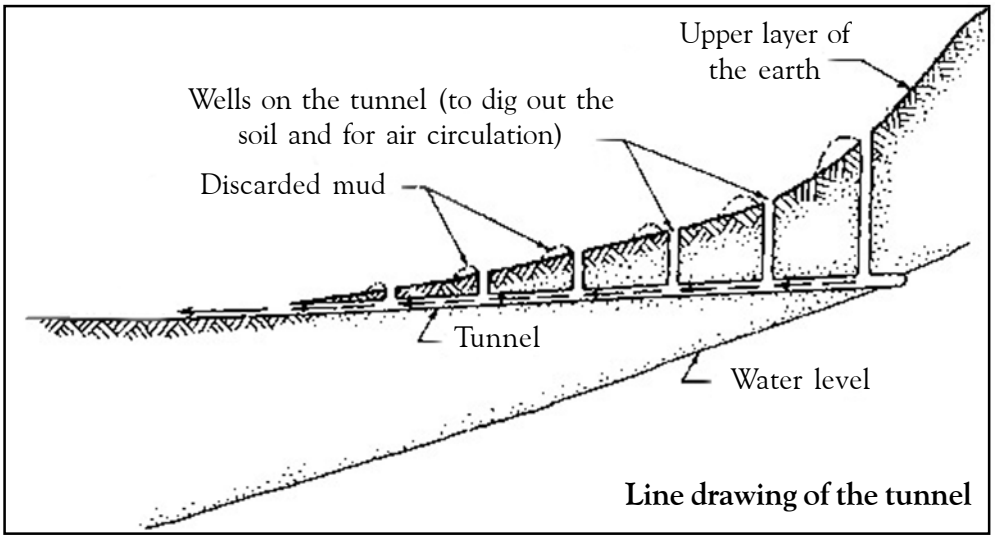
Tunnels or sub-terrain passages are common features in coastal Karnataka, as well as in Malnad. These are crosscut openings drilled into hillsides to tap clean, pure and natural water. The sub-terrain water level at the base of the hill is generally at a higher level than the groundwater levels of the plains. Hence, when crosscut openings are drilled, the end portion of the aperture reaches the sub-terrain water level of the hill. Water flows out easily through the tunnels owing to the gravity. As it is available without the use of pots and buckets, the tunnel system is popular and is an integral part of the lives of farmers in coastal areas.

Tanks generally exist close to tunnels to order to store the water carried into them. Tanks are also used to harvest water and hold large volumes of water. Together these are good examples of traditional conservation techniques.

Gopalakrishna Bhat of Komgotu village near Nilesvar of Kasargod District. says, "Tunnels provide water sustenance to the majority of farmers in Kasargod, Dakshina Kannada, Udupi and other coastal districts."

The history of tunnels

Historical records show that as far back as 2,500 years ago, Iran and other countries in the Middle East had a special tunnel-like structures to transfer water called



Line drawing of the tunnel

Ghanats or *kanats*. Thus, it can be presumed that tunnels could have been in existence even prior to this date. Furthermore, records show that some *kanats* were several miles long and that the water in the *kanats* was used for irrigation, as well as for the requirements of the residents of the city.

There is no definite information available about the origin of tunnels in Malnad, though this method could have reached the shores of India through Arab traders. Some people also contend that the system was introduced by the Tughlak rulers.

The excavations conducted by the Archaeological Department of India shed light on the tunnels drilled under Shivappa Nayak. These were, however not intended for the provision of water and were actually secret passages to escape from the fort. However, as the tunnels are similar in design, these manmade structures could have been the basis for constructing water tunnels. Posadigumpe, the highest peak in Kasargod has about 2,000 water tunnels.

Building tunnels

The Malnad area receives an average rainfall of 3,500 mm annually. However, the soil in this region does not have the strength to hold rainwater for long. As it is an area of undulating landscape, water rushes down slopes during the monsoon; yet in summer there is scarcity.

In this situation, it is difficult to dig a well on the slopes of the hill and lift water out of it. Thus, water tunnels were dug by the hillside, after assessing the suitability of the task like the gradation of the hill, the type of soil, the geographical condition of the earth and others related factors. It was therefore, important to consult knowledgeable people for this. Work on tunnels began only after suitable arrangements were made to address these problems. Even after this was done,

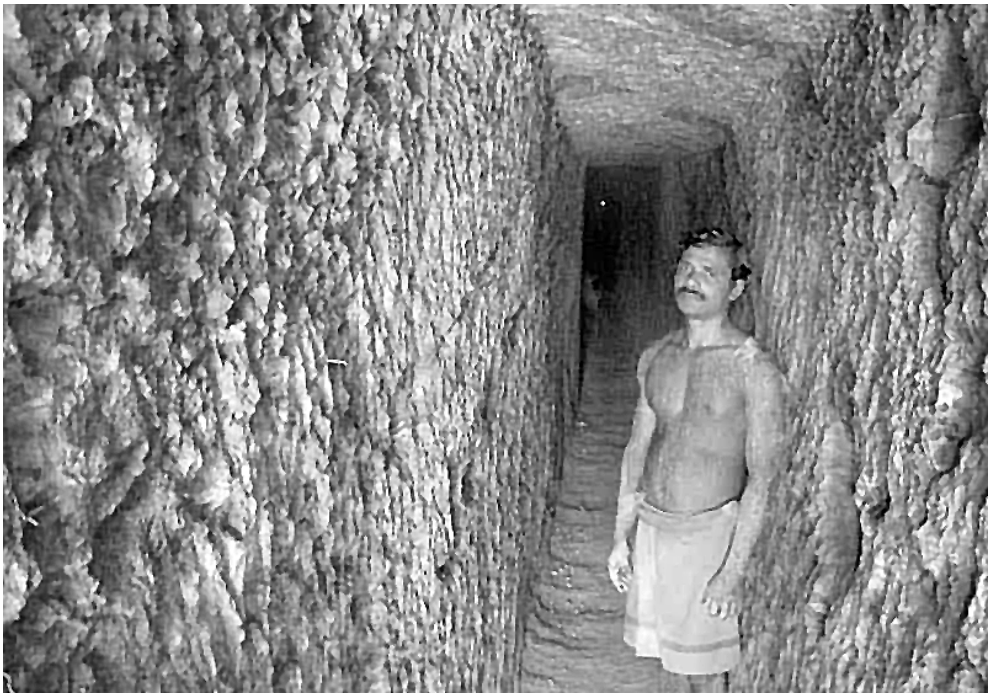
drilling tunnels was not an easy task. Often the light was insufficient, and lack of oxygen and safety were concerns below the damp and loose soil.

Before the digging starts, water sources were ascertained on the basis of termite pits and by using Ayurvedic plants. This was a largely a trial and error method. A tunnel was normally about two feet wide and six feet high. Though smaller tunnels could have been adequate for drawing out the water, yet the tunnels were widened to accommodate a person to walk through them. In spite of this, it was almost impossible for a worker to carry the mud basket on his head and transport it outside. The worker had to move with bent knees, pushing the basket forward with both hands till the opening of the tunnel. At places, areca leaf was spread on the floor, and the mud basket was placed on it and pulled outside. A few years ago, three people in Kasargod entered a small tunnel while hunting for wild boar and were suffocated to death. Since then, attention is paid towards the width of the tunnel.

Simple tools

Tools like pickaxes, spades and small chisels were used for digging the tunnels and as the work progressed, the light got dimmer. When working in daylight, a mirror was placed at the mouth of the tunnel to reflect light inside the cavern. Advancing further was even more difficult as breathing became shallow.

When working after sunset or at night, candles or wick lamps were used to do the work. Kerosene lamps are not suitable as they emit a lot of smoke and increase the



carbon dioxide content inside the tunnel, making breathing very difficult for the workers. Use of electric lamps is totally ruled out, and thus candles and wick lamps that emit soft light were the best options.

The tunnels were only dug in places where the soil was made up of laterite as the chances of a laterite tunnel collapsing were minimal. Any other type of soil would not have been able to withstand the drilling and hence constructing tunnels at such places was not possible. If a rock formation was encountered while advancing into the tunnel, the route had to be changed. As a result, some tunnels may have as many as four forks.

An example for this is the effort made by Amai Mahalinga Nayaka of Adkanadka. He ventured into digging tunnels and was successful only with his fifth tunnel. The first four tunnels did not yield one drop of water even after consistent efforts over several months. On an average, each of these four tunnels would have been at least 50 meters long with a couple of forks in each of them. The fifth attempt was successful and this enthused him to dig two more tunnels. He was eventually able to cultivate his two acres land on the slopes of the hill. His efforts fetched him the Varanasi Agriculturist Award for the year 2004.

Tanks and tunnels

The quantum of water available from a tunnel depended on the geographical factors of the respective region. Normally, water at the rate of 2-6 litres per minute, gushes out of the tunnel and this is stored in tanks built out of mud and stone called *Erku*. In the Kudreppadi field near Kasargod, the water stored is transferred to a bigger tank from where it provides irrigation to the areca plantations through motor pumps. Kottanguli Venkata Krishna Bhat near Mulleria has built a spacious tank of over half an acre in front of the tunnel dug by him. The water that gets filled here flows down and feeds his five acre areca crop. Like him, there are many people in the coastal belt who irrigate their areca plantations without resorting to the use of electricity.

In order to augment water in the tunnel, some people construct drainage pits in the hills. Through these pits, rainwater that would have otherwise flowed away is collected in the ruined tunnels. This is a system that Nayaka has used to ensure that his disused tunnels will be a source for water in a few years.

In the earlier days, areca strips were used as a lining while transporting water in the tunnel over a long distance to prevent the mud from soaking it up. Plastic pipes are now used in the place of areca strips.

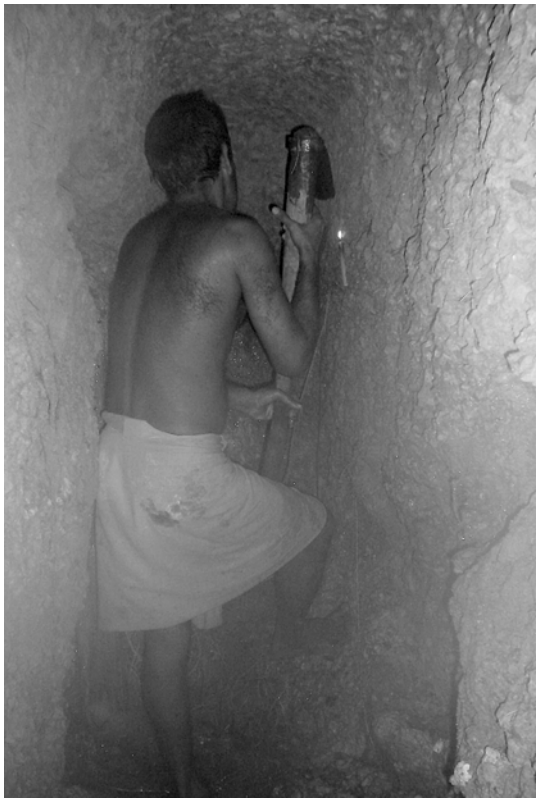
In places where the farmers lived in the plains, the construction of tunnels was a boon to the workers who lived at the base of the hills and mountains. It provided additional income to them, as they would finish their day's work in the field, rest

for a while and dig tunnels almost till midnight. The farmers quickly realised the value of this arrangement and had the workers do double work.

During the period of construction, when a worker felt suffocated inside, he came out for a breath of fresh air and continued the work later. Though the workers rested at intervals and dug the tunnel at a slow pace, they were able to finish the work within 2-3 months. Thus, digging of a tunnel did not necessitate high expenditure nor was it a cost intensive activity; it requires about Rs.100 to dig 1.5 feet of soil. The 330 feet long tunnel that was constructed by Tirumaleswara Bhat of Niduvaje about 30 years ago would presently cost about Rs.26,400.

Tirumaleswara Bhat, an elderly citizen of Niduvaje says, "We prefer to drink the pure, cool water obtained from the depths of the mountain directly as this water is tastier than even the bottled mineral water." During monsoon, the water from the tunnel, as well as the rainwater from his rooftop is channelled into the well in his courtyard. In summer, his well is filled with only water from the tunnel and this ensures that it remains full.

In the villages of Bayaru in Kasargod district and Manila of Dakshina Kannada, there are innumerable tunnels. In Bayaru, the water tunnels are more of a culture and a tradition rather than a mere construction. The Brahmin communities here own at least one tunnel per household. Some households have six, eight, 12 or more tunnels.



In Bayaru and Manila villages, 40 per cent of the water sources are dependent on tunnels. But dependence on modern methods has not spared these villages either, as borewells have been introduced in the area. However, some elderly farmers still prefer tunnels, and hence workers skilled in this work are hired. But their numbers are decreasing and new generation farmers have not shown much enthusiasm in maintaining the tunnel system. Borewells are becoming more popular owing to the ease with which they can be drilled. Some years ago, there was an attempt to popularise crossdrilling using iron pipes which had received a poor response.

"The water tunnel gave us life. We are grateful for this. I cannot imagine the condition of my plantation were it not for this tunnel and tank," says Gopalakrishna Bhat.

But this is changing. Since the nineties, the use of borewells has proliferated and as a consequence, ground water levels have rapidly shrunk. The number of houses along hills and mountains are also rapidly multiplying and an environmental imbalance does not augur well for the excellent tunnel systems. In the present circumstances, due to widespread deforestation, the soil does not absorb rainwater. The number of people who drill tunnels is also on the decrease. It is feared that in the light of the decreasing use of and support for tunnels, this age-old system might be totally destroyed.

Ravishankar Doddamani is an agriculturist, lecturer and a freelance writer. He is especially interested in reporting agriculture and rural developments.

Marginalised *Madakas*

Harish Halemane

Madakas have been in use for hundreds of years at several places in the coastal districts of Dakshina Kannada and Kasargod. Though seemingly a lot like tanks and ponds, madakas are in actual fact, quite different from them, in both design and use. Constructed by the community at a very low cost, the utilitarian value of the madaka is unique and is ideally suited for coastal areas.

Madaka is one of the most common traditional systems of water conservation followed in several places in coastal Karnataka. It has been in use for hundreds of years at several places in the districts of Dakshina Kannada and Kasargod. However, this system is not unique or restricted to Karnataka. Since *madakas* can be constructed in hard stone surfaces as also in clayey regions, these are also found in other states, though these are known by different names. There are similar structures in Rajasthan which called *johads*. The traditional *pemghara* in Orissa also resembles the *madaka.*

The cycle of water is that after rain falls on earth, it joins the streams and rivers and flows into sea before getting absorbed by the clouds to result in rain once again. In this process, some of the rainwater is absorbed by the soil to form

groundwater. It is this resource that meets the needs of the community in times of scarcity.

Over time, indiscriminate use of groundwater has led to a situation where even coastal districts like Dakshina Kannada and Kasargod have low water levels by the end of January. This becomes even more acute before the onset of summer. This is unfortunate since coastal districts receive an average annual rainfall of about 400 cm. Yet due to the geographical terrain, most of the rainwater flows into the sea. With little effort to recharge the groundwater, water shortage becomes a harsh reality by the end of January, despite the heavy rains received.

However, in addition to run-off of rainwater, population increase in recent decades, extension of agricultural land, changes in the crop pattern, construction of borewells, irrigation by electric motors, destruction of forests and other factors have also been instrumental in creating a situation of water scarcity.

The simplest and most sustainable answer to the problem of water scarcity is rainwater harvesting. This can be in the form of roof-top collection in urban areas and by conserving water in *madakas* in the rural areas.

What is a *madaka*?

Very simply put, a *madaka* is a large soak pit. *Madakas* are mostly found in geographical areas that have high terrain on three sides and a shallow area on the fourth. In physical terms, a *madaka* is a natural formation that has high terrain on three sides and a shallow manmade bank or a barricade on the fourth side. As these mostly make use of natural formations, very little human effort is needed to create a *madaka*.

The water that flows down from the higher level collects in the *madaka* and slowly percolates into the soil. The laterite soil in agricultural areas is ideal for *madakas* as it allows slow percolation of water through the cracks. As a result of this, water oozes through springs and other outlets into manmade tanks or wells which are located near the point of water collection in the *madaka*.

Madakas are normally constructed in laterite soil. Though this type of soil does not have the quality which allows water to trickle into the earth, the construction of a bank or a barricade enables the process of seepage. The bank or barricade is erected by joining stones together with the help of sticky soil or cement.

Provision is made to make sure that excess water which flows out from the top of the barricade. Small channels are constructed to allow the flow of excess water collected in the *madaka* into agricultural fields, which are utilised by farmers to cultivate paddy. As the flow follows the natural gradient, a pump is unnecessary. However as water scarcity was not a concern in earlier times, people were content with using the *madaka* as a collection point for water to only irrigate their lands. They did not realise that *madakas* also had the capacity to absorb water.

Proper care has to be taken to ensure that the first or second rainfall does not flow into the *madaka*. This is necessary as the rainwater flowing down the hill carries dry leaves, weeds etc. along with top-soil. If this is deposited in the *madaka,* it

reduces the volume of space for water collection. A greater threat is from the flow of the top-soil into the *madaka* bed, which can fill the cracks, thereby rendering this system useless.

Sometimes a tank constructed for water harvesting is also called a *madaka.* Though both serve the same purpose, yet there is a major difference. A tank is generally manmade and is normally constructed on agricultural land. As opposed to this, the *madaka* depends on natural features and is must be at an elevated place. Only the bank or the barricade of a *madaka* on one side is manmade. Water from the tank is directly used for irrigation whereas instances of directly lifting water for irrigation from the *madaka* are far and few**.** This is because the water in a *madaka* percolates into the soil, making the soil moist and cultivable.

Why is a *madaka* relevant today?

However, with the gradual increase in population, the demand for water also increased. Cash crops, such as areca and coconut which required higher quantities of water became popular in coastal areas, and these very often replacing paddy. The *madakas* lost their importance and fell into disuse. At some places, even shops and shopping complexes were built where the *madaka* once existed. About three decades ago when electric motors invaded the market, borewells and submersible pumps completely erased the *madakas* from the farm lands.

Let's see how the *madakas* are relevant today:

- *Madakas* enhance the decreasing groundwater level. This ensures rejuvenation of the subterranean water.
- *Madakas* increase the water levels in wells, tanks and borewells.
- Pumping of water to irrigate the land just below the *madaka* is considerably lessened. This in turn prevents irresponsible use and exploitation of groundwater and water in wells, tanks and borewells.

Afforestation is imperative in order to prevent silt deposits in the *madakas*. This step also augments the level of water. It creates new ecosystem as various animals and birds seek shelter in the forest. The water in the *madaka* also nurtures aquatic life.

In fact *madaka* can be erected even where it does not exist as all that it needs is a minimum of two natural barricades at a slight height, although barricades on three sides is ideal. Some expense and human labour may be needed to construct the *madaka* on the fourth side. Yet this expense will be trivial when compared to the benefit of getting water from the well. The construction of a *madaka* in the plains may be slightly difficult, though in Malnad and coastal areas, it does not pose any problem. Over the centuries, these constructions have a proven track record of augmenting water levels in the surrounding tanks and wells, and as such, any amount spent on them will be worth it.

Reviving *madakas*

A deeper study on the *madakas* brings to light many facts. At some places, farmers have retained the system which reflects their pride about a traditional water source as well as a commitment to preserve it for future generations. There are others who have rejuvenated or built afresh *madakas*. Let us look at some success stories.

The Kanavu *madaka*

The case of Kanavu Gopalakrishna Bhat of Peruvaje village in Sulya Taluk, Dakshina Kannada is a typical case in point. Though he and his brother Tirumaleswara Bhat have separate lands, they have a common water source – the *madaka*. The *madaka* spreads over three and a half acres and provides water to over 50 acres of areca plantation. Their father, Narasimha Bhat, settled in Kanavu in the year 1945 and Gopalakrishna Bhat recalls the drought condition of the plantation just two months after the rainy season. The following years only aggravated the situation. In about 1950, they built a small stone tank at an altitude inside the plantation. "Unexpectedly water started springing forth and this set us thinking in terms of building a tank," says Bhat. "Instead, we opted for a *madaka*."

The topography here is ideal for constructing a *madaka* since this is an area endowed with heights on three sides and different types of vegetation. Gopalakrishna Bhat explains, "We do not even clear the dry leaves here as the layer created is beneficial in preventing soil erosion. The rainfall also does not run off hastily. It is slowly absorbed by the soil."

Bhat recalls the time when the bank built against the *madaka* crumbled down. "It was in the year 1972. Nobody knows how. Unfortunately, the bund collapsed and the plantations at the lower level were washed away. Ours was not the only plantation to be affected. Water flooded many other plantations and caused some

serious problems. Each farmer was aware of the loss caused to the others, so nobody complained. Even now, people of the village enquire whether the bund is in good condition and whether the annual repairs are carried out properly. This is because they know that if the *madaka* is maintained, storage levels of the wells and ponds in the vicinity will go up."

Bhat's areca plantation is at the lower part of the *madaka* and the plantation has seven tanks. He uses sprinklers while drawing water from these tanks. He explains, "With the slow trickling of water into the earth, the initial 'deposit' of water remains intact. What we use is only the 'interest' on it – sufficient for irrigating the plantation."

The *madakas* of Joklakatte and Aringula

The Joklakatte and Aringula *madakas* are situated in Kasargod. According to Dr. Chandrasekhar Chowta, an elderly agriculturist, the Joklakatte *madaka* has a history of hundreds of years. The basin of this *madaka* is large with laterite formations on three sides and a shallow area at the centre. A bund has been erected on the fourth side using laterite pieces which have been glued together with mud. "Water that collects in this *madaka* has been a boon to the paddy farmers of many villages. Even a delayed monsoon does not impact on the cultivation," says Chowta. Children play around it and hence the name *Joklakatte*

The Aringula *madaka* is located near Manjeswara near Kasargod and means 'rice pond' as paddy is cultivated in the lands around the *madaka.* This is located in a shallow area within a vast expanse of land where about four feet of water collects during the rainy season. This water is used in the paddy fields near the bund.

The *madaka* of Mundur

Monappa Karkera is an experienced agriculturist of Mundur, a small village near Puttur in Dakshina Kannada. He often thought of raising a coconut farm on his fields. But due to the persistent water problem, he gave up this idea and instead built a spacious *madaka* of about 10 feet deep at the same place. He explains, "By the end of January, every year we would be anxious about water for the areca crop. But within one year of building the *madaka*, it has yielded results. When I found an overflow of water in the borewell below the *madaka*, I knew that this was because of the *madaka.* This water is available till the end of summer." Karkera intends to increase the height of the *madaka* to collect more water. His plantation is now full of not only areca and coconut, but also vegetables, mango, custard apple and other fruit bearing trees. The *madaka* has been very fruitful to the plantation and profitable to him too.

In today's scenario where the water crisis is getting acute by the day, structures like the *madaka* are very relevant. It is an unfortunate fact that though there are

about 1,000 *madakas* in the districts of Dakshina Kannada, Kasargod and Udupi, water tankers to the villages is a common sight.

Experience shows that some districts of Rajasthan have made an effort to conserve water through traditional systems where they have been successful. The question that arises is when areas with scanty rainfall have been able to manage water using indigenous systems, why have the *madakas* been neglected? Despite receiving good rainfall, why do the coastal districts of Karnataka face water shortage?

Reviving the old *madakas* and building new ones should be two important programmes. When this happens, *madakas* will move out from the pages of history and become a part of our lives once again.

Harish Halemane belongs to Kumble of Kasargod. Combining agriculture with photography and videography, he contributes articles and photofeatures to many newspapers. He has a special interest in science, technology, agriculture and environmental issues.

A model for rainwater harvesting

The Melukote system

Ravindra Bhatta Inokai

The sacred town of Melukote in Mandya District is an excellent example of rainwater harvesting. The tanks and ponds here form a highly systematic network to ensure that Melukote never faces water scarcity conditions. The system that came into practice hundreds of years ago is still existing and can be used as an example in the formulation of water conservation and management programs.

In the state of Karnataka, sacred places and pilgrimage centres do not mean only fulfilling a vow or worship to God. Each of the temples carries a social, and, more importantly, an environmental message as well. This can be experienced whenever people visit any of the hill temples of Karnataka. Apart from offering prayers to the deity, the devotees also follow eco-friendly measures and appreciate the intrinsic value of these practices.

A classic case of environmental concern is evident in the temple town of Melukote in Pandavpura Taluk, Mandya district which is an outstanding example of rainwater harvesting techniques. Melukote clearly demonstrates that water harvesting is not a new concept and has been in practice for over hundreds of years. The primary principle of rainwater harvesting is to arrest the flow of water in a way to make the earth absorb rain water. In Melukote, this principle has been very simply and effectively brought into use. It, therefore, serves as a role model for water experts who formulate water development schemes.

Literally translated Melukote means a fort at a height. As the name suggests, it is situated at a height of 3,600 feet above sea level. Melukote does not have any source of water and as such, the only source of water was the rain itself. The rulers realised that unless rainwater harvesting measures were adopted, there would be no water available - either for the temple rituals or for public use. They therefore built several tanks and ponds on the mountain. These water bodies are systematically built that even during severe drought, the ponds of Melukote will not dry up. As a result, there is no dearth of water either for Lord Cheluvanarayana to have his ablutions or for commoners to have a constant supply of drinking water.

These numerous water bodies have made a significant contribution in enhancing the charm of this well-known pilgrimage centre. Amongst them, the *Pancha kalyani*

is the most important *thirtha* and is a major center of attraction. The suffix *thirtha* is given to some of the ponds, for e.g.: *Ashta thirtha, Padma thirtha, Yadava thirtha* etc, while there are others which are associated with the names of local people (for e.g.: Ningamma pond, Doddayya pond etc).

The history of the Melukote ponds

Melukote ponds have a history dating back at least 500 years and though the names of people who built them are not available, details of repairs carried out, as well as the construction of steps and *Mantapas* have been recorded.

Several rulers of Karnataka such as the Gangas, the Hoysalas, the kings of Vijayanagara Empire and the Mysore Wodeyars have ruled Melukote. The *Puranas* also contain many references about Melukote.History tells us that Chamaraja Wodeyar (1617-1637), the 10th King of the Mysore Wodeyar dynasty built the *kalyani* here. This means that the pond was already in existence by then. The Chikka Devaraja Wodeyars (1704-1712) erected the Bindu Madhava temple to the south of this *kalyan*i and there are also records about the Mantapas built by Dodda Krishnaraja Wodeyar who ruled between 1713 and 1731. The Bhuvaneswari Mantapa on the stonewall of the *kalyani* was the contribution of Mummadi Krishnaraja Wodeyar, while Chamaraja Wodeyar (1838-1834) had the same cleaned.

In addition to this, the Yadavagiri Mahatmye that forms a part of Naradiya Purana also talks about the *kalyani* and the *Ashta thirtha* of Melukote. The Sritatva Nidhi, a literary work by Mummadi Krishnaraja Wodeyar and Yadavdri Charitam, probably a contemporary work, also mentions the *Ashta thirtha*.

The amazing network of ponds

Melukote has been described as the abode of 108 ponds. The ponds have been constructed at different levels and at different locations to collect the rainwater that falls on the mountain slopes. For instance, the Dalvai tank is towards the west and the Hosakere tank is towards the north. Each of the tanks collect the rain that falls in the local area and together, the ponds are able to collect rain from any part of the hill.

The design of the ponds in Melukote is in a manner that retains every drop of water that falls, and allows it to percolate into the soil. Hence, there are a large number of small ponds in addition to the large ones. The biggest tank is at the base of the mountain.

Apart from rainwater harvesting in hundreds of ponds, care is also taken to ensure that once the water is filled in the tank, it is not dirtied or wasted. Almost all the ponds have orderly steps to enable people to reach down in order to fetch water. Furthermore, all the tanks on the mountain are interconnected through stone pipelines, which facilitate flow of water from one tank to another.

Another unique feature is the filter pits outside each tank. The water flows into two filter pits before entering at the Melkote tank. These filters collect dry leaves, sticks and other bodies, thereby supplying only pure water to the tanks. Steps taken to filter water at different levels are a special feature of this place.

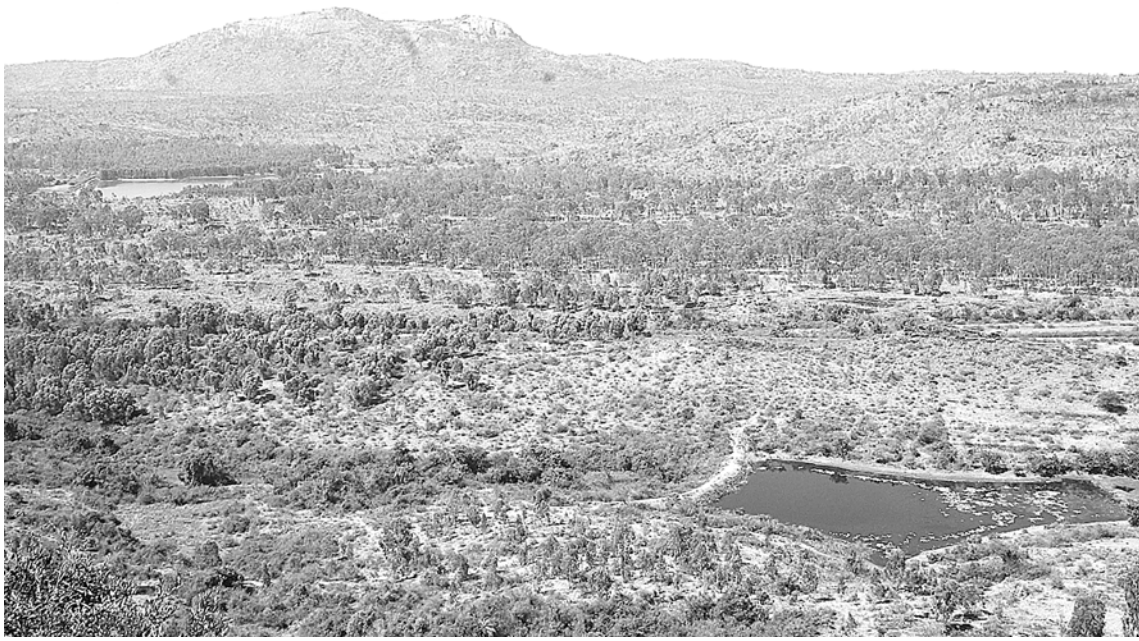
The excess water that is collected in Melukote's ponds flows into the Hosakere tank at the lower area. This water flows into the Dalvai tank, fills it up and continues

its onward journey to the Hebbal canal and from there onto Tonnur tank, which is located further away from Melkote. This amazing link system ensures that not a drop of water is wasted. The Tonnur tank and Hosakere at the base of Melukote irrigate hundreds of acres of lands, besides augmenting the ground-water level in the entire region.

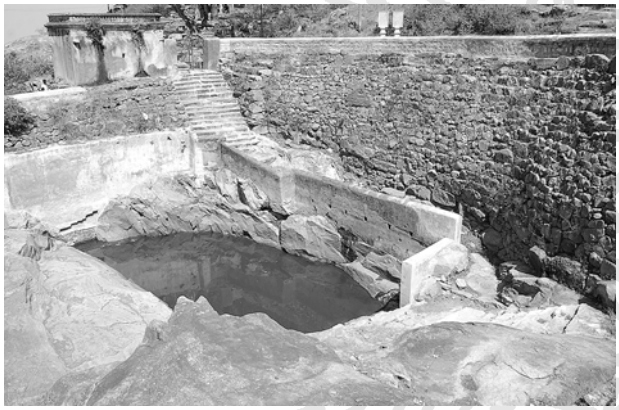
Akka-tangi *Ponds*

The drainage system, which allows flow of water from one tank to the other, is highly scientific. This amazing system can be best seen in the *Akka-tangi* ponds, the most famous of all the ponds in Melukote. The route taken by the water before it joins the *Akka-tangi* pond begins from the Dhanushkoti tank that is situated at the top of the hill, then to the Veda Pushkarani pond and subsequently to the Chikkayyana pond. Above the *Akka-tangi* pond is a temple dedicated to Kulashekhara Alwar, one of the Sri Vaishnava saints. A pipeline provided at the lower portion of this temple also joins the *Akka-tangi* pond.

These two ponds pose a riddle. The *Akka* pond at the top is clean whereas the *tang*i pond at the bottom, inspite of the filter system, is dirty. Other than a folk legend, no scientific explanation can be provided for this phenomenon. Perhaps the *tangi* pond itself was meant to be a filter, and therefore it is muddy and dirty.



Legends galore



Legends and myths on the ponds of Melukote form a unique oral tradition. Each pond has more than one legend or fable woven around it. There are separate ponds for washing clothes, for toilet purposes, for bachelors and for women. There is also a belief that issueless couples are blessed with progeny when they offer prayers to Lord Cheluvanarayana after they have a dip in the *Ashta thirtha,* which is at a distance of 26 km from Melkote.

Though the Pauranik stories and the folk legends on *kalyani* and the *Ashta thirtha* are still prevalent, there is no recorded information on the reason behind the construction of so many tanks. Yet a walk around Melukote and its surrounding villages is evidence that the numerous ponds and the connecting channels were meant only for rainwater harvesting and for managing the overflow of water.

Melukote can, therefore, be regarded as a unique model in harvesting rainwater in smaller tanks and subsequently allowing the surplus water to fill up the bigger tanks. This system is more economical than constructing huge reservoirs to provide irrigation. What is more significant is the fact that these water bodies have been conceptualised, implemented and maintained by the communities of Melukote.

In today's situation of water scarcity, the ponds of Melukote are an outstanding example of rainwater harvesting and management. There is a lesson to be learnt from this for our water planners, if only they are willing to learn.

Ravindra Bhatta Inokai is a Mysore-based journalist working with Prajavani. He writes frequently on water related issues.

The water pool for cattle

Gokatte

Ghanadhalu Srikanta

All over Karnataka, there are small ponds that dot the landscape. Called gokattes, these pools are designed for use by cattle. Gokattes provide water to drink as well as a place to rest for cattle. Fed by rainwater, these pools serve as a perennial source of water for cattle and a community asset as well.

Protection of land and water has been an issue of prime importance to rural communities. Over time, various conservation practices have been developed through the use of indigenous knowledge, a bold sense of experimentation and a keen eye for measurement and calculation. It is, therefore, not surprising that tanks, ponds, wells and cattle pools developed by these local skills provide the blue-print for present day check dams, gully plugs and trench cum bunds.

Gokatte or cattle pool is a simple and traditional water conservation practice. These pools can be found all over – in and around villages, outside towns, at one corner of the field, at the base of the hill and in some instances, even in the middle of a tank. While some have been built very systematically using stones, others have been created in pits. This is built without the help of any special tools or gadgets.

There are many different types of *gokattes* in Karnataka, such as community cattle pool, town pond, small pond, *madaka*, excavated well, water pit etc. Though the water conservation methods varied, *gokattes* were in practice in some form or the other, as a community effort even as recently as two decades ago. However, community-based activity was directed not only at the building of *gokattes* but for desilting and strengthening of tanks, repairing the wall, whitewashing and removing mud from the ponds, which were all a part of the community effort. People participated in good numbers for the construction of the *gokatte* and the tank.

Eye-technology

A *gokattes* is a simple but amazing construction which captures and collects all the rain in an area. Using the unique eye-technology of the elders, this system uses the skill of the trained eye to work out the entire process of the flow of water to the *gokattes* by just observing the gradient of the land. So scientific was the point of placing the *gokattes* that not a drop of water is wasted, thereby filling the *gokattes* to the brim. The overflow water reaches the village tank and this in turn would fill up all the wells in the area.

Normally all the *gokattes* in an area were connected to each other. This facilitated a system where a full pool would flow into the next one, which in turn would fill up another nearby pond. When all the ponds were full, the water would reach the main tank in the town.

The cattle would generally graze in the hills located at the outskirts of the town. On their return, the cattle drank water from the *gokattes* which were situated at the base of the hills or on the borders of the villages. As these pools were built on a slope, some portion of the water soaked into the earth and the rest was retained in pools for cattle.

Some decades ago, Rangappa, an ordinary resident of Madanayakanahalli village of Chitradurga District built a gokatte in his village to provide water for the cattle. He worked single-handedly to construct the gokatte and met all the expenses that were incurred in this. In appreciation of his effort, the community named the gokatte after him. Till today it continues to be a water source for cows, sheep, goats and other grazing animals. With ample water all around the year, fruit bearing trees have grown in the area and the gokatte has emerged as a fine example of ecological harmony.

Who built the *gokattes*?

A common answer to this question is the Taluk Panchayat, District Panchayat and Village Panchayat. But it is the names of persons like Ramajja and Kittappa who were responsible for building the *gokattes*, tanks, ponds and wells for the benefit of the villagers. This was done entirely as *shramdhaam* or service to the community. Their commitment towards the wellbeing of the community has been recognized - that even today many of the *gokattes* carry the names of their donors in acknowledgement of the services that the people had rendered to the community.

Gokatte water - its uses

G*okattes* are plentiful in the plains of Karnataka including Kolar, Tumkur, Chitradurga, Davanagere, Shimoga and Bangalore rural districts. For instance, in Gowribidanur Taluk of Kolar District, the gokattes are in the form of water pools. Sri Narayanaswami, a retired teacher puts their number at about 200. According to him, these pools were not only a community asset but were individual water systems to feed the land of each farmer. The concerned farmer undertook the maintenance, though anybody could use the water collected in it.

It would not be an exaggeration to say that all the coconut trees in the plains have thrived on water provided by the *gokattes*. The subterranean moisture it provides is sufficient to nurture the coconut saplings, irrespective of their distance from the *gokattes*. G*okattes* are of great benefit to floriculture too and there are cases of

farmers in Chitradurga district who undertake cultivation of flowers using water from the *gokattes* and earn about Rs. 50,000 annually.

Mr. N. Devaraja Reddy, a water expert from Chitradurga, cites some success stories as a result of *gokattes* thus:

Kenchappa, a poor farmer with a family of six members, has about 40 *guntas* of land in Nagaraghatta of Holalkere Taluk, Chitradurga district. This is a very dry area and is rain-dependent. But there is a *gokatte* in his village. He has taken up jasmine cultivation and carries water from the *gokatte* on his cycle for watering the jasmine plants. Kenchappa is able to earn about Rs. 50,000 in a year.

In Holalkere and Hosadurga Taluks of the same district, water available from the *gokatte* is used even to this day to water coconut saplings. The farmers carry water in pots on cycles irrespective of the distance they have to pedal. Shekarappa, a farmer of Chikkaimmiganur provides water to his 10-acre coconut grove from the nearby *gokatte.*

In Chitradurga town, water at a place called Rangajjana *gokatte* is sweeter than borewell water. This is because, water that collects in the *gokatte* is rainwater that has percolated into the earth over several years. This improves the level of groundwater, both in respect of quality and quantity. The local people believe that food prepared with the latter remains undercooked whereas the *gokatte* water ensures tasty dishes!

Normally, farmers grow different crops in the fields around the *gokattes* as water contained in it can sustain any type of cultivation. This implies that the *gokattes* conserve groundwater level and ensure diversity in cultivation.

When BAIF, a NGO took up the issue of community based land-water conservation in Tiptur district, the first action was to create awareness among people about the *gokatte*. The organization introduced the history of *gokatte* as part of its project in order to make people water-literate. It also revived the languishing *gokattes* in the villages coming under the project, propagated a flourishing nursery using its water and created employment for the farmers.

Why did the *Gokattes* disappear?

According to Late Dr. Somashekara Reddy of the Indian Institute of Management, Bangalore, during the British rule, the government conducted a land survey. Wherever it found lands that did not generate income, they were considered unfit for cultivation and were included under the government administration. As part

of this survey, much of the land with *gokattes* was confiscated from the people. Gradually, as a result of this, the system faded. What remains today are only the *gokattes* that are under community ownership and in religious places.

The present status

Unfortunately, *gokattes* have been allowed to fall into disuse. The tanks and bunds that were built and maintained earlier by the communities are now under the village, taluk or district administrations. Thus, the villagers do not volunteer for de-silting the tank or for repairing the *gokatte*. There is a change in attitude that as tax payers they need not concern themselves with these problems. The government has also turned a blind eye towards these systems, resulting in the unfortunate loss of a tried and tested tradition and a culture associated with it.

At the same time, the government has taken up World Bank aided projects like Sujala, Water Augmentation Project Association and River Basin Development Schemes, through which it has stepped forward to protect *gokattes*, tanks and the like. These have undergone a metamorphosis and are called canal bunds, gully plugs, agricultural pits etc. The only difference is that the communities no longer evince enough interest in these and the government is trying to persuade them with incentives and money to participate in the project.

Solution for revival

Farmers should voluntarily identify the *gokattes*, tanks and ponds, study their condition and facilitate the smooth flow of rainwater into them. Tanks and ponds should be desilted and the water level should be increased. Construction of a *gokatte* costs approximately Rs. 40,000 today. If the government can finance this amount, either in the form of a loan or a subsidy and make the construction of a *gokatte* compulsory, there is no doubt that all the villages will be rich in water within two years. If the *gokattes* can be revived before the monsoon starts, a traditional and time-tested water harvesting system will get a new lease of life.

Ghanadhalu Srikanta is a journalist who is currently with Prajavani a Kannada daily. He has a special interest in agriculture, rural development, horticulture and organic cultivation.

A well in every house

The story of Ravur Village

Ananda Thirtha Pyati

Open wells are a common feature of every village in India. Interestingly in Ravur village in northern Karnataka almost every house has a well. These wells has been have been well-kept and maintained over years and are the source for potable water for not just the household, but the entire village.

With the advent and extensive use of borewells over the past few decades, the importance and value of open wells has reduced. This has led to a deterioration in the conditions of the open wells. In many cases, open wells have become garbage dumps and sites for dumping of waste matter. Indiscriminate use of borewells has rapidly led to a depletion of the groundwater levels and in a span of a few decades wells which had originally held 20 – 30 feet of water currently hold only half a foot.

This pattern is evident across the whole state of Karnataka. The situation is very alarming in north Karnataka, where rainfall is scanty to start with and water scarcity is a common annual phenomenon. Sadly this is also noticeable in the Malnad area along coastal Karnataka, where in recent years despite the heavy rains, wells which are generally full to the brim all through the year are seen to dry up in summer.

In this scenario the situation in Ravur village can be regarded as an oasis of sorts. Located in Gulbarga District of northern Karnataka, Ravur presents a unique, but welcome picture that is quite in contrast to the rest of the state. Despite being located in dry, poor rainfall areas, known for its scorching temperatures, the open wells in this village stay in good condition all through the year. The wells have clear water, some even going down to 100 feet. In other cases, the wells remain full of water at fairly high levels, even during the summer months. These wells serve as main water sources for the community.

360 wells in one village

It is a known fact that historically temples were built near water sources. When ruins of temples and idols were accidentally found in Ravur village while laying the foundation for a building construction, the community firmly believed that there would be a water source nearby. The ruins of many temples in the area that were found subsequently indicated that it was likely that water would be available in plenty in the area.

Ravur is home to a wide variety of wells, which range from a 1.5 foot wide well to 10 feet wide ones. According to Rangappa, a resident of the village, "It is believed that at one time our village had 360 wells. Many of these are still there."

The existence of wells in almost every house in the village greatly substantiates his claim. The importance given to wells in Ravur is evident from the fact that every house has a well either in the courtyard, backyard, at the entrance to the house or even inside the house.

Gowdara *bhavi*

Gowda, a prominent person of the village, has a tiny square well in his house that is two feet long and two feet wide. It is called the *Gowdara Bhavi*. The patriarch of the family believes that the well holds 100 feet at water and has never dried up, to date. It is the source of water for several houses in the neighbourhood.

This is one of two wells in Gowda's house. The other well which is much bigger is in the process of being filled up and closed. As Prabhavati, the lady of the house explains, "We get adequate water from the small well and do not need the bigger one. The well is so big that despite dropping huge quantities of mud and stone, we have not been able to fill it up."

Joshi's well

Another unique well is at Joshi's house which is in the backyard. Constructed over 150 years ago, the well is three feet wide in diameter and has a depth of 40 feet. During the monsoons, the water level in the well begins to rise gradually. The collected water lasts till January.

"As the well is in our backyard, we are careful to maintain it properly. When the water level reduces in the summer moths, we close the opening with a stone slab to protect the well," explains Shankara Bhat Joshi. "Till recently the well used to last almost the whole year, but now the water levels are gradually falling. We are thinking about starting rainwater harvesting in our house so that we get water supply through the year," he says.

Kattalu *bhavi*

The *Kattalu Bhavi* is one of the largest wells in Ravur village. It provides water to about 75 per cent of the village population. Water is available at a depth of about 15 feet and lasts all through the year, even in summer months when water levels in other wells in the village get depleted or dry up.

Kattalu Bhavi did not originally have a platform around it. There were several steps that led down to the water. In the mid-60s, the government facilitated the building of a platform around the well in order to keep the water in the well clean and unpolluted. The water in *Kattalu Bhavi* is very sweet and is used for cooking. Sometimes it is used for washing clothes, drinking water for animals, bathing etc. all of which is carried out outside.

Water is presently drawn from eight wheels erected over the well. It has also become a space for the community to gather and the place echoes with the voices and joyful laughter of women and children.

The well is associated with several legends. *Kattalu* in Kannada means darkness and 70-year-old Hazarat Bi recalls an interesting anecdote about the naming of *Kattalu Bhavi*, "The well was still under construction and we had not yet struck water. It was the night of *Khatal* during Moharram. People who had danced all night were thirsty and were looking for water to drink. When the procession reached the well, water began trickling into it. All the members of the procession were able to get water to drink and quench their thirst. As this incident occurred on the night of the *Khatal*, the well was given the same name. People who are not aware of this story call the well *Kattalu Bhavi*. But it is actually this incident that has brought light to Ravur."

Mehboob Bi, an elderly woman in the village relates another story. Some years ago, there were attempts to fit the well with an electric motor in order to draw put the water more efficiently. However, the idea was subsequently dropped. "When the pump and tap were fixed, the water levels in the wells suddenly went down. There was no apparent reason for this. We believe this is God's well, and we must draw water from it only by immersing a pot in the well and pull it up manually. We therefore removed the pump and the tap."

While there may be a more scientific reason for the water levels to reduce, a traditional well has been spared from overuse in the name of God.

Rama *bhavi*

Located outside the village, the *Rama bhavi* is situated alongside a temple dedicated to Lord Ramalingesvara. There is an attractive stone *mantapa* and a huge tree alongside that provides shade. Large quantities of water are drawn from the well through two pumps to irrigate the gardens and plantations in the village, and yet the water levels in the well remain constant. The community believes this is a

boon they have received from nature. There is also a belief that bathing in the water can cure diseases.

The current state of the well however, is worrying. Clothes are washed by the well, and there are heaps of garbage and other rubbish dumped nearby. But the community is aware of the problem and is looking for ways to correct this situation.

Wells within houses

Ravur has some unique wells which are built inside houses. In fact these wells are not noticeable at first, and are easy to miss. The wells are interestingly built. A narrow passage through which only one person can pass leads to the well inside the house itself. The passage is usually situated either to the right or the left of the main door. The well is normally very deep and has a very narrow mouth. The space around it is enough for just one person to stand across and draw water using a rope and a pot.

Dattatreya Joshi, a community member, explains the rationale behind constructing wells inside the house. "In earlier days, joint family systems was followed and there was a high demand for water. It was not feasible for ladies to step outside the house as and when water was required. Hence, wells were constructed inside the house."

In Ravur, each well is identified with each family. Thus, names such as Ranganapur well, Joshi's well, Siddagunda's well, Plantation well, Tamburi well, Mutt well, Koli's well, Upadhyaya's well and so on are commonly used. Some wells are also reserved for communities, like washerman's well, woodcarver's well etc.

Community wisdom

"A well in each house augurs well", is a traditional saying in the state. This is followed in spirit, in areas of plentiful rainfall, such as Malnad. However, this practice is not so prevalent in the other areas and in most cases an entire village may have four or five open wells. Ravur is probably the only village in north Karnataka that has seen wisdom in the saying and has practiced it.

There is a local proverb that a newly married girl has to perforce come to the well, as it is here that people share their joys and sorrows. Wells are important community

spaces and provide the perfect atmosphere for camaraderie amongst women.

The invasion of borewells has not only deprived the community of this space, it has also resulted in severely depleted water levels. Traditional wells have turned into garbage pits. In this respect, by choosing to stay with traditional wells, the people of Ravur have emerged as a community with foresight.

Currently borewells are extensively used all over the state. This has resulted in depletion of groundwater due to overexploitation of the resource. In comparison, the wisdom of the community in Ravur who have maintained their wells in good condition, has resulted in positive benefits for them. They continue to enjoy uninterrupted water supply and availability. In spite of the government having provided borewells in their village, the community in what can be seen as a heartening trend, prefers the traditional wells.

In the past decade however, some wells have started to dry up in summer. But the community is aware that with diligent and regular maintenance, the longevity of the wells can increase. It has therefore begun to take measures to maintain their wells. Efforts are being made to ensure that the wells are maintained carefully and that rainwater is not wasted. This can keep water levels constant.

A neighbouring locality has a factory, effluents from which are polluting some of the wells in Ravur. "This is a big factory. We are poor people. We need the jobs. What can we do?" a community member questions with frustrated anguish.

On one hand there is a unique water system; on the other hand is a modern factory. Both have value to the community. Yet there are ways by which pollution can be minimised and prevented from causing harm to the traditional wells of Ravur. For if we lose a centuries-old water culture, can it possibly resuscitated?

Ananda Thirtha Pyati is a reporter in the Gulbarga center of the Kannada daily Prajavani with a firm interest in water related issues.

Interlinking Ponds

Water Conservation at Bellary Fort

Sripada Joshi

History records Tipu Sultan as one of the finest generals in South India. Yet it is a little known fact that the well-being of his soldiers was of prime importance toTipu. His focussed efforts to conserve water at the top of the 50 foot tall hill of Bellary bear testimony to the measures that he took to ensure that his soldiers and the royal family were not effected by shortage of water.

The district of Bellary in Karnataka has a harsh climate. The area is dotted with rocky terrain and low hills. Tipu Sultan, also known as the Tiger of Mysore fought many battles in this area in the 18th century. Water had to be provided for the thousands of soldiers who were on the move and who fought in these battles. Yet there was no source of water supply in the area nor was there any known method to harvest and manage whatever little water was available.

Tipu realised that in order to enable his soldiers to do their responsibility efficiently, it was essential to provide for their well-being. Much of this depended on adequate water supply. Much of his efforts was spent in understanding the local water management systems and to devise an ingenious method of water conservation.

Located in the centre of the district is a huge 50-foot high hill where Tipu built a fort which spread over five acres. Within this area, there were 40 structures resembling ponds which were open to the skies. Rainwater was allowed to collect in these ponds. Though each pond was independent, yet these were interlinked by man-made canals. The water collected in these ponds was sufficient to meet the water needs of over 1000 people. Even if a battle lasted for months or even years, the water was sufficient for the soldiers and members of the royal family.

Once the ponds were full, the excess water was allowed to flow downhill, through specially laid man-made canals. These canals led into a big pond located at the foot of the hill. Apart from this, the water that flowed downhill was also allowed to collect in a well in the soldier's camp in Devi Nagar called Basavana Kunte. Located near the then district headquarters, this well also met the water needs of the city.

So skilled was the technology used for construction, that even today the canals which were designed for the outflow from the interlinked ponds can be found along the ramparts of the fort.

Why did the system fall into disuse?

However the outstanding example for water conservation on top of the hill at Bellary was not used by Tipu for long. Being an astute general, Tipu was aware of the need to keep his movements stealthy. He chose another hill near the Bellary fort hill which had a lower altitude. However, this provided a vantage point for the enemy's soldier's to spy on the movements of Tipu's army. Tipu realised that that the number of soldiers, stocks of arms and ammunition, food and water supply could all be monitored from the higher attitude nearby.

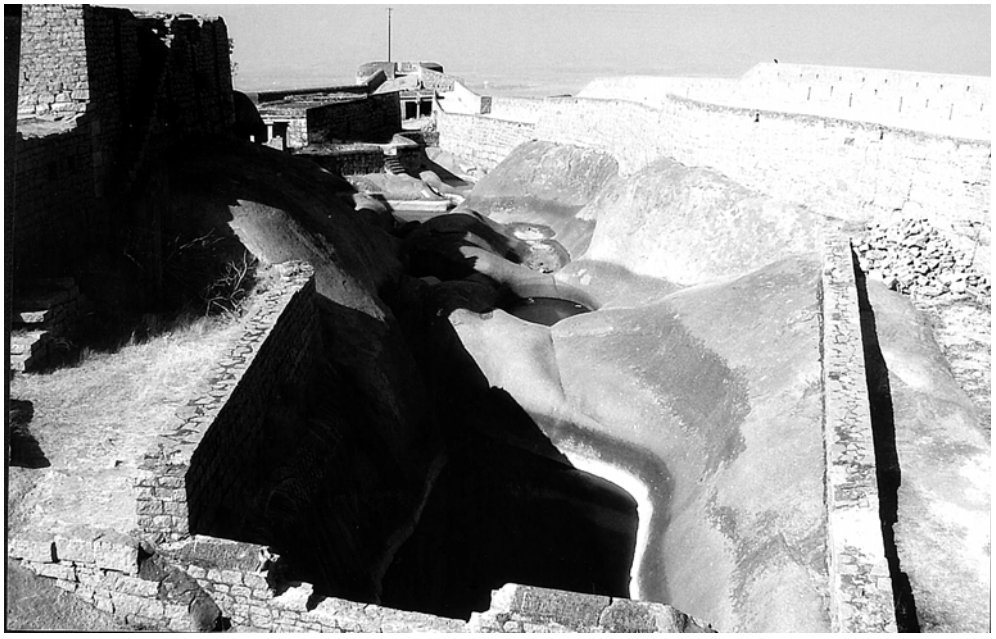
In order to ensure that his movements were kept secret, Tipu was forced to abandon this fort and moved camp once again to Gutti, a hill located at a distance of 80 km from Bellary. Tipu built a fort on top of the hill, which was interestingly on the same lines of the fort at Bellary fort.

As a result of this relocation, the enemy's army too moved out of the Bellary fort. The 40 water bodies on top of Bellary fort subsequently fell into disuse. The canals that interlinked the ponds were not maintained and became neglected.

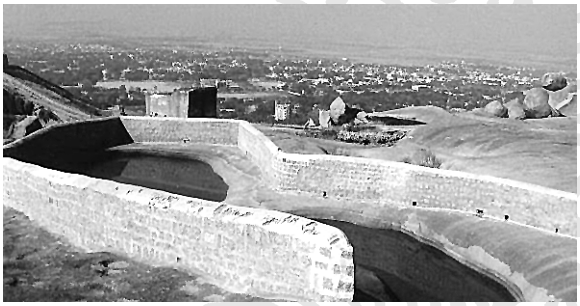
Over the last hundred years, the conditions of the ponds has deteriorated and today the ponds are choking with filth and garbage. No water collects in these ponds and outflow too has stopped.

Endeavours for revival

Mr. Harsh Gupta, Chief Executive Officer of the Bellary District Panchayat, visited the area and realized the value of the pond-like structures atop Bellary Fort. He



drew up a detailed plan to revive the ponds and sought the participation of several organizations to partner in the effort.



He sanctioned Rs.1,00,000 on behalf of the District Panchayat for this Food-for-Work project. The work of dredging was taken up to remove the garbage from the ponds. Cement bags, sand, bricks and other construction material was transported on mule back to the top of the fort.

As many as 38 of the 40 ponds were dredged and stonewalls were erected, wherever necessary. Canal repair was carried out systematically. The two larger ponds entailed considerable expense so the Tourism Department and Archeological Survey of India were requested to support the project.

There were plans to develop a garden in the fort to attract tourists to this historical spot. Mr. Harsh Gupta adds, "For us, water harnessing is not the only goal. Our aim is to educate people, especially students who visit the fort about the significance of water conservation and how it was implemented even in the 18th century."

Unfortunately, Mr. Harsh Gupta was transferred and the project was shelved!

Sripada Joshi is a senior reporter in Prajavani, Gulbarga division and writes frequently on environment issues, especially water..

Yajaman Panagars and *Tukkadi* Systems

Knowledge sources for tank water distribution

A.M. Veeresh

The practices followed by our ancestors for distribution of tank water are numerous. The care and concern they took especially during drought and the spirit of sharing they demonstrated while using whatever little water was available is worth emulating. Many practices have not been recorded, and, thus, are lost. An introduction to two practices that highlight the wisdom of farmers in irrigating their lands.

Jetti Agrahara is a village in Koratagere Taluk of Tumkur District. It is home to a large tank with a command area of 477 acres. This tank serves as a lifeline for humans and cattle from six villages. It is also a major resource that recharges open wells and borewells in the area. A unique, community-based system known as the *yajaman panagar* system, which is in practice in all the six villages, ensures efficient and equitable distribution of tank water. The system, which is simple, and yet very precise in the way it is implemented, fosters a spirit of cooperation among farmers. It is also one that can become a model for replication regardless of region and area.

The background

In 1911, the British government initiated a move that would enable communities to manage their own water resources, and accordingly enacted the Tank Panchayat Act. Under this Act, any group that collectively possessed not less than half the uncultivated land below the tank could form the Tank Panchayat. They had to however, get the consent of two-thirds of the farmers in the command area.

The Tank Panchayat was constituted with community members and consisted of the village chief, the village accountant, and selected farmers. The farmer members could be those who possessed uncultivated land or garden land, or even landless farmers. The Panchayat served a term of three years and the village head functioned as the president.

The Act, which was implemented all over the country, was scrapped later, as several Tank Panchayats failed to carry out their assigned duties. Farmers in a few villages however, had seen value in the system, and follow it to this day, albeit altered to suit specific needs depending on the region and the community.

***Yajaman Panagar* system in Jetti Agrahara**

Jetti Agrahara is one such village where the system has been kept alive. It has come to be known as the *yajaman panagar* system. *Yajaman* means a farmer belonging to the command area and *Panagar* is a version of the Marathi word *Panagrahi*. By its very title, it conveys the synergy between the two, and that it provides equal responsibilities and rights to farmers of the command area as well as those who regulate the water.

Though no definite records are available, according to the community, a queen called Ammajamma gifted Jetti Agrahara to the Jattis in 1870. To mark the occasion of this endowment, a small tank was built in the village. It was converted into a large tank in 1904.

The catchment area of the tank is 7.29 sq. km and the water-spread area is 299 acres. The command area is 477 acres spread over six villages i.e. Jetti Agrahara, Kallukundahalli, Jampenahalli, Beladarahalli, Navilu Kurke and Malleswara Palya. 853 farmers of these villages derive benefits from the tank.

The land in the command area has been divided into landholdings of a minimum of 0.25 gunta and a maximum of 14 guntas per person. The *neeruganti* gets four acres, the village head gets 14 acres, the Jattis get 14 acres and the family of the village accountant 14 acres as *inam*, a grant in perpetuity.

Though the tank has three sluices, the centre one has been shut down because of an unfortunate accident. About 50 years ago, it had developed a leak, and the *neeruganti* who tried to repair it was sucked into it and died. The other two are in

good working condition. One sluice covers three villages while the other covers the other three villages.

Out of the command area of 477 acres, 20.24 acres have plantation crops, 225.16 acres are irrigated lands and 270.40 acres are semi-arid lands. The *yajaman panagar* is vested with the duties of ensuring equitable distribution of water, maintenance of Raja *Kaluves* (main canals) and supervision of sluices.

While in most villages where traditional water distribution systems are still in practice, *neerugantis* manage and control water, Jetti Agrahara is still being efficiently managed both under the *neeruganti*, as well as, the *yajaman panagar* systems. There is no information about this practice elsewhere. In Kolar district, *dhamasha* and *tukkadi* systems are prevalent, but the *yajaman* system is not heard of.

Selection process

Yajaman Panagars are chosen at a village meeting where villagers from the six villages gather and indicate their selection after a mutual discussion. Caste and creed are not considerations for selection and everybody is eligible. Farmers who can influence opinion within the community and bring them together are given preference. Four individuals from the two villages on the left bank canal and six from the three villages on the right bank canal are appointed as *yajaman panagars*.

The performance of the *yajaman panagars* is assessed by the community every year, and those who are found lacking in their work are replaced with more committed persons.

The functioning

Before deciding on the crop to be grown in the command area, the *yajaman panagar* calls for a meeting of the farmers. Depending upon the level of water in the tank, a collective decision acceptable to all the farmers is taken.

Paddy is grown when the tank is full; millet, groundnut or a similar crop is grown if it has 18-19 feet of water. If the water level is about 12-13 feet, only areca and coconut plantations receive water.

The timings and quantity of water to be released from the tanks is dependent on the decision about which crop will be grown. When the decision has been in favour of paddy, water is released to the entire command area twice a day through both the sluices for the first month.

After the month is over, water is provided between 6 a.m. - 6 p.m. to the command area of Jetti Agrahara and from 6 p.m. - 6 a.m. to the rest of the villages. The sluices are closed and no water is released on Mondays. This self-imposed restriction helps to economise on water and control its unnecessary usage.

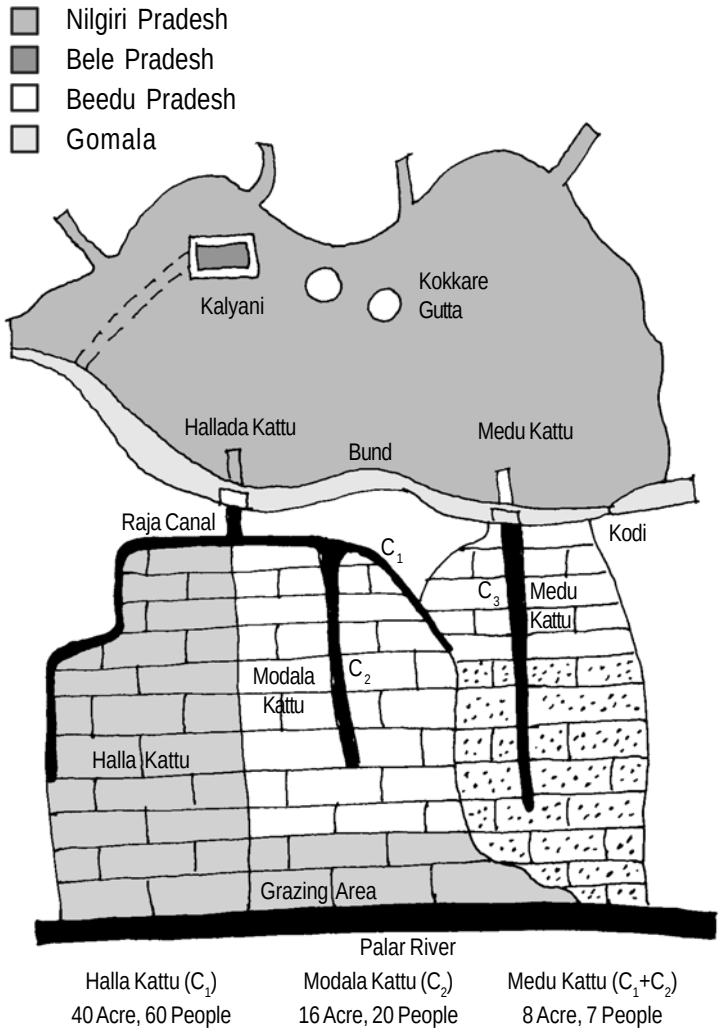
Interestingly, fields at the farthest end are irrigated during night for two chief reasons. Providing water during daytime might result in the farmers at the base of the tank pressurising the *neeruganti* into giving them more than their due share of water. Second, it is believed that water flows faster when temperatures fall, and can reach the farthest fields more speedily. By themselves these are small efforts, by when combined they go a long way towards enabling equitable water distribution, and help to prevent avoidable skirmishes within the community.

The *yajaman panagar* has several other responsibilities. Chief among them are:

- Ensuring the participation of the entire community in de-silting the main canal and cleaning it
- Motivating the community for *shramadaan* when necessary
- Levying fines on those who do not respond to requests for *shramadaan*
- Supervising the work of the *neeruganti*
- Ensuring that sluices and regulators are maintained in good condition
- Resolving disputes that might arise between farmers from either side of the command area
- Collecting crop cess
- Monitoring the canals for encroachments and taking timely action against the encroachers
- Coordinating with the irrigation department etc.

Frequently, it is the wastage, rather than shortage of water that poses major problems to the community. There are many instances where personal enmity and greed prevent fair and equitable distribution of water even when the tank is full. In such

Front Pond of the Village - Kammadatti Village



instances, the *yajaman panagar* system is helpful and actually helps to bring the community together.

Tukkadi System

While building tanks the community devoted special attention towards the courtyard, command area and the maintenance of the tank. Towards this, various indigenous systems and practices were followed bearing in mind the needs of each village and the geographical location of the tank. The *tukkadi* or the Restriction system is one such unique practice and was earlier in practice in several tanks of Mulbagal taluk of Kolar District. Presently it is followed only in the four tanks of Hanumanahalli, Meleri, Kammadatti and Uttanuru.

Under this system, the command area is divided into three portions and water is provided to each of them in turns every season. It is a system worked out through consensus by the community during times of water shortage. Created through wisdom and experience, this system meets the requirements of the farmers equitably.

Tukkadi system in Kammadatti village

The *tukkadi* system is still actively pursued in Kammadatti village in Mulbagal taluk of Kolar District. Kammadatti village falls under the purview of the village panchayat of Devaraya Samudra and is situated on the Mulbagal-Kolar road. It was once a sugarcane-growing area in the dry belt of eastern Karnataka.

The tank here receives water from several canals. The command area has 102 farmers and four wells. There is a *Kalyani* in the tank used by people for drinking water purposes. The tank has two sluices, and four *Raja Kaluves* (main canals). Paddy is the major crop grown in this region. Four other villages in the command area also follow the *tukkadi* rules.

The Monsoon Crop Method

During the monsoons, paddy is sown through the dry soil method in the command area depending upon the extent of rain. Tank water is used only if the moisture content is not sufficient for the crop. It is the *neeruganti's* responsibility to regulate water.

The summer season

During the first harvest, the *neeruganti* calls a meeting of all the farmers of the command area, with the consent of the elders of the village. The decision to raise a second crop is taken at the meeting, after which the *tukkadi* system comes into effect.

A huge rock known as *kokkare gutte* in the centre of the tank is used as a yardstick to assess the level of water in the tank. According to the community, this natural formation is about nine feet high. When the rock is totally submerged in water, the tank overflows, and when the water level is at about six feet, a second crop can be grown. When the level is less than six feet, no crop is raised. Instead, the tank water is used only for washing clothes and as drinking water for cattle.

The community has divided the command area into three portions. These have been named as: Halla kattu, Modala kattu and Medu kattu. When the water levels are low, crops cannot be grown in all portions, as the available water is not adequate for the entire area. In such a situation, cultivation is carried out in turns over each area.

At such times, the other farmers can neither grow any crops, nor use the tank water. This system does not change despite a farmer's field being situated next to the canal and the soil containing enough moisture content. It is also possible that

a farmer may get his turn only once in many years. The rule is waived only for those farmers who have wells, provided they cultivate the crop specified by the community.

Calendar of crops grown in the area

Sl.no.	*Name of the embankment*	*Year*
1.	*Halla kattu*	2005-06
2.	*Modala kattu*	2000-01
3.	*Halla kattu*	1996-97
4.	*Modala kattu*	1990-91
5.	*Medu kattu*	1985-86

The table demonstrates how the *Tukkadi* system was strictly implemented. As water levels were not sufficient in the *Medu Kattu* area after 1990, eucalyptus is grown here and, hence, the area does not receive any water. According to Venkatappa, a villager, water will be provided if demanded under law.

In cases where farmers in all the areas insist on receiving water, the *neeruganti* is empowered to close the sluice. Around 15 years back, during a conflict where an individual farmer had demanded water, a consensus was taken from the community and the sluice was closed. A similar situation has not risen again. As Balaramanna says, "Our elders created this three step method and we are following their rules. This is beneficial to all of us".

Yajaman panagara and *tukkadi* systems are excellent examples of the traditional wisdom exhibited by elders. They also symbolise their spirit of cooperation, which can serve as a lesson for contemporary life.

A.M.Veeresh is a post-graduate in social sciences and works in the Kolar office of Water Augmentation Association.

Sisandra

A watering hole for travellers

C.R. Nagendra Prasad

Built in stone and located on the sides of roads and highways, sisandras can be commonly seen in selected areas of Karnataka. These intriguing tub-like structures were constructed to provide water to the weary traveller. Built by the rich and the poor alike, the sisandras are a unique practice that has sadly, faded away.

A mofussil bus comes to a halt near a stone structure about 5 - 6 feet high. The bus conductor and helper stand on the stone structures to load sacks containing vegetables and other produce onto the top of the bus.

Were these structures built to make bus loading easy? The answer is an emphatic, "No!" These structures, which were once meant for a different reason have, unfortunately been reduced to the status of bus loading platforms!

Built many hundreds of years ago, these stone structures called *sisandras* were actually tubs which looked like cradles. Constructed at the junction of two or three roads, the *sisandra* contained drinking water to quench the thirst of weary travellers.

Going on pilgrimages to holy places was an age-old tradition. Many of the pilgrim centers travelled from remote places. It was also believed that travelling on foot would invoke the blessings of the deity or religious leader. Rest houses all along the routes offered food and shelter. But what if a pilgrim felt thirsty enroute? Carrying water was onerous especially while treading long distances. To provide relief to such travellers, *sisandra*s were built on the roadside.

Sisandras are found on the rural roads of Kolar, Tumkur, Chitradurga and certain parts of Bangalore district. At the entrance to Chitradurga fort, there is a well preserved *sisandra.* One *sisandra* was recently found while digging a foundation for a house in Kolar area. It is presently housed in the office of the District Armed Forces. Similar structures are also found in Dakshin Kannada, though these are smaller in size and are earmarked for animals.

Who built these *sisandras*?

While kings and emperors provided tanks, wells and rest houses, the rich traders of major towns built *sisandras* for the common man. Inscriptions dating as far as

600 years back in Kolar district give evidence of a *sisandra* built by a trader, who founded the town of Madamangala. Providing water in Hindu mythology was considered "*dharma*". People from the scheduled caste community were employed to fill water in these *sisandras*. In the words of Sri V.S.S. Shastry of Kolar, "Even upper caste pilgrims drank water from the *sisandra* thus proving that caste differences were washed away by the water in the *sisandras*!"

Feudal chiefs were instrumental in building small townships as well as the roadside *sisandras*. People were employed not only to erect the structures but also to fill water in these *sisandras*. Employment was thus generated not only through the construction of *sisandras* but also for ensuring that there was always enough water in them. The king's officials made the payment to the people who carried the water from the tanks and wells to the *sisandras*. Unfortunately very little documentation is available about this unique system.

How is it constructed?

Sisandras are water tanks built with four stone slabs, generally made of granite. The measurements of the tank varied, though the height was generally of 5–6 feet. The capacity of the *sisandras* varied according to its usage. If it was meant for the pilgrims, the size would be enough to contain about 30 pots of water. If the *sisandras* were meant to cater to traders and merchants who assembled for the village fair, massive structures to hold hundreds of pots of water, would be constructed.

Very old *sisandras* were carved out of rocks. More recent ones have four flat slabs mounted on a base slab to resemble a box. The edges are sealed with concrete. The top is also covered with a slab, which has a circular opening to facilitate the filling of water. The cover also prevented dust and leaves from contaminating the water, thus keeping it fit for human consumption. A hole on one side of the structure served as a tap and when not in use, it was sealed with a thick wooden stick. Whenever water was needed, the stick had to be pulled put and water would flow out. *Sisandras*, which catered to the general public were placed on four stone pillars and the height was convenient to drink water from the hole.

Special *sisandras* were also built for animals. These were at the ground level, but were constructed using

the same technique. Thus the needs of man and beast were both met by the donors of these *sisandras*.

From the pages of history

In 1792, when the British army was passing through Kolar, an artist named Daniel accompanied the infantry. He used to draw scenes of soldiers resting and in the background along with hills and woods, would be *sisandras*! About 200 years later, an Italian researcher called Anthony came to India to visit the places featured in the paintings of Daniel. He used photography to capture these places but there was a total transformation everywhere. Towns had come up where forests once existed and the hills were denuded. Anthony carried two paintings of Daniel with him - one was the stone pillar at the Gavi Gangadhar temple at Bangalore and the other was of a *sisandra* on the Mulbagal-Kolar road. Anthony was able to locate the stone pillar easily but the *sisandra* was nowhere to be seen. At this stage, Chandra Prakash, an employee of Bharat Earth Movers Ltd., joined Anthony in his search but it was in vain. A very disappointed Anthony returned to Italy. Chandra Prakash persisted in has search and finally found the *sisandra* in the neighbouring village.

How did it get relocated? Many travellers rested at a rest house in this village so Madhav Rao, a government official shifted it as he believed it would serve a better purpose in this new location. This happened in the beginning of the 20th century and Chandra Prakash promptly sent a photograph and all other details to the Italian researcher!

Kautilya's Arthashastra states that land routes must be equipped with water and shade- giving trees. In fact quenching thirst is considered even more important than giving alms. One of the first gestures of *Athithi sevo bhava* is to offer water. Kings and rich men as well as the poorest of families honoured this tenet since time memorial. Each act of giving water rendered a great service to weary people. The *sisandras* continued this practice in the same spirit.

The *sisandras* is a simple practice which can easily be revived – and which will then provide relief and earn goodwill from the ordinary traveller.

C.R. Nagenra Prasad is an agriculturist and has a special interest in organic cultivation. Writing is his hobby.

Talaparige

Nature's science and art of water management

Mallikarjuna Hosapalya

The word talaparige is used for the point where water springs out from sandy soil. This is a unique water source that gets activated only when the tank dries up. Talapariges were major sources of water supply in the hilly areas of Tumkur, Chitradurga and Kolar districts. Once revered and celebrated by the community, talapariges were focal points of rural culture. Sadly, today talapariges have disappeared.

With their head warmly covered to avoid the early morning chill, Nagarappa, Gopali, Narasappa and Anji along with other labourers set out westwards in the wee hours of dawn to reach the big tank in the village. Their job was to repair the *talaparige* canal. They are not alone in their mission. Groups of men are already at work at different points - working to repair the canal. The canal runs for about 1.5 km from the *talaparige* in the centre of the tank to the main sluice. This activity takes place every year between January-March.

What is a *talaparige*?

A *talaparige* is the point in the tank bed where water springs out from the sandy soil. It is also referred to as a swamp or a sweet water spring. Water from a *talaparige* is harnessed at the point where the maximum water springs out. *Talapariges* however become active only when the water in the tank dries up. Water in *talapariges* is used as drinking water for humans and animals and also for agricultural purposes.

Talapariges are found on rocky surfaces of the hill slopes where the water flows down during the monsoon and dries up in the summer, as well as on riverbanks, rivulets or streams. When it rains, water soaks in through cracks in the rocks and boulders and collects as subterranean water. It later springs forth wherever there is sandy soil. Rain water that collects under the earth by the banks of rivers, rivulets or streams gushes forth through *talapariges* when these water sources run dry in summer and the sand is struck. The point where water trickles, oozes or springs out is called the *talaparige*.

Talapariges do not have any definite shape. Most generally have a stonewall on three sides with an open portion on one side, so as to facilitate flow of water. A pit is dug wherever water can soak through. The maximum depth is about 15 feet, although the average depth is only 5 feet. The length and breadth is usually between

15-20 feet. As the canals are equal in measurement to these *talapariges*, both sometimes appear to be a single structure. While *talapariges* are generally built of stone in the middle of the tanks, sometimes these can also be found in places where there are no tanks.

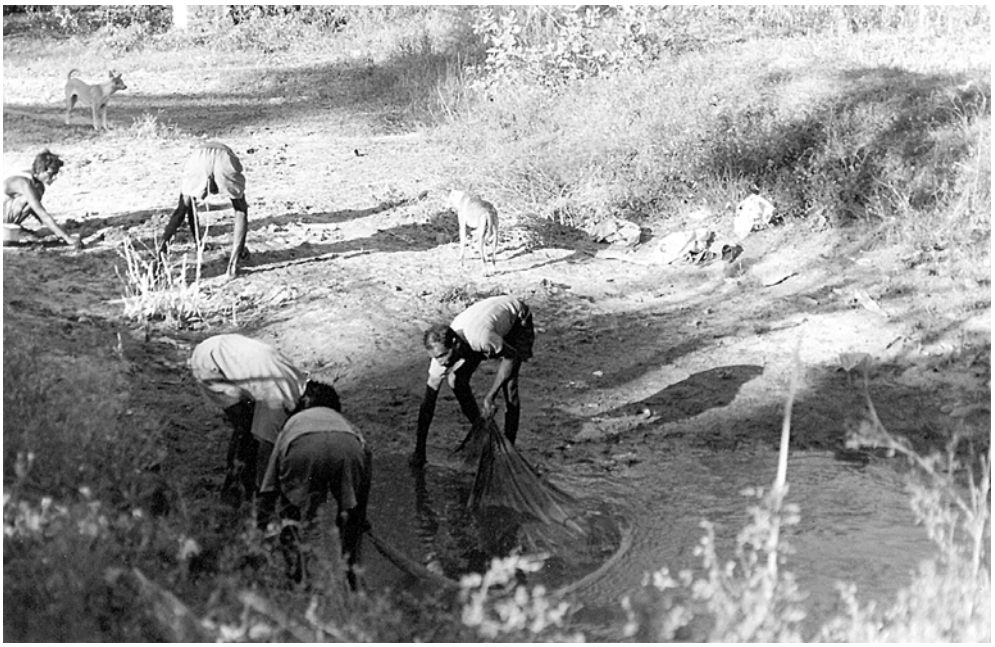
The uniqueness of a *talaparige* is that water flows out of it only when it is used. This is owing to the fact that the eye of the *talaparige* closes when water does not flow out. The portion or the corner of the *talaparige* from where water oozes out is called the 'water eye'.

This point is of special significance. Workers who repair the canal observe this eye constantly to prevent it from getting covered with topsoil. For instance, the *talaparige* in Akkiramapur, Koratagere Taluk remained unused for many years, and the 'water eye' has choked up with moss and lichen.

In Karnataka, *talapariges* exist in the rocky surfaces of the mountainous areas of Tumkur, Kolar and Chitradurga districts. Anantapur and Cuddapah in Andhra Pradesh are also believed to have *talapariges*. Some sources claim that the word is of Telugu origin, though in some places it has local derivatives too.

Many spendoured wonder

Each *talaparige* is different from the other in shape and size. Often, a *talaparige* merely the size of a floor mat can supply water to over hundreds of acres. Some *talapariges* are akin to small tanks. Several *talapariges* can exist in a limited area. These generally form a chain adjoining the slope of the earth with a gap of about



0.5 to 2 km between them. "Water equivalent to a 10 hp outflow is generally available in our *talaparige*," states Dr. Nagaraj Pradhan of Akkiramapur.

Talapariges have another special feature. As they are found below the ground level, water does not normally flow to the adjacent fields. It travels some distance in the canal and then irrigates the lands there.

The instance of the *talaparige* at Rayavara village is interesting. It was situated near a burial ground in the village, it fed water to the fields at Akkiramapur located at a distance of eight km. The villagers of Rayavara village asserted a right over the water in the *talaparige*. Rayavara has about 200 houses and the villagers raised their summer crop using the *talaparige* water. The canal was as wide as the tank canal and its repairs as well as maintenance costs were the responsibility of these villagers. However, for the past few years, drought conditions have affected the *talaparige* and the interest of the villagers is also on the decline. Though the *talaparige* still exists, the canal is full of weeds. Lakshmamma of Akkiramapur says, "We would get good sweet water from this *talaparige* and have had many celebrations here. At that time, the community in Rayavara took care of the canal, but they have now stopped doing so."

The *talaparige* of R. Venkatapura near Akkiramapur was once secured with stone slabs but is now in ruins. "People have gone in for pump sets and borewells. *Talapariges* are lost in this modernity," rues Hanumanthappa, a community member.

Yet, the Hosakere chain of Madhugiri Taluk is a good example of the *talapariges* since there are four contiguous ones over a stretch of 10 km. These are the lifelines for all the surrounding villages.

In another case, the water from the *talaparige* is directed from the main channel to three channels near the paddy fields. This division ensures an equitable distribution to all of them. For this purpose, the gap between each channel is measured. A coconut palm is cut to the right measurement; when placed across the main canal, a uniform volume of water flows out. A *Gonchakara* or a *Gamakara* is appointed to oversee the implementation and distribution of water.

Cultural unity through *talapariges*

The *talapariges* were of great religious significance for the community. Any occasion, whether it was a local festival or religious procession began with worship offered to the goddess Gangamma in the tank centre point. This was significant for it was not a massive *pushkarani*, a historic *kalyani* or even a small natural pond in the rocks. Mostly, square water pits, *talapariges* had stone slabs on three sides and were visible only from close quarters. Yet they held great significance for farmers, as drought patterns could be assessed based on the water levels in the *talaparige*. If

a *talaparige* dried up, it was a signal of difficult times for farmers, and for life of the community itself. A dry 'water eye' was an indication of the water scarcity that was likely to follow.

Talapariges, once a central part of the rural community have mostly fallen into disuse today. While some have dried up due to continuous drought and indifference, others have been encroached upon. One such example is a public *talaparige* near Koratagere town, which has now become part of a private property. Many such instances have virtually erased the tradition of the *talaparige*, thereby destroying entire chains of this unique system.

There is an urgent need to undertake a detailed study of the significance of *talapariges* and revive this beautiful art and science in nature.

Mallikarjuna Hosapalya is a former project coordinator in Communication for Development and Learning. He has a rich and varied experience in agro-rural journalism. He has published a book on different types of millets in kannada.

The friendly water pond

Kuntes

Poornima K.K.

Every village in Karnataka has a kunte, the water, in which, serves several purposes. Situated in or very close to the village, these kuntes also help to maintain the ecological balance in the area around it. However kuntes are facing extinction today due to land encroachments.

Scene I: The harvest festival of Sankranti in the month of January. Everybody in the village has gathered around the village pond along with their cattle. They swim in the water astride their cattle, give them a good rub and are thoroughly enjoying themselves. By the time all the fun and frolicking ends, the water has turned muddy, but the people and cattle are clean!

Scene II: In the district of Mandya, prior to the commissioning of the K.R.S. Dam, one could spot a *kunte* formed in the shallow area of every field. In summer, these *kuntes* turned into patches of green vegetables.

Scene III: Around the villages of Haveri, two or three *kuntes* near every village are a common sight.

These scenes highlight the importance of *kuntes* which were once a common feature in Karnataka's rural life. *Arakere, volakere, devikere, katte, kola* and *kuntes* were also traditionally a part of the range of traditional water harvesting systems in the State. Since ancient times, *kuntes* have been present in almost every village. In north Karnataka, a *kunte* is called a *gund*i and it is also used for aqua culture. The word *kunte* is a derivative of *gunte*; a measure of land. Since every village had at least a *gunte* of land earmarked for water harvesting, this name was later changed to *kunte*.

What are kuntes*?*

A *kunte* is very similar to a pond. It is normally circular in shape and not very deep. It is structured in such a way that the rainwater directly flows into it and is collected in it. Some *kuntes* had a sluice and a natural waste weir, which helped in controlling the water outflow. It is a very simple technique and one that is very friendly to the environment and community.

In addition to the water being used for domestic purposes, these manmade water harvesting pools were also used as soak pits to increase the groundwater level. The water collected in the *kunte* were greatly beneficial in recharging the surrounding open wells. As a natural corollary, the vegetation around the pools

also increased and this in turn helped to maintained the ecological balance in the areas around it.

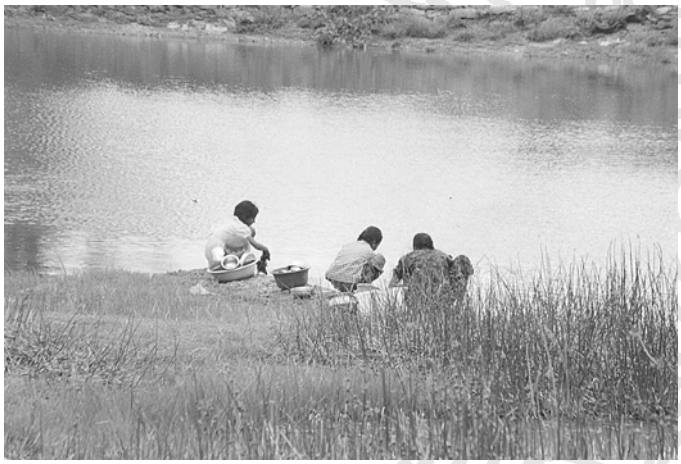
Water from the *kuntes* was also used for growing vegetables, millet and even for soaking paddy fields. Another use for this water is in the brick kiln constructions. The various uses of the *kunte* prove that it was a community asset, which mets community needs and generated livelihood.

Some are of the opinion that *kuntes* and the cattle dikes are one and the same. But this may not be true, as the latter was meant only for animals and was constructed wherever the cattle grazed, whereas the *kunte* was within the village and was meant for human use.

Unfortunately, land encroachments and the ubiquitous borewell have proved to be the undoing for these traditional *kuntes.*

The *kuntes* in Kakola village

The village of Kakola in Doddaballapur Taluk, Bangalore Rural District, was founded in 1902. There are 300 families here and they cultivate millet, paddy, vegetables, oil seeds and pulses. Kakola had a *kunte*, though there was a cattle dike existing even prior to the founding of the village. As the community found it difficult to provide water for their cattle, they dug a pond in the dike, which was initially maintained by the community. One person from each family participated in the dredging and maintenance of the pond to ensure the flow of water into it. Presently, this is now the responsibility of the village Panchayat and is awarded as a contract to a single person.



There is another pond called Marakal-lamma *kunte* in the same village built by a local woman by the same name. She had a new *kunte* built as the earlier *kunte* was encroached upon and the volume of water in it decreased. She did this as a voluntary contribution to the people of the village. Although this pond is very small, water is available throughout the year. In acknowledgement of her service, the people in the village named the *kunte* after her.

The people of Kakola have preserved their faith in the advantages of the traditional *kuntes* and are still reaping the benefits. *Kuntes* were, thus, an integral part of the rural life of Karnataka and it is hard to find a village without this water source. If this simple method of collection is revived, it will go a long way in reducing the drought conditions that have become an annual feature in the State.

Poornima K.K. is a project associate at the Centre for Environment and Education and has a post graduate degree in environmental sciences. Writing is her hobby.

Communication for Development and Learning (CDL) is a Bangalore based not-for-profit organization set up in 1997 to facilitate the use of communication as an integral part of the development process. Recognising that development is about putting people first, CDL has adopted a three-way approach in communication. CDL uses innovative methods of communication with the community while simultaneously learning from them. Placed at the fulcrum of the process of exchange and dialogue, CDL presents a unique three-way communication model, which feeds into both sectors.

Since inception CDL has been working on different thrust areas. Based on these experiences and the emerging understanding, CDL has developed in-house competencies in the following areas:

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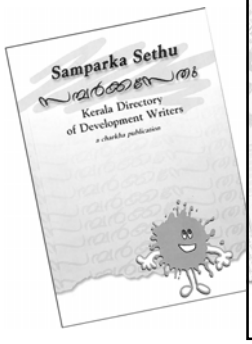

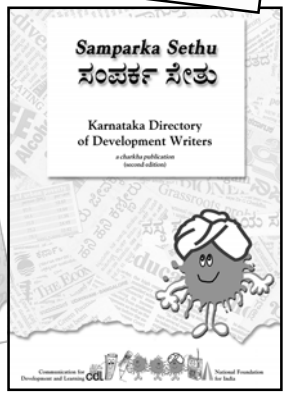

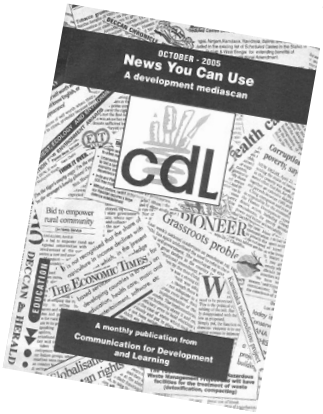

This book is a unique compilation of different water conservation and management practices that have traditionally been used in the state of Karnataka. Each practice is simple, low-cost and in harmony with the local conditions. Based on the knowledge drawn from within the community, each article not only documents the practice, but also attempts to explain the scientific principles underlying the same.

Each of the practices highlights the amazing knowledge of the traditional water engineers and managers in the community.

The publication is an attempt not only to appreciate the concept of traditional water management and to reiterate the value of traditional wisdom that has sustained the water needs of the people of Karnataka for centuries.

Communication for Development and Learning
11/A, 7th Cross, 17th Main Road, Koramangala 6th Block
Bangalore – 560 095
Tel. 080-25503481 Fax: 080-25524192
E-mail: cfdal@dataone.in
www.waterjournalism.org