Re-using Irrigation Drainage

Gonchi Irrigation System in Penna River Basin

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Gonchi Irrigation System in Penna River Basin

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Source:

'Pulusu Neetitho pantala saagu – Penna Nadee parivahaka praanthamlo gonchi kalvala dwaara vari saagu',
Compiled by R. V. Rama Mohan in Telugu language (Oct 2011)

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Foreword

We first came to know about the *Gonchi* seepage channel system of agriculture being practiced in Madirepalli village of Singanamala *mandal,* Anantapuram district during 2005. We were surprised to see the continued existence of this traditional practice and the institutional system under-pinning it. Since we began studying these channels in 2009, we noted that this system is in vogue in many places for generations and accordingly extended the time-frame and geographical scope of our study. We observed that this system is still surviving downstream of canal *ayacut* areas of Mid Pennar Reservoir (MPR) located near Penakacherla village of Garladinne *mandal.* We subsequently extended the scope of the study in a phased manner to the entire *ayacut* area of the two main canals of MPR. *Gonchi* channels not only survived the time but also extended their *ayacut* areas utilizing the irrigation drainage from the *ayacut* of MPR. It would not have been necessary to publish this book if the MPR had not been built in 1968.

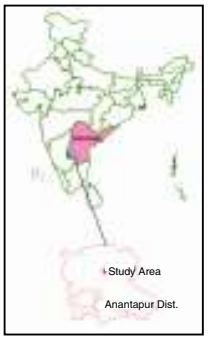
The primary aim of writing this book is not only shedding light on the historical aspects of *Gonchi* seepage channels and traditional water institutions evolved around them but also to highlight the use of Irrigation Drainage *(Pulusu Neeru,* in local parlance) that rejuvenated these channels. Another special feature of this book is that it attempts to introduce local dialects associated with *Gonchi* system to the readers to the extent possible.

Irrigation drainage has always been viewed as a 'problem' in the context of irrigation projects that were constructed before and after the Independence. A lot of focus was placed on getting rid of it from the *ayacut* as efficiently and as soon as possible. In fact, the entire effort in the coastal areas was to divert this drainage water to the sea! The main objective of this book is to inspire our engineers, rulers and officials think about not just the renovation of *Gonchi* channels but to also explore newer ways of expanding *ayacut* areas by utilizing irrigation drainage water.

Penna Ahobilam Balancing Reservoir (PABR) recently constructed in Anantapur district is an obvious opportunity. Releasing water from the right canal of this project into number of irrigation tanks en route will provide ample scope for renovating existing *Gonchi* channels in many villages between the right canals of PABR and MPR. Descriptive memoirs from the British period reveal the existence of a number of *Gonchi* channels in villages such as Marutla, Kalagallu and Udhiripikonda. Though there is no clarity on specific reasons that led to the gradual decline of these channels that were functional until the 1920s, it can be surmised that reduced seepage due to reduction in forests and vegetation in the catchments of channels and insufficient maintenance of the channels due to lack of unity among farmers could be the key factors at play. Special efforts to renovate these *Gonchi* channels will not only lead to fabulous results but also lay the foundation for a new trend in irrigation. Efforts will continue to trace such experiences of using drainage water for irrigation elsewhere and to bring out further publications.

R. V. Rama Mohan

1. Background of Anantapur District



Anantapur district is located in Southern Andhra Pradesh between 13°40' and 15°15' Northern Latitude and 76°50' and 78°30' Eastern Longitude with semi-arid climatic conditions. It belongs to the *Rayalaseema*[1] region of Andhra Pradesh state in India. It is spread across 19,130 sq. km area and has a population of 40,83,315 as per the Census of India 2011. It is bounded on the North by Kurnool district, on the East by Kadapa and Chittoor districts and by Karnataka State on the West and the South. According to historians, the district is named after Anantasagaram, a large tank. Anantapur is the major town and the head-quarters of the district.

Anantapur town is located at a distance of approximately 354 kilometers from Hyderabad and 200 kilometres from Bangalore. It is located close to National Highway No.7 and is well connected with good transport facilities. Most of the people in the district speak Telugu. Kannada is also a popular language in the western and the southern parts of the district which lie adjacent to Karnataka.

The economy of Anantapur district is primarily dependent on agriculture. The government has recognised it as a drought affected district with extremely low rainfall and has been implementing a number of schemes to regenerate natural resources and mitigate the effects of drought on agriculture and other livelihoods. The average annual rainfall of the district is 553 mm only as against the average of 925 mm for the whole of Andhra Pradesh.

Penna, Chitravathi, Hagari (Vedavathi), Papagni and Swarnamukhi are the major rivers that pass through the district. Chitravathi and Papagni are tributaries of River Penna and Hagari is a tributary of River Tungabhadra. Swarnamukhi flows through the southern part of the district into Chittoor district and further to join the Bay of Bengal. Water flows in these rivers only during the monsoon and for a few months later. They remain dry with sand beds and weeds exposed for the most part of the summer and winter seasons. 80% of the district's geographical area falls in the catchment area of River Penna and the remaining 20% under the catchment area of River Krishna.

Total irrigation potential from various surface water schemes in the district is 1.33 lakh hectares as in 2007-08. This accounted for approximately 11% of the total agricultural land of 11.88 lakh hectares in the district. While 39% of the total land under surface water irrigation is the potential of major irrigation projects, 48% is the potential from minor irrigation sources (ponds and tanks only, information about other minor sources is not fully available) (GoAP 2009b). Minor irrigation sources thus play a key role in the district's agricultural scenario. The table below presents details of irrigation potential as well as actual land irrigated by different sources during 2004-2008. While the actual area irrigated by medium and minor irrigation sources is dismal, area irrigated by groundwater is 1.19 lakh hectares, occupying 78.4% of the total area irrigated in 2007-08.

1 *Rayalaseema* is a geographical region in Andhra Pradesh. It includes the southern districts of Anantapur, Chittoor, Kadapa and Kurnool

Project	Total *Ayacut* [2] (Hectares)	Irrigated *Ayacut* (Hectares) *		
		2004 -05	2005 -06	2006 -07	2007 -08
I. Major Projects					
1. Tungabhadra High Level Main Canal (HLC) and Guntakal Branch Canal	51,771	26,513	26,534	23,229	24,877
Sub-total (I)	51,771	26,513	26,534	23,229	24,877
II. Medium Projects					
2. Bhairavanithippa	4,856	0	2,539	275	486
3. Upper Pennar	4,066	0	0	0	0
4. Chennarayaswamy Gudi	445	0	255	364	0
5. Penna Kumudhavathi	2,639	0	0	0	0
6. Pedaballi	607	0	162	0	0
7. Yogi Vemana	5,212	0	674	0	0
Sub-total (II)	**17,825**	**0**	**3,630**	**639**	**486**
III. Minor Irrigation Sources (ponds and tanks) 2,730 in all	63,762	2,355	10,063	2,440	7,337
Sub-total (III)	**63,762**	**2,355**	**10,063**	**2,440**	**7,337**
IV. Groundwater (Wells, Bore Wells, Filter Wells)	Information not available	**1,12,903**	**1,13,379**	**1,11,111**	**1,18,791**
Total (I+II+III+IV)		**1,41,751**	**1,53,606**	**1,37,419**	**1,51,491**

* Source: GoAP (2006, 2007, 2008, 2009b)

The district usually receives its first spell of rain through the south-west monsoon during the first week of June. The effect of the monsoon spell continues till September, after which the district receives rain through the northeast monsoon from October to December. In all, the district has only 20-30 average rainy days during the monsoons. Climatic changes and recurring drought are resulting in acute water shortages and crop loss once in every 2-3 years. Though there are a number of medium and small irrigation sources, they do not receive enough water and are practically defunct. Some projects (such as, Bhairavanithippa) do not receive sufficient water even once in ten years. Many medium and small irrigation projects are not functioning to their full potential due to lack of rainfall, construction of new check dams in upper catchment areas and silting up of their storage areas.

2 *Ayacut* is the command area under an irrigation water source

2. River Penna and Mid-Pennar Reservoir (MPR)

2.1 River Penna

River Penna is also known by the names, Pennar and Penneru. It is one of the major east-flowing rivers in South India. It originates in the Nandidurg Hill Range (part of the Eastern Ghats) in Karnataka and flows downstream in northwestern direction into Anantapur district of Andhra Pradesh. It flows through Kolar and Tumkur districts of Karnataka and enters Andhra Pradesh in Hindupur *mandal* of Anantapur district. It proceeds further eastwards to Kadapa and Nellore districts and joins the Bay of Bengal. Penna traverses a total length of 597 km through its course. Its catchment area lies between $13^0 16'$ and $15^0 52'$ Northern Latitude and $77^0 04'$ and $80^0 10'$ Eastern Longitude.

The table below provides some key details relating to River Penna:

State	Catchment Area (Sq. Km)	Major Tributaries	Catchment Area of Tributaries (Sq. Km)	Average rainfall in the catchment (mm)
Karnataka	6,937	Jayamangala	1,282	508 to 988
Andhra Pradesh	48,276	Chitravathi	5,908	
		Kunderu	8,057	
		Papagni	7,423	
		Sagileru	3,077	
		Cheyyeru	7,325	

The average annual flow in River Penna has been calculated by the Central Water Commission (CWC) as 6.32 cubic kilo metres (CWC 2006:87). From the Anantapur district perspective, out of the total geographical area of 19 lakh hectares, 80% of the land fall in the catchment area of River Penna and 20% in the catchment of River Krishna.

The major dam projects built on River Penna are Somasila, Upper Pennar, Mid Pennar, Mylavaram and Penna Ahobilam. Penna Ahobilam is the most recent one and yet to be operationalised fully. All the other projects have been completed and irrigation and drinking water are being supplied from them. The following table contains the details of schemes in Anantapur district:

Project	Year of completion	Type of Construction	Height of dam (m)	Length of dam (m)	Total Storage Capacity (10^3 cub. m)	Primary Uses
Upper Pennar	1958	Earthen Dam	17	3,505	51,282	Irrigation
Mid Pennar	1968	Earthen Dam & Gravity Masonry	43	1,175	1,46,260	Irrigation
Penna Ahobilam	Under Construction	Earthen Dam & Gravity Masonry	46	2,060	3,14,000	Irrigation, hydroelectricity

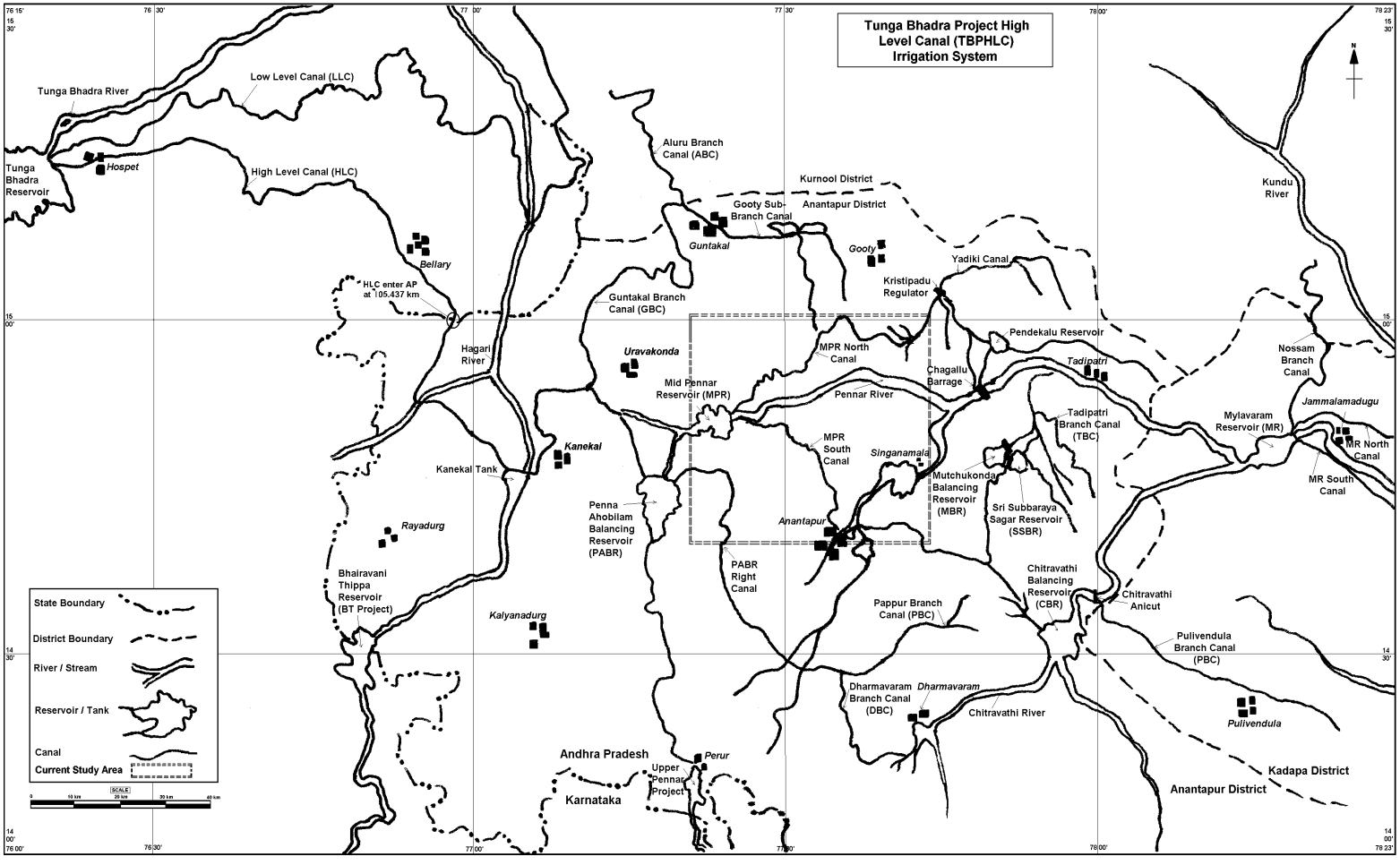
Source: CWC (2009)

2.2 Mid Pennar Reservoir (MPR)

The Mid Pennar Reservoir and villages under its *ayacut* area are the focal points for this field study on *Gonchi* seepage channels. This study attempted to examine the Mid Pennar Reservoir, its main canals on both sides of River Penna (North and South Main Canals); their distributaries; and to establish an interrelation between them and *Gonchi* channels. Therefore, before presenting the details of *Gonchi* channels, a brief introduction to the Mid Pennar Reservoir is given below.

Mid Pennar Reservoir is located near Penakacherla village in Garladinne *mandal* of Anantapur district. Through its North and South Canals on both sides of the river, the Reservoir provides drinking water to nearly 40 villages in Pamidi, Singanamala, Garladinne and Anantapur (Rural) *mandals* as well as to Anantapur town.

The length of the MPR North Main Canal is 58.5 km and that of the South Main Canal is 96.7 km. 5,186 hectares under 19 distributaries of the North Main Canal and 14,194 hectares under 29 distributaries of the South Main Canal have been fixed as the *ayacut* of MPR. However, farmers mostly cultivate paddy in the *ayacut*, as a result of which fields at the tail-end of some distributaries do not receive sufficient water. These tail-end areas are either being irrigated using groundwater or cultivated as rain-fed lands. The Krishna Water Disputes Tribunal allotted 1.87 TMC ft of water to the North Canal and 4.32 TMC ft to the South Canal from High Level Canal (HLC) of Tungabhadra Dam. This water is released through the HLC to the Mid Pennar Reservoir and from there to the North and South Main Canals for supplying water to the *ayacut*. Water is released for the *kharif* crop in August, depending on the release of water from Thungabhadra dam to the Mid Pennar Reservoir. The diagram below illustrates the HLC system of canals and the *ayacut* regions of the MPR.



Source : Index map of TBPHLC System, I & CAD Dept., Andhra Pradesh (Undated)

Preliminary study of *Gonchi* channels has brought out that most of them are located within approximately 60 km downstream of MPR. They originate from the river bed and irrigate lands in the villages on both banks of the river. It was also discovered that water is being diverted into *Gonchi* channels from different points all along Thadakaleru as well as from Pooletivagu streams [3].

It was further found that the seepage water in these *Gonchi* channels reduced proportionate to their distance downstream from MPR. Bearing this is mind, the scope of the *Gonchi* study was restricted to a distance of 60 km downstream of Mid Pennar Reservoir. Similarly, the study limits itself to part of Thadakaleru, i.e., from the origin of Thadakaleru to the point at which it merges with Singanamala tank. Some *Gonchi* channels that originate from Pooletivagu stream have also been included in the book.

3 Thadakaleru and Pooletivagu are streams joining Penna river on southern and northern banks of the river respectively

3. Traditional irrigation Systems in Anantapur district

Tungabhadra High Level Canal (HLC) is the only major water source to Anantapur district. As per data available for 2007-08, HLC's irrigation potential is 51,771 hectares of land. Efforts are underway to supply water to approximately 1.5 lakh hectares of land in the district by expanding irrigation capacity through HLC – Stage 1 and Stage 2 works, Penna Ahobilam Balancing Reservoir (PABR) and Chitravathi Balancing Reservoir (CBR). Apart from this, irrigation facility is created to approximately 17,800 hectares of land through medium irrigation projects such as Bhairavaanithippa, Upper Pennar, Chennarayaswamy Gudi and Penna Kumudhavathi projects. However, due to limited availability of water in major and medium projects, the total area actually irrigated is less than 31,000 hectares annually during 2004-2008.

Groundwater is the other key water resource for irrigation as well as drinking water in Anantapur district. Agriculture was practiced under open wells in the past but with drying up of most of the open wells, bore wells have gained prominence over time. Number of bore wells have gone up significantly during the last 20 years and groundwater emerged as as a major alternative source of irrigation. According to the 4th Minor Irrigation Census, 1,11,566 open and bore wells are irrigating 1,11,000 hectares of land in 2006-07 (GoAP 2009a).

Apart from the above, a number of traditional minor irrigation sources are still operational and are providing farm based livelihoods to small and marginal farmers. The kings of Vijayanagara constructed traditional water harvesting structures in 15th and 16th centuries itself, to meet the drinking water, irrigation and other domestic needs of the people. Many of them that were constructed during their reign 500 years ago continue to be lifelines for many villages even now. Prominent among them are tanks, ponds and water diversion / seepage channels. According to the 4th Minor Irrigation Census, there are 4,155 such tanks, ponds, seepage channels and other minor water sources in the district (GoAP 2009a). Today, many of them are partially or fully defunct, silted up or damaged due to negligence and absence of regular maintenance systems. These traditional sources were neglected by our rulers over time. Indifference of *ayacut* farmers also adversely affected their utility. But, all this has led to recognition, over the last 15 years, of the need to revive them.

A number of wide ranging efforts were made by many individuals, voluntary organizations and officials to protect these traditional sources that are slowly disappearing from the scene. From the first Collector of the district Sir Thomas Munro to officials like Sri Somesh Kumar, voluntary organizations such as RDT and many social activists contributed their bit by desilting and repairing tanks and ponds, collectivizing and motivating farmers to participate in these activities. Crises such as increased

incidence of drought in the district, reduced availability of groundwater and lesser inflows of water into the Tungabhadra HLC also led the rulers to focus attention on these traditional water resources.

Prior to the British rule in India, our kings and rulers not only dug many tanks and ponds but also handed-over the charge of maintaining them to the local farmers. Farmers and *zamindars* (local landlords) were encouraged to dig water harvesting structures and were rewarded in turn with some land under their *ayacut* or part of the revenue generated as water cess, under the *dasabandham* system that was in vogue in those days. Local rulers were given powers to collect water cess and were also given the responsibility of maintaining these structures. Farmers together used to carry out collective maintenance works (*kudi marammathu,* in local language), appoint water managers (*Neeruganti,* in local language) and share water without any conflicts or discrimination. However, it must be noted that the oppressed and underprivileged castes in the society never had equal opportunities in such administrative functions due to dominance by the upper castes.

The collective maintenance and the *dasabandham* systems flourished in *Rayalaseema* region from the period of the Vijayanagara kings (14^{th} – 16^{th} centuries) to the rule of the kings of Mysore (till 1800). Subsequent to the defeat of Tipu Sultan by the British East India Company and the Nizams during the Fourth Anglo-Mysore Battle (1798-99), the East India Company's Madras Presidency was ceded a major part of the Mysore kingdom including today's Anantapur district[4]. From 1800 onwards, Madras Presidency appointed Thomas Munro as Principal Collector of the ceded territory.

Then on, significant changes were brought about in the land cess structure with the primary objective of increasing revenue. The *Ryotwari Patta* (individual land titles) and cess collection were introduced during his time. While encouraging the system of collective maintenance, he arranged for major repairs by the Company. Whenever the beneficiaries of *Dasabandham* lands did not maintain them well, those lands were handed over to others.

In one of the letters written by Thomas Munro to the District Collectors in 1803, he made interesting observations relating to the collective maintenance system. He mentioned that whenever a portion of bund of a pond or tank got damaged, the villagers could either collectively get it repaired or employ the services of expert labour in such works to restore the structure to functional state.

Writing about *Gonchi* seepage channels in Penna river basin and other smaller rivers, he stated that it was quite normal for farmers in ceded districts to maintain and repair these channels. They had also been undertaking desilting and bush clearance activity on their own every year.

4 Based on the details given about Anglo-Mysore wars in http://en.wikipedia.org/wiki/Anglo-Mysore_wars

Following is an excerpt from the letter[5] written by Munro, which is collected from Vundavalli (1995):

> *"It is usual in many places when the damages of Tanks are trifling not amounting to above ten, twenty or thirty pagodas, for the cultivators themselves to make the necessary repairs either by their own labour or by an assessment of grain for the help of waddiwars".*

Writing about seepage channels in the same letter, he said -

> *"The repair of water courses is still more common than that of tanks by the labour of the cultivators. In every part of the country (ceded Districts) water courses are annually cleared out by them and the performance of such works is not regarded as any extra duty more than the payment of their rents. In my division all the water courses from the Pennah and the smaller rivers are kept in repair by the cultivators, those from the Toom Budderah being upon a greater scale and more exposed to damage may perhaps have been most frequently cleared out at the expense of the Sirkar but even in those I imagine that a part of the work had always been done by the cultivators. There is nothing in the expense that ought to be too heavy for them to fear, but it is possible that the work is chiefly required near the heads of the water courses, that it is too much for the inhabitants of the adjacent villages to perform and those of the villages lower down could not assist on account of the distance without suffering great inconvenience. All water courses from tanks ought invariably to be kept in good order by the cultivators themselves. It is only in cases where they may have been choked up from the neglect of many years that they ought to be cleared out at the public expense".*

These words by Thomas Munro reflect the participatory maintenance of tanks and seepage channels in those days. This letter is a valuable source of historical information on the manner in which farmers used to carry out collective maintenance and repairs especially in Pennar river basin. The terms 'Pennah' and 'Toom Budderah' used above are obviously referring to today's 'Pennar' and 'Tungabhadra' respectively.

5 Letter from Thomas Munro to the Collector of Harapanahally and Cumbam, CDR V.648, P.170, 172-173

Participation by farmers and the systems of collective maintenance got weakened by the time power shifted from the East India Company to the British government in 1857. As a consequence, the Madras Presidency enacted the Madras Compulsory Labour Act in 1858 making it binding on farmers to undertake such collective maintenance works, which they had been doing voluntarily until then. The *Ryotwari Patta* system, transfer of control over tanks and other common properties to the government and increased privately-owned irrigation wells were major reasons for these developments. *Tehsildars*[6] and higher level revenue authorities were given control over village committees and powers to enforce compulsory collective maintenance under the Act. Provision was also made under the Act to penalize farmers who did not participate in collective maintenance activity. However, as the Act did not yield desired results, the Government introduced a new system of levying water cess on farmers and in return Government meeting the maintenance costs of irrigation systems through Irrigation Cess Act 1865. Later on, voluntary collective maintenance systems collapsed to a large extent and farmers carried out maintenance works under pressure from these Acts.

During the early 20th century, tanks, ponds and seepage channels and other water resources in the ceded districts were surveyed thoroughly and categorized on the basis of basins and sub-basins. Each basin was divided into sub-basins and mapping of both state-owned and privately-managed water sources was done in a meticulous fashion. These survey reports were published in several volumes. Subsequent to the severe famine during 1876-78, a commission was constituted and based on the recommendations of this commission, a new scheme known as 'Tank Renovation Scheme' was devised. Offices were set up under the scheme between 1880 and 1920 and field studies were done to identify tanks requiring repairs and to prepare cost estimates for the same. Tanks and other minor water sources that have the potential to earn revenue in terms of water cess were given priority and repairs were done. The Revenue and Public Works Departments were given the responsibility of maintaining such renovated sources in future. These details were documented in the reports titled 'Descriptive Memoirs of Irrigation Works'. These reports for some of the basins / sub-basins are available with the Irrigation Department in Anantapur.

Few pages of these reports that are related to Kalyanadrug Minor Basin under Upper Pennar Basin are reproduced here :

6 An official of revenue department at *tehsil* or block level, which is a sub-district unit

DESCRIPTIVE MEMOIRS OF IRRIGATION WORKS

IN THE

KALYANDRUG MINOR BASIN

OF

UPPER PENNER RIVER BASIN.

Position and extent of the minor basin.

This minor basin is a subdivision of the Upper Penner river basin. It is named after the important taluk station of Kalyandrug situated within its limits. It lies mainly in the Kalyandrug taluk of the Anantapur district and in the Rayadrug taluk of the Bellary district. Portions of the minor basin also extend into the Dharmavaram, Anantapur, Gooty and Madakasira taluks of the Anantapur district, and its upper portion lies in the Mysore territory. It covers an area of about 1,078 square miles. It comprises all lands draining into the Penner river between the limits of the Upper and Lower Vedavati minor basins on the west, and Anantapur minor basin on the east. The Gooty minor basin forms its northern boundary, while the Hindupur minor basin lies to the south. The Bangalore-Guntakal line of the Madras and Southern Mahratta Railway traverses the basin at the north-east corner.

Source of supply.

The local rainfall forms the chief source of supply to the irrigation works in this minor basin. There are 63 spring channels which take their source from the Penner and its tributaries.

Rainfall.

The average rainfall for the 40 years ending with 1909 at the following stations which lie within or near the minor basin as registered by the Revenue Department is as follows:—

	INCHES.
Talukas—	
Dharmavaram	20·48
Penukonda	23·91
Kalyandrug	19·93
Uravakonda	21·87
Rayadrug	19·86

And the maximum recorded rainfall in 24 hours as registered are as follows :—

	INCHES.
Dharmavaram, 16th Aug. 1892	7·85
Penukonda, 21st May 1879	7·50
Kalyandrug, 20th Oct. 1880	6·50
Uravakonda, 12th Sept. 1900	9·30
Rayadrug, 14th Sept. 1895	7·60

Maximum flood discharges.

Ryve's formula $D=CM^{\frac{3}{4}}$—c.m.$^{\frac{3}{4}}$ has been adopted for calculating the flood discharges from the catchment areas, the value of C (as a working co-efficient for free catchments) being taken as 350 to 450 according to the nature of the country and that of c as from 70 to 90 respectively for the whole intercepted catchment areas which operate as moderators of flood discharges.

Grouping of irrigation works.

In this minor basin there are 523 irrigation works of which 390 belong to Government, 129 are private and 4 lie in the adjoining Mysore territory. Of the 390 Government works with a total irrigable ayacut of 7,555 acres, the restoration of 37 works has been estimated for. The rest are omitted for the reasons stated against them in the statement of financial details. Three of the Government works are in charge of the Public Works Department and the remaining are in charge of the Revenue Department. There is no dasabandam work estimated for by the Public Works Department.

No. XXII, PENNER KUNTA CHANNEL.

Ayacut 122·20 acres. Assessment Rs. 636-3-0

This channel has its head in the bed of the Penner river about 2 miles north-west of No. 6 Koppalakonda village in Anantapur taluk. It has an average bed width of 6 feet, side slopes 1½ to 1 and bed fall 1 foot per mile and can carry 6 cusecs with a depth of water 1·1 feet.

The channel is in fair order. Irrigation is carried on by means of cuts.

No. XXIII, PENNER KONDA CHANNEL.

Ayacut 272·55 acres. Assessment Rs. 1,451-3-0.

This spring channel has its head about 2¼ miles north-east of Ramapuram, a hamlet of No. 5 Penakacherla village, Anantapur taluk.

The channel has an average bed width of 6 feet, side slopes 1½ to 1 and bed fall 4·71 feet per mile and can carry 8·32 cubic feet per second during dry season with a depth of water one foot. The channel is intercepted by one cross drainage whose catchment area is 1·65 square miles and maximum flood discharge of 417 cusecs and the channel gets filled up when the cross drainage vanka is in floods and it is dug in the bed of the vanka when necessary. Irrigation is carried on by means of cuts. The usual clearance of the channel is attended to by the ryots.

No. CCXXI, PALEM PENNER CHANNEL.

Ayacut 91·25 acres. Assessment Rs. 456-14-0.

This spring channel has its head in the bed of the Penner about 1¼ miles south-west of No. 35, Katrimala village, Gooty taluk, above an anicut 67 feet long. At the head of the channel there is a head sluice having a vent one foot wide and 1½ feet high.

The channel has an average bed width of 4 feet, side slopes 1½ to 1 and bed fall 2½ feet per mile and can discharge 3·97 cubic feet per second with a depth of water one foot.

The channel is intercepted by two cross drainages, the first having a free catchment basin of 1·78 square miles with a maximum flood discharge of 438 cusecs and the second one having a free basin of 10·56 square miles and a combined basin of 13·27 square miles with a maximum flood discharge of 1,680 cusecs. There are no masonry works and the channel, which gets filled up during floods, is dug in the bed of the vanka when necessary.

An in-depth study of the memoirs would enable us to understand how detailed and technically-sound they had been written. Some of the ponds, tanks and channels mentioned in these reports, which were written nearly 100 years ago, no more exist in those villages today. There are also slight differences in the names of villages or water sources given in these reports and their present nomenclature. These must be

understood as changes that took place over time. As a part of the present study, data related to some of the seepage channels was collected from the field and compared with that extracted from the memoirs. Following table presents these details:

Sl.	Village	Mandal	Present Study (2010)		Details given in the Memoir *		
			Seepage Channel	Kharif *Ayacut* (Acres)	Seepage Channel**	Total *Ayacut* (Acres)	Average *Ayacut* of 5 years (Acres)
1	Koppalakonda	Garladinne	Konda kaluva	300	Penner Konda kaluva (XXIII, Pg. 40)	272.55	267.51
			Kunta kaluva	250	Penner Kunta kaluva (XXII, Pg. 40)	122.20	120.78
2.	Kesavapuram	Garladinne	Pedda kaluva	400	Penner Pedda kaluva (XX, Pg. 39)	199.33	173.90
			Chinna kaluva	350	Penner Chinna kaluva (XXI, Pg. 40)	151.23	147.35
3.	Kathrimala	Pamidi	Eguva kaluva	100	Kathrimala Penner Pedda kaluva (CCXVI, Pg.88)	98.20	62.58
			Diguva kaluva	100	Kathrimala Penner Kotha kaluva (CCXVII, Pg.88)	80.52	48.69
4.	Palyam	Pamidi	Eti kaluva	150	Palyam Penner kaluva (CCXXI, Pg.89)	91.25	59.50
5.	Appajipeta	Pamidi	Appajipeta Eti kaluva	200	Appajipeta Penner kaluva (CCXXII, Pg.89)	148.19	121.07
6.	Kandlapalli	Pamidi	Vanka kaluva and Eti kaluva (together irrigate one *ayacut* area)	150	Kandlapalli Penner kaluva (CCXXIV, Pg.90)	104.50	90.38

* Source: Madras Presidency (1922)
** Page number indicates reference to specific channel in the memoir

A closer look at the table would bring out some interesting changes that took place over time. Further, these memoirs inform us that head sluices were present at the points where the Kathrimala Pedda kaluva[7], Kathrimala Kotha kaluva and Palyam Eti kaluva took-off from the river Penner. Today, we do not find these head sluices, but spring heads (*thalipiri*, in local language). We may thus conclude that these seepage channels primarily functioned as surface water diversion channels during the 1920s. Farmers dug *thalipiris* and modified the channels as seepage channels when the flow of surface water dwindled. However, the memoirs inform us that channels like Kandlapalli Eti kaluva, had already been receiving water through a *thalipiri*.

7 *Kaluva,* in local Telugu language, means a channel that carries irrigation water to its *ayacut*

A comparison between the *ayacut* of the channels listed in the table, during 1920s and the present, reveals some surprising facts. The extent of the *ayacut* has gone up miraculously by 12% – 154% during these 100 years, but not for the reasons extraneous to the science of hydrology. The seepage channels of those days depended on natural rainfall and on the inflow of rainwater into River Penna and other streams. Subsequent to the construction of the Mid Pennar Reservoir and its North and South Canals in 1968, "new water" entered the catchment area of the river and changed the Hydrological Cycle of Penna basin. Water from Tungabhadra dam passed through the High Level Canal (HLC) and entered Mid Pennar Reservoir, increasing water seepage from the reservoir into the sand on the downstream river bed. Over and above, irrigation drainage from the *ayacut* of the MPR canals also merged with the water in the river and the streams, augmenting seepage flows in *Gonchi* channels. The end result is a significant increase in the *ayacut* of the seepage channels over the last 100 years.

Even though a detailed study of these seepage channels and their geographical conditions was done during British times, not much effort was made to study and document the social institutions that developed around them, especially social regulations and the indigenously-formed, self-managed *Gonchi* committees.

Farmers in the *ayacut* areas of seepage channels conceived this *Gonchi* system without external interventions or financial support from individuals, voluntary organizations or governments and are still managing them cooperatively in a manner that is beyond the imagination of any contemporary social scientist or researcher. They are also managing these irrigation systems overriding differences of caste, religion, political affiliation or ideology. This study team found this to be quite unbelievable and felt that this social knowledge is quite precious for the current generations. Therefore, remaining chapters of this book place greater focus on such social organization, cooperation and the wonderful institutional system of *Gonchi*.

4. Gonchi System – Management

4.1 About *Gonchi*

Gonchi method or the institution of *Gonchi* refers to the system wherein farmers in the *ayacut* of seepage channels practice agriculture by equitably distributing water; carry out operation and maintenance themselves and resolve all the disputes through collective and informal regulations. These seepage channels take off from a river or stream and normally have a length of 2-6 km. Each of them typically supplies irrigation water to 100-400 acres of land in one or two villages. Farmers formulate social regulations, maintain the channels and undertake repairs by themselves under this system. This system has been in vogue in Anantapur district for generations but there is little information available about the etymology of the word '*Gonchi*'.

4.2 Components of the *Gonchi* System

The physical structure of a typical *Gonchi* system has the following four primary components:

1. *Thalipiri*
2. *Gonchi* main channel
3. Network of distribution channels
4. Command area or *ayacut*

4.2.1 *Thalipiri*

Thalipiri refers to a deep trench in the shape of a basin that is dug on the bed of a river or stream. It usually has a depth of 6-15 feet and is suitably designed to enable water flow into the seepage channel by gravity. Whenever there is a copious inflow of water into the river or the stream during the rainy season (June-September), part of this water emerges as seepage in *thalipiri* and enters the seepage channel. *Gonchi* farmers undertake desilting and bush clearance activity at least 2-3 times a year to enable water to pass freely through the seepage channels. Even when there is no flow of water in the river, seepage from *thalipiri* continues to feed the channels till March – April. *Ayacut* farmers harvest and make optimal use of these low flows for cultivating a second crop of paddy.

4.2.2 *Gonchi* Main Channel

The channel that carries seepage water from the *thalipiri* towards the *ayacut* is referred to as the main channel. These channels usually are 2-6 km long, with a depth of 2-3 m. These Channels are dug with mild slopes over their length so as to facilitate gravity flow of water.

4.2.3 Network of Distribution Channels

Distribution channels are dug to divert water from the main channel to the *ayacut.* Each of these distribution channels, which branch out of the main channel at different points along its length, is designed to irrigate 20-50 acres. Farmers dig two or more smaller channels from each of these distribution channels to direct the water to different parts of its designated *ayacut*. The *ayacut* under each of these distribution channels and the individual farmers to benefit are thus predetermined.

A wooden plank, locally called *pantham or pantham moddu,* is used to measure and release water proportionately from the main channel to the distribution channels and from there to the smaller channels. In some villages, *pantham* is not used for water distribution but each farmer is given water for a fixed amount of time on rotation basis. The duration for which water is to be released to each farmer is calculated on the basis of available flow from the *thalipiri* and aggregate area sown in the *ayacut*.

Normally, *pantham* measures 3-6 m long with a square or rectangular cross-section. On one of its faces, slots of different widths are incised, each having depth of around 5 cm. *Pantham* is placed across the channel with the slots facing upwards. Two or more channels are made downstream of the *pantham* in such a way that each such channel receives water passing through a slot on the *pantham.* The width of the slot is made in proportionate to the *ayacut* under that particular channel originating from it, a measure of four finger-widths (approximately 6-7 cm) per acre being the usual norm. Thus these wooden planks help to measure and regulate the water flow to different parts of *Gonchi ayacut* area.

4.2.4 *Ayacut*

Water flows by gravity from the *thalipiri* to the *ayacut* under the *Gonchi* system without any mechanical lifting of water. When water is released from the distribution channels to the *ayacut*, farmers under that distribution channel receive water on a rotation basis, especially when seepage goes down after January month. Since, the area of land to be sown by each farmer during the *Kharif* (Aug-Dec) and *Rabi* (Dec-March) is decided by the *Gonchi* farmers collectively beforehand based on water availability, they do not face much water shortage problems. When the availability of water in the channel goes down considerably during March – April, water is released to farmers for 45 minutes to one hour turns. Some farmers also irrigate their fields using 'hand bores' (shallow bore wells drilled manually) to counter the water shortages at the tail-end of the *Rabi* crop period.

'An abandoned hand bore with slotted casing pipe

4.3 *Gonchi* Committee – Management Structure

Farmers have been managing the *Gonchi* seepage channels on their own for generations. The *ayacut* farmers form themselves into a committee irrespective of their individual political affiliation or caste and take up this responsibility voluntarily. *Gonchi* committees are formed for each village wherever two or more villages have *ayacut* under one seepage channel.

4.3.1. Identification of *Gonchi* leader

The leader or elder in-charge of the *Gonchi* committee is called *pinnapedda* or *gonchigadu,* in local Telugu language. All the *Gonchi* farmers assemble and identify one of them as the leader of their committee. The leader is retained for the next term or replaced after 2 or 3 years, based on the performance. The leader has special powers in areas such as water management, distributing water among farmers, repairs to the channel etc. The *ayacut* farmers are bound to abide by the decisions of the leader. Anyone opposing or not complying with the decisions of the leader shall pay a fine, whose value is already decided by the committee for that particular channel. The leader also has the authority to stop releasing water to a farmer in the *ayacut* if the farmer violates agreed norms or uses water deviating from the decisions taken by the committee.

The leader is not only given special powers but is also held in high regard. Though he is not paid an honorarium, he discharges his duties in a very responsible manner. He also acts as a mediator to solve disputes in the context of water sharing between *ayacut* farmers and between villages. It is notable that most disputes between farmers are ephemeral and are solved right at the level of committee.

4.3.2 Identification of *Neeruganti*

One or two *neerugantis* (water managers in the *ayacut*), proficient in irrigation water management, are appointed to take care of water distribution in the *Gonchi ayacut* and to supervise the water sharing in an equitable manner. They visit different parts of the *ayacut* during the *Kharif* and *Rabi* seasons and ensure the flow of water from the main channel to distribution channels and sharing of water between farmers within the *ayacut* area of the distribution channels. They follow the instructions of *pinnapedda* and report to him on day-to-day operations. The *ayacut* farmers compensate *neerugantis* by giving them a specified proportion of their produce at the end of the harvesting season. The *neerugantis* thus earn additional income while practicing agriculture in their own lands.

4.3.3 *Gonchi* channel maintenance works

Regular maintenance and repairs to channels assume great significance under the *Gonchi* system. Since *thalipiris* and channels originate from the bed of river or a stream, it is common for loose sand to slip and silt up the *thalipiris* and for the bunds of the channels to get damaged by the force of flowing water. Water inflow gets reduced and crops dry up if this desilting activity is not done periodically and in a timely manner during the crop season. Outgrowth of bushes and grass in the *thalipiri* and the channels obstruct water flow. Though they are cleared at periodical intervals, they resurface within no time, creating an obstruction to smooth flow of water.

Farmers, therefore, undertake joint bush clearance and desilting activity at least 2-3 times during each of the *Kharif* and *Rabi* seasons. In addition, stone structures were built or pipes laid across these channels for people and carts to tread across them. These structures were provided with pitching in stone on both upstream and downstream sides to prevent breaches to the bunds of the channels. These stone structures suffered damage over time and the loose stones that slipped into the channels began blocking the flow of water. Bunds of channels, which are made of loose sand and earth, got breached at some points resulting in wastage of water.

Whenever it was necessary to undertake maintenance works relating to the *Gonchi* channels, farmers assemble at the village level to discuss and identify the channel lengths where desilting and bush clearance works to be carried out. Each farmer assumes responsibility of sending one person (as labourer) for each acre they own in the *Gonchi* channel area. Public announcements (*dandora*, in local Telugu language) were made a day in advance calling upon them to participate in bush clearance and desilting activity. It would also be made clear to them that they have to pay fine (*kuntu* or *thappu*, in local Telugu language) to the extent of Rs. 50-100 per day if they do not take part in these works. Farmers undertake maintenance works on the appointed date under the supervision of the *Gonchi* leader (*pinnapedda*). This activity is taken up twice or thrice in each crop season to ensure sufficient water supply to crops. Meetings are also held by the farmers during religious and local festivals to decide on the use of money collected through the fines. The leaders maintain a record for the fines collected and keeps track of expense made from this account, if any.

Prayers and animal sacrifice are performed to village deities *Musalamma, Pothalaiah* and *Gangamma* after the *Ugadi* festival in March. The farmers later share the meat of animal sacrifice amongst themselves. They also distribute sweets and

snacks amongst the *ayacut* farmers during such occasions. The money collected through the imposition of fines are also used to undertake repairs to village temples. This money is also used to carry out maintenance works in *Gonchi* channels, in cases of emergency. In addition, farmers also contribute cash for any large-scale desilting works using machines once in few years.

4.4 Benefits of the *Gonchi* system

The *Gonchi* system of irrigation has been recognized as an important water facility in villages covered by the study. Farmers grow one or two paddy crops every year in the *Gonchi ayacut* leading to household food security as well as well-being. They are able to afford better amenities at home and provide better education to their children. In addition, following are important household and community level benefits derived by the *Gonchi* farmers:

- Drinking water is available to livestock and washermen get access to water for washing clothes

- Self-sufficiency in fodder has been achieved and shepherds do not have to go to other places in quest of fodder
- Seepage channels recharge groundwater all along their course resulting in increased water availability from bore wells and revival of dried up wells. Farmers use water from bore wells to grow Sweet Orange orchards in dry land areas

- Productivity of paddy crop is reported to be better when irrigated with *Gonchi* water than under bore well irrigation
- Drinking water bores do not go dry due to enhanced recharge from *Gonchi* channels and there is no water scarcity even during the summer months in these villages
- Small and marginal farmers as well as farm labourers have better employment opportunities within villages as cultivation of more than one crop in *Gonchi ayacut* provides employment throughout the year
- Marginal and small farmers dependent on the *Gonchi* system are brought on to a common platform and a spirit of unity; cooperation; collective ownership and informal social regulations have been fostered by the *Gonchi* system.

4.5 Social Regulations in *Gonchi* system

Informal regulations that are agreed upon and pursued by the *Gonchi* farmers are very special. These regulations have been in existence for hundreds of years and are being adhered to in word and spirit, setting high standards in water management and equitable distribution. Some of the important regulations are as under:

- People belonging to other villages are not allowed to extract sand from around the channels and *thalipiri*
- People living in *Gonchi* villages may extract and carry sand only by using bullock carts only for their own use
- No bore wells shall be dug close to *thalipiris* or in the vicinity of channels. All existing bore wells shall be removed so as to avoid drying up of seepage channels
- Contributions shall be made by farmers in addition to the money raised through imposing fines, if necessary, to fund channel renovation and maintenance works
- *Gonchi* farmers shall contribute labour (1 labourer per each acre of land under the *Gonchi ayacut*) and undertake bush clearing and desilting activity without fail on specified dates fixed by the committee and leader
- Desilting activity shall be taken up between 5 to 11 am and again between 3 to 6 pm during the summer months
- Anyone failing to participate in maintenance works would be levied a fine of Rs. 25-50 for half-day of absence and Rs. 50-100 for a full-day absence. The leader would vouch for the receipts and use of such money collected by imposing fines
- All farmers in the *ayacut* shall share water from the channel equitably. Anyone transgressing this rule shall not be supplied with water.
- Farmers shall utilize *Gonchi* water only for the allotted length of time – usually for 45-60 minutes at a time on a rotation basis

- Fine of Rs. 500-1,000 would be levied on farmers who fail to participate in the desilting and bush clearance works for a whole year
- Revenue generated through fines should be used for maintenance and developments of the *Gonchi* channels. The leftover money may be shared among the farmers or used to celebrate festivals. A decision in this regard should be taken in consultation with all farmers in committee meetings
- Desilting and development works must be taken up in the *Gonchi talipiri* and channels 2-3 times each in the *Kharif* and the *Rabi* seasons
- Water supply to be stopped to farmers who do not participate in *Gonchi* maintenance works and who do not comply with the decisions of the committee
- Planning for the *Kharif* and *Rabi* crops must be taken up on the basis of availability of water and all the *ayacut* farmers must adhere to the decisions made by the committee
- Farmers extracting water in contravention of the decisions taken by the committee and the leader would be penalised to the tune of Rs. 300 and farmers extracting sand in the vicinity of the channels would be imposed fine to the extent of Rs. 2,000. Especially, this norm is being implemented in Vankaraju kalva village of Pamidi *mandal*, Anantapur district.

4.6 Setbacks to farmers in the process of sustaining *Gonchi* channels

Though farmers are maintaining the *Gonchi* channels with great unity and success, they are also facing problems occasionally from fellow farmers in their village and from other villages. Controlling and regulating the extraction of sand and drilling of bore wells in the vicinity of channels are the two major challenges faced by all the *Gonchi* farmers and evidence from the past indicate that *Gonchi* committees fairly succeeded in facing such issues. Following are some of such instances in the past -

- Conflicts arose when the farmers prevented outsiders from extracting sand in their villages and the issue was taken to the notice of the police officials and the District Collector. Such conflicts occurred in the recent past between Koppalakonda and Kottalapally villages; Kesavapuram and neighbouring villages; Nidanavada and surrounding villages
- *Gonchi* farmers fought with farmers from their own villages in the process of placing restrictions on the drilling of bore wells near *thalipiris* and channels in Koppalakonda and Palyam villages
- Some farmers were indifferent to the *Gonchi* and not participating in meetings as well as maintenance works. Village elders and the *Gonchi* leaders counseled and convinced them to come forward with active participation
- Steps taken to prevent encroachments on *Gonchi* channels and *thalipiris* have been quite successful in most of the *Gonchi* systems. However, some of them (such as Pedda kaluva and Sannaram kaluva in Illuru of Garladinne mandal) have vanished due to illegal encroachments and the extraction of sand around *thalipiris.*

- Conflicts arose in distribution and sharing of water between Podaralla and Regadi Kothur. Similar incident that had occurred between Boyakottala and Govindampalli villages in the past was settled with the interventions of elders from those villages.

4.7 Major problems faced by *Gonchi* system

Most important problems faced by the *Gonchi* system, that were observed in this study are as follows:

- There is a lot of outgrowth of grass and bushes in the *thalipiris,* which has adversely affected the seepage in-flow. This problem has been particularly witnessed in channels studied in Pamidi *mandal*. Earthen bunds of the channels got breached at some points along the length, causing leakage and wastage of water back to the river or streams. Stone walls or checks to plug these breaches would help to solve this problem permanently

- Sufficient water is not available for fields at the tail-end of the *ayacut* areas resulting in wilting of paddy crop, especially, during the fag-end of *Rabi* season, due to reduced seepage inflow in *thalipiris.* This problem can be adressed by desilting the bed of *thalipiris* and thus increasing seepage inflow
- Though the extent of cultivated land under the seepage channels has gone up by using fallow lands for agriculture, crop loss is still prevalent due to water shortage during the summer time

- Extraction of sand near the *thalipiris* and the channels has also resulted in reduced availability of water during the summer
- Some *Gonchis* have partially disappeared and some others have completely vanished due to encroachments on the channels

Sand mining from the bund of *talipiri*

- Pipe culverts and stone structures at road crossings got damaged and are obstructing the flow of water in channels. The necessity of bigger investments in their maintenance works has hindered *Gonchi* committees from taking up these works.

4.8 Reasons for sustaining *Gonchi* System over generations

Cohesive and exuberant *Gonchi* farmers' committees and the social norms and regulations pursued by them have primarily helped to sustain the *Gonchi* system over generations. Though the *Gonchi* committees could be given credit for implementing the norms and social regulations in an effective and sustainable manner, no channel could have survived in the absence of seepage in the *thalipiris*. Favourable, timely monsoons and green cover in the catchment area had resulted in the prolonged availability of seepage in these channels during the early days. Geographical and social changes affected the seepage channels in Anantapur district and led to their extinction over time.

However, construction of the Mid Pennar Reservoir (MPR) over River Penna in 1968 veered off many *Gonchi* channels located downstream from decline and contributed to their revival. Percolated water from the reservoir and irrigation drainage from the MPR *ayacut* is flowing down to the river and streams and re-emerging in the *thalipiris* as seepage water. This resulted in a gradual increase in the extent of land irrigated under seepage channels in villages downstream of the reservoir and its North and South Main Canals, bringing new light in the lives of the farming families.

5. Mapping and Renovation of Seepage Channels

During the course of the field study, information related to the location of the channels, their origin, present functional condition as well as the constitution and functioning of *Gonchi* committees was gathered for 37 seepage channels in 27 villages downstream of Mid Pennar Reservoir, spanning 60 km along the length of the river Penna. In this study done over one year period, the study team not only met and interacted with *Gonchi* farmers but also personally visited the *Gonchi* origin points (*thalipiris*) in every seepage channel; important sections of the channel; damaged structures; and recorded the details. An attempt was also made to plot the spread of these seepage channels in the catchment areas of Penna river and Thadakaleru stream on a map.

Topo sheets prepared by the Survey of India in 1974-75 (6-7 years after the completion of the Mid Pennar Reservoir) were used as the basis for this study. These maps are not only very descriptive and comprehensive but also contain details of nearly all seepage channels and proved to be very useful in the study. However, the maps do not contain information on the names and the lengths of these seepage channels, making it difficult to compare them with the details collected through field surveys.

This problem was overcome using GPS techniques by measuring the latitude and longitudes of number of points along the channels and the coordinates of the *Gonchi thalipiris.* This information was used to easily correlate with the channels marked in the topo-maps. In addition, channels that had dried up and completely abandoned were separated based on the field survey and the same were not included in the map preparation. Satellite images taken on 17th December 2005 (IRS-P6, LISS-III) were used to identify changes in the alignment of channels after the preparation of topo-maps during 1974-75 and to pin-point few smaller channels that were omitted in topo-maps. The positions and alignment of the channels in the topo-maps were adjusted using the GPS coordinates and the satellite images and were integrated to generate a simple map using the ArcGIS software. Thus, this study, which was carried out in four stages (1. Information gathering at the village level; 2. GPS survey of channels; 3. Examination of topo-maps; and 4. Study of Satellite images), identified and mapped those channels that were either partly (or) fully functional (or) had the potential of being revived. The Map that was generated not only includes information on 37 seepage channels but also clearly demarks North and South Main Canals of the Mid Pennar Reservoir and their distributaries. Also, flow of drainage water from the command areas of MPR distributories to re-emerge in *Gonchi* channels is also indicated. The hydrological relation between Mid Pennar Reservoir and the seepage channels has thus been clearly established by over-laying them using a single map. Annexure I contains details of GPS coordinates relating to the 37 seepage channels and the villages studied. Annexure III presents the map that meticulously depicts these seepage channels.

Out of these 37 seepage channels, renovation works were carried out in 15 channels during 2010-12 with financial support from Diversion Based Irrigation (DBI) program of Jamsetji Tata Trust (JTT), Mumbai. *Gonchi* committees and farmers not only planned and executed works, but also contributed 25% of the costs in cash. *Gonchi* committees of these 15 channels were federated as *'Penna Gonchi Sanghala Samakhya '*.

Brief profile of each of these 37 channels follows including pictures of *thalipiris*, channels and renovation works done.

Koppalakonda

Village	:	Koppalakonda
Gram Panchayat	:	Koppalakonda
Mandal	:	Garladinne
Total families in the village	:	420
Agricultural families in the village	:	390
Total population of the village	:	2,050
Female	:	1,085
Male	:	965
Total extent of land in the village	:	4,223 acres
Land under cultivation	:	4,013 acres
Fallow land	:	210 acres
Primary crops grown in the village	:	Paddy, Groundnut, Sweet Orange
Primary water sources in the village	:	*Gonchi* channels, MPR South Canal, Bore Wells
No. of *Gonchi* in the village	:	2
Names of the *Gonchi* channels	:	Konda kaluva, Kunta kaluva
Present condition of *Gonchi*	:	Channels covered with grass, shrubs and silted up

Details of *Gonchi* channels:

Sl. No.	Name of *Gonchi*	Water Source	Length of channel (km)	*Ayacut* farmers	Irrigated Land (acres)		Names of *gonchigallu*	MPR South Canal Distributary	Land irrigated under MPR (acres)
					Kharif	*Rabi*			
1	Konda kaluva	*Thalipiri* from the bed of River Penna	6	188	670	300	Nallappa	3	450
2	Kunta kaluva	*Thalipiri* from the bed of River Penna	5	150	250	250	Obulesu		

Kesavapuram

Village	:	Kesavapuram
Gram Panchayat	:	Kesavapuram
Mandal	:	Garladinne
Total families in the village	:	265
Agricultural families in the village	:	240
Total population of the village	:	1,185
Female	:	596
Male	:	589
Total extent of land in the village	:	3,014 acres
Land under cultivation	:	2,949 acres
Fallow land	:	65 acres
Primary crops grown in the village	:	Paddy, Groundnut, Sweet Orange
Primary water sources in the village	:	*Gonchi* channels, MPR South Canal, Bore Wells
No. of *Gonchis* in the village	:	2
Names of the *Gonchi* channels	:	Pedda kaluva, Chinna kaluva
Present condition of *Gonchis*	:	Outgrowth of grass and thorny shrubs in the channels

Details of Gonchi channels:

Sl. No.	Name of *Gonchi*	Water Source	Length of channel (km)	*Ayacut* farmers	Irrigated Land (acres)		Names of *gonchigallu*	MPR South Canal Distributary	Land irrigated under MPR (acres)
					Kharif	*Rabi*			
3	Pedda kaluva	*Thalipiri* from the bed of River Penna	5.0	150	400	400	Rami Reddy	3	250
4	Chinna kaluva	*Thalipiri* from the bed of River	4.5	120	350	350	Venkatanar ayana		

Muntimadugu

Village	:	Muntimadugu
Gram Panchayat	:	Muntimadugu
Mandal	:	Garladinne
Total families in the village	:	196
Agricultural families in the village	:	185
Total population of the village	:	1,010
Female	:	525
Male	:	485
Total extent of land in the village		830 acres
Land under cultivation	:	800 acres
Fallow land	:	30 acres
Primary crops grown in the village	:	Paddy, Groundnut, Sunflower
Primary water sources in the village	:	*Gonchi* channels, MPR South Canal, Bore Wells
No. of *Gonchis* in the village	:	2
Names of the *Gonchi* channels	:	Konda kaluva, Eguva kaluva
Present condition of *Gonchis*	:	The channels are filled with grass and shrubs

Details of *Gonchi* channels:

Sl. No.	Name of *Gonchi*	Water Source	Length of channel (km)	*Ayacut* farmers	Irrigated Land (acres)		Names of *gonchigallu*	MPR South Canal Distributary	Land irrigated under MPR (acres)
					Kharif	*Rabi*			
5	Konda kaluva	*Thalipiri* from the bed of River Penna	2	85	150	0	M. Damodar Reddy	5	550
6	Eguva kaluva	*Thalipiri* from the bed of River Penna	2	45	60	60	Venkata Reddy		

Patha Kalluru

Village	:	Patha Kalluru
Gram Panchayat	:	Kalluru
Mandal	:	Garladinne
Total families in the village	:	408
Agricultural families in the village	:	375
Total population of the village	:	2, 085
Female	:	1,075
Male	:	1,010
Total extent of land in the village	:	1,782 acres
Land under cultivation	:	1,760 acres
Fallow land	:	22 acres
Primary crops grown in the village	:	Paddy, Groundnut, Guava
Primary water sources in the village	:	*Gonchi* channels, MPR South Canal, Bore Wells
No. of *Gonchis* in the village	:	1
Name of the *Gonchi* channel	:	Patha Kalluru kaluva
Present condition of *Gonchi*	:	The channel is filled with sand and grass

Details of *Gonchi* channel:

Sl. No.	Name of *Gonchi*	Water Source	Length of channel (km)	*Ayacut* farmers	Irrigated Land (acres)		Names of *gonchigallu*	MPR South Canal Distributary	Land irrigated under MPR (acres)
					Kharif	*Rabi*			
7	Patha Kalluru kaluva	*Thalipiri* from the bed of River Penna	12	180	300	300	Angajala Pullanna Angajala Kishtanna	5	430

Illuru

Village	:	Illuru
Gram Panchayat	:	Illuru
Mandal	:	Garladinne
Total families in the village	:	1,150
Total population of the village	:	5,400
Female	:	2,850
Male	:	2,550
Total extent of land in the village	:	5,250 acres
Land under cultivation	:	5,150 acres
Primary crops grown in the village	:	Paddy, Groundnut, Mango, Sunflower
Primary water sources in the village	:	MPR South Canal, Bore Wells
No. of *Gonchis* in the village	:	1
Name of the *Gonchi* channel	:	Pedda kaluva
Present condition of *Gonchi*	:	The *Gonchi* channel as well as *thalipiri* is filled with silt, sand and has been defunct for 15 years

Details of *Gonchi* channel:

Sl. No.	Name of *Gonchi*	Water Source	Length of channel (km)	*Ayacut* farmers	Irrigated Land (acres) *		Names of *gonchigallu*	MPR South Canal Distributary	Land irrigated under MPR (acres)
					Kharif	*Rabi*			
8	Pedda kaluva	*Thalipiri* from the bed of River Penna	5	140	0 (250)	0 (250)	Mekala Peda Nallappa Narayanaswamy	5	520

* The figures in brackets denote total area of *ayacut*. The *Gonchi* is currently defunct.

Reasons for defunct status of *Gonchis*:

The three *Gonchis* in the village (Sannaaram kaluva, Kotha kaluva and Pedda kaluva) lost water seepage due to over-mining of sand around their *thalipiris* and channels, thus these channels got gradually filled-up with sand. With increase in level of channel bed, water stopped flowing by gravity from *thalipiris* to channels. Also, few farmers occupied channel areas and started cultivating crops. *Gonchi* channels got completed ignored after the MPR canal was constructed to the village. But, the Pedda kaluva, whose details are given above, has potential for revival.

Kallumadi

Village	:	Kallumadi
Gram Panchayat	:	Kallumadi
Mandal	:	Singanamala
Total population of the village	:	3,200
Female	:	1,640
Male	:	1,560
Total families in the village	:	730
Total extent of land in the village	:	3,800 acres
Land under cultivation	:	3,650 acres
Primary crops grown in the village	:	Paddy, Groundnut, Sunflower
Primary water sources in the village	:	Water from the MPR South Canal, Bore Wells
No. of *Gonchis* in the village	:	1
Present condition of *Gonchi*	:	The *Gonchi* is filled with silt / sand and is totally defunct. However, it is possible to renovate the system.

Details of *Gonchi* channel:

Sl. No.	Name of *Gonchi*	Water Source	Length of channel (km)	*Ayacut* farmers	Irrigated Land (acres) *		Name of *gonchigadu*	MPR South Canal Distributary	Land irrigated under MPR (acre)
					Kharif	*Rabi*			
9	Kallumadi kaluva	*Thalipiri* from the bed of River Penna	2	88	0 (100)	0 (100)	Chinnakrishna Reddy	5	420

*The figure in brackets denotes total land under the *ayacut*.

Reasons for disappearance of the *Gonchi* system:

Seepage in the *thalipiri* has gone down due to over-extraction of sand around it. The *Gonchi* channel is also filled with silt and sand. Farmers had not cared much for the *Gonchi* after the construction of the MPR canal. As groundwater is available at shallow depths, farmers are also depending on bore wells to meet their irrigation needs.

Nidanavada

Village	:	Nidanavada
Gram Panchayat	:	Nidanavada
Mandal	:	Singanamala
Total population of the village	:	1,150
Female	:	592
Male	:	568
Total families in the village	:	275
Agricultural families in the village	:	260
Total extent of land in the village	:	1,200 acres
Land under cultivation	:	1,150 acres
Fallow land	:	50 acres
Primary crops grown in the village	:	Paddy, Groundnut, Sweet Orange, Lime, Banana
Primary water sources in the village	:	*Gonchi*, MPR South Canal and Bore Wells
No. of *Gonchis* in the village	:	1
Name of *Gonchi* channel	:	Pedda kaluva
Present condition of *Gonchi*	:	This *Gonchi* was renovated in 2009 and is presently in functional state

Details of *Gonchi* channel:

Sl. No.	Name of *Gonchi*	Water Source	Length of channel (km)	*Ayacut* farmers	Irrigated Land (acres)		Name of *gonchigadu*	MPR South Canal Distributary	Land irrigated under MPR (acres)
					Kharif	*Rabi*			
10	Pedda kaluva	*Thalipiri* from the bed of River Penna	2.5	165	220	220	Sri Rami Reddy	5	390

Raachepalli

Village	:	Rachepalli
Gram Panchayat	:	Rachepalli
Mandal	:	Singanamala
Total population of the village	:	1,540
Female	:	805
Male	:	775
Total families in the village	:	365
Agricultural families in the village	:	340
Total extent of land in the village	:	1,680 acres
Land under cultivation	:	1,560 acres
Fallow land	:	120 acres
Primary crops grown in the village	:	Paddy, Groundnut, Sunflower
Primary water sources in the village	:	MPR South Canal, Bore Wells, *Gonchi* channels
No. of *Gonchis* in the village	:	2
Names of the *Gonchi* channels	:	Kotha kaluva, Pedda oota kaluva
Present condition of *Gonchis*	:	Both the *Gonchis* are currently operational. Farmers are maintaining them in a cooperative manner

Details of *Gonchi* channels:

Sl. No.	Name of *Gonchi*	Water Source	Length of channels (km)	*Ayacut* farmers	Irrigated Land (acres)		Names of *gonchigallu*	MPR South Canal Distributary	Land irrigated under MPR (acres)
					Kharif	*Rabi*			
11	Kotha kaluva	*Thalipiri* from the bed of River Penna	6	106	150	150	Adi Reddy	5	380
12	Pedda oota kaluva	"	6	280	400	400	Bangarappa		

Podaralla

Village	:	Podaralla
Gram Panchayat	:	Vadiyampeta
Mandal	:	Bukkaraya Samudram
Total population of the village	:	1,152
Female	:	581
Male	:	571
Total families in the village	:	288
Total extent of land in the village	:	675 acres
Land under cultivation	:	580 acres
Fallow land	:	95 acres
Primary crops grown in the village	:	Paddy, Groundnut, Jowar, Red Gram, Green Gram
Primary water sources in the village	:	MPR South Canal, water from Pamurayi irrigation tank, bore wells, *Gonchi* channel
No. of *Gonchis* in the village	:	1
Present condition of *Gonchi*	:	This *Gonchi* is currently operational. Farmers are maintaining it in a cooperative manner. There are occasional conflicts with farmers of Regadi Kotturu village on sharing the diverted water from Thadakaleru stream

Details of *Gonchi* channel:

Sl. No.	Name of *Gonchi*	Water Source	Length of channel (km)	*Ayacut* farmers	Irrigated Land (acres)		Name of *gonchigadu*	MPR South Canal Distributary	Land irrigated under MPR (acres)
					Kharif	*Rabi*			
13	Oori kaluva	Seepage from Thadakaleru stream and sewage from Anantapur town	8	62	70	70	Pothulaiah	11	70

Regadi Kotturu

Village	:	Regadi Kotturu
Gram Panchayat	:	Regadi Kotturu
Mandal	:	Bukkaraya Samudram
Total population of the village	:	1,450
Female	:	727
Male	:	723
Total families in the village	:	315
Total extent of land in the village	:	648 acres
Land under cultivation	:	396 acres
Fallow land	:	67 acres
Primary crops grown in the village	:	Paddy, Groundnut, Bengal Gram, Jowar, Bajra, Sunflower, Red Gram
Primary water sources in the village	:	*Gonchi*, Pamuraayi irrigation tank
No. of *Gonchis* in the village	:	1
Present condition of *Gonchi*	:	Farmers are maintaining the *Gonchi* in a cooperative and efficient manner

Details of *Gonchi* channels:

Sl. No.	Name of *Gonchi*	Water Source	Length of channel (km)	*Ayacut* farmers	Irrigated Land (acres)		Names of *gonchigallu*	MPR South Canal Distributary	Land irrigated under MPR (acres)
					Kharif	*Rabi*			
14	Oori kaluva (after being use by Podaralla)	Seepage from Thadakaleru stream and sewage from Anantapur town	3	180	260	0	Nagabhushanam Mallaiah	11	450

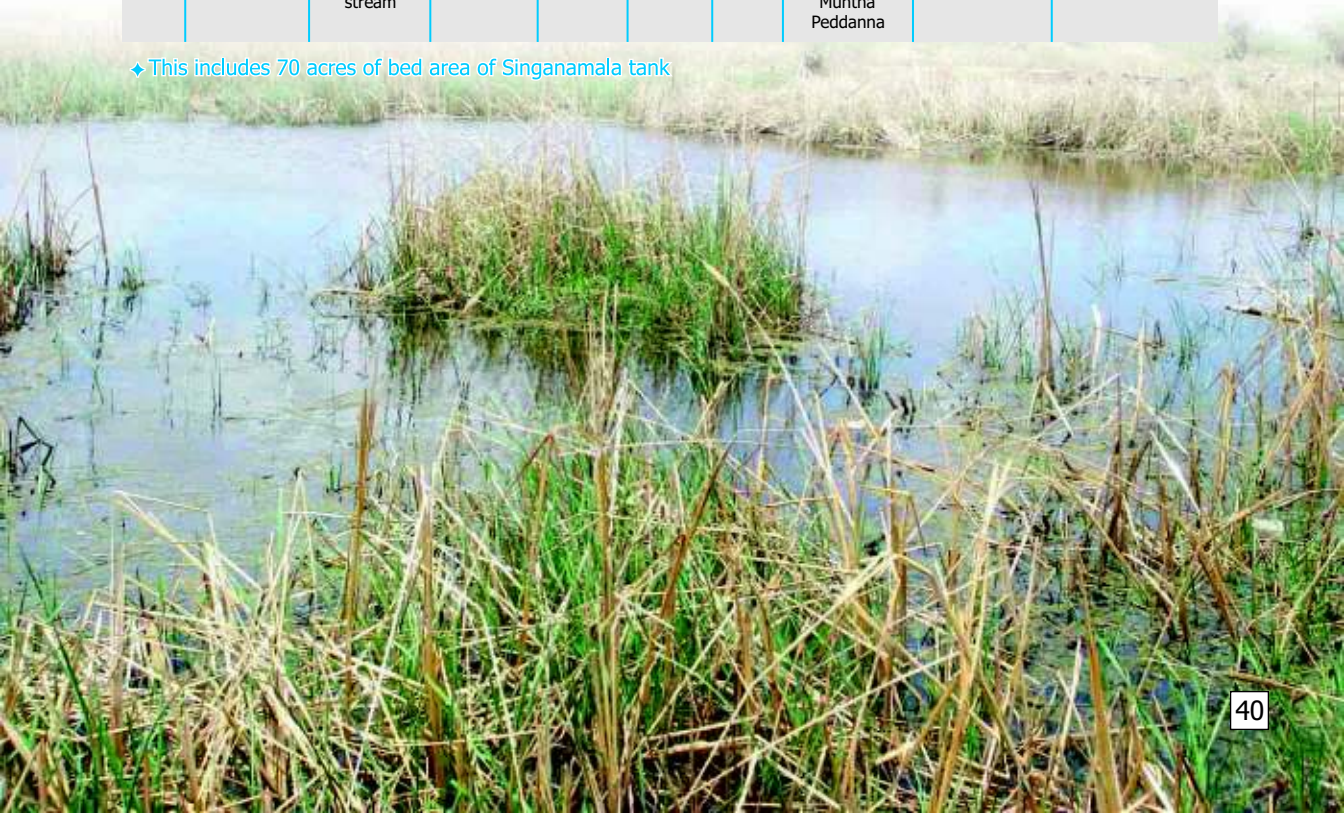
Guruguntla

Village	:	Guruguntla
Gram Panchayat	:	West Narasapuram
Mandal	:	Singanamala
Total population of the village	:	1,950
Female	:	980
Male	:	970
Total extent of land in the village	:	2,500 acres
Land under cultivation	:	2,500 acres
Fallow land	:	Nil
Primary water sources in the village	:	*Gonchi* seepage channel
No. of *Gonchis* in the village	:	1
Present condition of *Gonchi*	:	*Gonchi* is operational but needs renovation and repairs

Details of *Gonchi* channel:

Sl. No.	Name of *Gonchi*	Water Source	Length of channel (km)	*Ayacut* farmers	Irrigated Land (acres)*		Names of *gonchigallu*	MPR South Canal Distributary	Land irrigated under MPR (acres)
					Kharif	*Rabi*			
14	Oota kaluva	Seepage from Thadakaleru stream	4	108	220	220	Pakeeranna Thikkanna Muntha Peddanna	Nil	Nil

✦ This includes 70 acres of bed area of Singanamala tank



Madirepalli

Village	:	Madirepalli
Gram Panchayat	:	Aakuledu
Mandal	:	Singanamala
Total families in the village	:	168
Total population of the village	:	690
Female	:	358
Male	:	331
Total extent of land in the village	:	702 acres
Land under cultivation	:	569 acres
Fallow land	:	133 acres
Primary crops grown in the village	:	Groundnut, Paddy, Chilly, Vegetables
Primary water sources in the village	:	*Gonchi*, bore wells
No. of *Gonchis* in the village	:	1
Name of the *Gonchi* channel	:	Kondaraju kaluva
Present condition of *Gonchi*	:	Outgrowth of grass and silt deposition have reduced the irrigation potential. However, farmers follow the practice of equitable water sharing using *pantham* at the head of distribution channels.

Details of Gonchi channel:

Sl. No.	Name of *Gonchi*	Water Source	Length of channel (km)	*Ayacut* farmers	Irrigated Land (acres)		Names of *gonchigallu*	MPR South Canal Distributary	Land irrigated under MPR (acres)
					Kharif	*Rabi*			
15	Kondaraju kaluva	Seepage and irrigation drainage from Thadakaleru stream	6	100	100 *	0	Nagi Reddy Pedda Krishnaiah	8	Nil

✦An additional 50 acres of land in Neelampalli gets irrigated from this Kondaraju Kaluva

Somuladoddi

Village	:	Somuladoddi
Gram Panchayat	:	Somuladoddi
Mandal	:	Anantapur (Rural)
Total families in the village	:	480
Total population of the village	:	2,226
Female	:	1,076
Male	:	1,150
Total extent of land in the village	:	1,276 acres
Land under cultivation	:	1,250 acres
fallow land	:	26 acres
Primary water sources in the village	:	MPR South canal, *Gonchi* channel from village tank
No. of *Gonchi* in the village	:	1
Present condition of *Gonchi*	:	Farmers are maintaining the *Gonchi* in a cooperative manner

Details of *Gonchi* channel:

Sl. No.	Name of *Gonchi*	Water Source*	Length of channel (km)	*Ayacut* farmers	Irrigated Land (acres)		Name of *gonchigadu*	MPR South Canal Distributary	Land irrigated under MPR (acres)
					Kharif	*Rabi*			
16	Kaluva	Village Irrigation Tank	2	350	500	500	Chandrasekhar Reddy	12	270

* Water diverted from distributary No. 12 of the MPR to the village tank and the usage of this water is regulated by the *Gonchi* norms

Govindampalli

Village	:	Govindampalli
Gram Panchayat	:	Govindampalli
Mandal	:	Bukkaraya Samudram
Total families in the village	:	93
Total population of the village	:	374
Female	:	172
Male	:	202
Total extent of land in the village	:	406 acres
Land under cultivation	:	388 acres
Fallow land	:	8 acres
Primary water sources in the village	:	*Gonchi* channel from Thadakaleru stream
No. of *Gonchis* in the village	:	1
Present condition of *Gonchi*	:	Farmers are maintaining the *Gonchi* in a cooperative manner. Water gets wasted when the bunds of the distribution channels are damaged

Details of *Gonchi* channel:

Sl. No.	Name of *Gonchi*	Water Source	Length of channel (km)	*Ayacut* farmers	Irrigated Land (acres)		Name of *gonchigadu*	MPR South Canal Distributary	Land irrigated under MPR (acres)
					Kharif	*Rabi*			
17	Oori kaluva	Seepage from Thadakaleru and sewage from Anantapur town	5	100	120	120	Seetha Reddy	Nil	Nil

Boyakottala

Village	:	Boyakottala
Gram Panchayat	:	Bukkaraya Samudram
Total families in the village	:	110
Total population of the village	:	396
Female	:	202
Male	:	194
Total extent of land in the village	:	316 acres
Land under cultivation	:	250 acres
Fallow land	:	66 acres
Primary crops grown in the village	:	Paddy, Groundnut
Primary water sources in the village	:	*Gonchi* water, bore wells
No. of *Gonchis* in the village	:	1
Present condition of *Gonchi*	:	Farmers are maintaining the *Gonchi* in a cooperative manner and are undertaking maintenance work. Some stone structures, such as culverts on the channel, need repairs.

Details of *Gonchi* channel:

Sl. No.	Name of *Gonchi*	Water Source	Length of channel (km)	*Ayacut* farmers	Irrigated Land (acres) *		Name of *gonchigadu*	MPR South Canal Distributary	Land irrigated under MPR (acres)
					Kharif	*Rabi*			
18	Oori kaluva	Seepage from Thadakaleru and sewage from Anantapur town	2	45	50	50	Sake Musalanna	Nil	Nil

✦ Water from shallow bore wells is also being used for cultivation in addition to *Gonchi* water

Neelampalli

Village	:	Neelampalli
Gram Panchayat	:	Neelampalli
Mandal	:	Bukkaraya Samudram
Total population of the village	:	1,233
Female	:	593
Male	:	640
Total families in the village	:	277
Total extent of land in the village	:	1,380 acres
Land under cultivation	:	1,286 acres
Fallow land	:	94 acres
No. of *Gonchis* in the village	:	3
Names of the *Gonchi* channels	:	Kondaraju kaluva, Enugumadugu Eti kaluva, Erravanka
Present condition of *Gonchis*	:	Farmers are regularly undertaking bush clearance and desilting activity. *Ayacut* has been increased by extending the distribution channels recently. Wastage of water was also prevented by strengthening bunds of channels.

Details of *Gonchi* channels:

Sl. No.	Name of *Gonchi*	Water Source	Length of channel (km)	*Ayacut* farmers	Irrigated Land (acres) *		Names of *gonchigallu*	MPR South Canal Distributary	Land irrigated under MPR (acres)
					Kharif	*Rabi*			
19	Kondaraju kaluva	Seepage and irrigation	6	35	50	0	Pulla Reddy	Nil	Nil
20	Enugumadugu Eti kaluva	drainage from Thadakaleru, augmented by	4	22	25	0	Rampullaiah		
21	Erravanka	sewage from Anantapur town	3	20	25	0	Mohan Reddy		

* In addition to *Gonchi* water, farmers use water from shallow bore wells in the *ayacut*

Janthuluru

Village	:	Janthuluru
Gram Panchayat	:	Janthuluru
Mandal	:	Bukkaraya Samudram
Total families in the village	:	239
Total population of the village	:	1,162
Female	:	580
Male	:	582
Total extent of land in the village	:	820 acres
Land under cultivation	:	680 acres
Fallow land	:	140 acres
Primary crops grown in the village	:	Groundnut, Paddy
Primary water sources in the village	:	*Gonchi* channel, bore wells
No. of *Gonchis* in the village	:	2
Names of the *Gonchi* channels	:	Nagala kaluva, Chendrayuni kaluva
Present condition of *Gonchis*	:	*Gonchis* are presently filled with grass and thorny shrubs, hampering the water flow in the channels. Farmers are undertaking essential repairs and distributing water equitably.

Details of *Gonchi* channels:

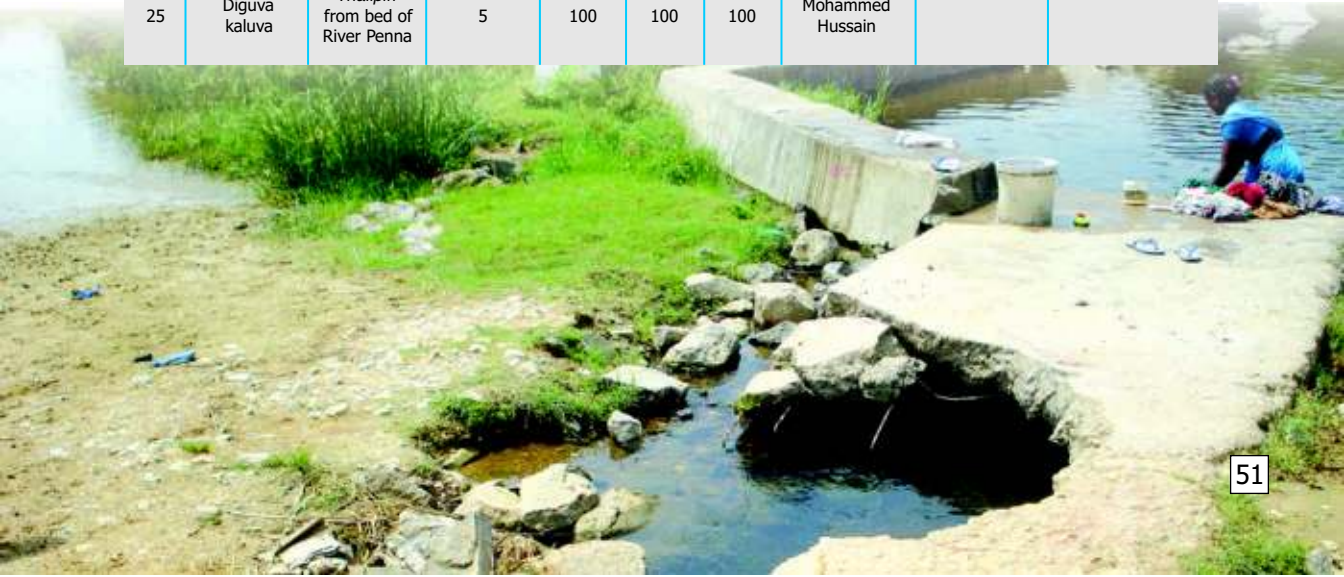
Sl. No.	Name of *Gonchi*	Water Source	Length of channel (km)	Ayacut farmers	Irrigated Land (acres)		Names of *gonchigallu*	MPR South Canal Distributary	Land irrigated under MPR (acres)
					Kharif	*Rabi*			
22	Nagala kaluva	Seepage from Thadakaleru augmented by sewage from Anantapur town	8	85	110	0	Nageswara Rao	Nil	Nil
23	Chendrayuni kaluva		7	98	150	0	Ramanna		

Kathrimala

Village	:	Kathrimala
Gram Panchayat	:	Kathrimala
Manda	:	Pamidi
Total families in the village	:	390
Total population of the village	:	1,780
Female	:	880
Male	:	900
Total extent of land in the village	:	1,950 acres
Land under cultivation	:	1,900 acres
Fallow land	:	50 acres
Primary crops grown in the village	:	Groundnut, Paddy, Sweet Orange, Vegetables
Primary water sources in the village	:	*Gonchi* channels, MPR North Canal, bore wells
No. of *Gonchis* in the village	:	2
Names of the *Gonchi* channels	:	Eguva kaluva, Diguva kaluva
Present condition of *Gonchis*	:	Parts of the *Thalipiris* and the channels are presently filled with grass and weeds. Farmers have been managing the water distribution effectively.

Details of *Gonchi* channels:

Sl. No.	Name of *Gonchi*	Water Source	Length of channel (km)	*Ayacut* farmers	Irrigated Land (acres)		Names of *gonchigallu*	MPR North Canal Distributary	Land irrigated under MPR (acres)
					Kharif	*Rabi*			
24	Eguva kaluva	*Thalipiri* from bed of River Penna	7	80	100	100	Rambabu	2	450
25	Diguva kaluva	*Thalipiri* from bed of River Penna	5	100	100	100	Mohammed Hussain		



Palyam

Village	:	Palyam
Gram Panchayat	:	Palyam
Mandal	:	Pamidi
Total population of the village	:	2,050
Female	:	1,020
Male	:	1,030
Total families in the village	:	420
Total extent of land in the village	:	2,200 acres
Land under cultivation	:	2,100 acres
Fallow and other public lands	:	100 acres
Primary crops grown in the village	:	Groundnut, Paddy, Sweet Orange, Vegetables
Primary water sources in the village	:	*Gonchi* channel, bore wells, MPR North Canal and irrigation tank
No. of *Gonchis* in the village	:	1
Name of the *Gonchi* channel	:	Eti kaluva
Present condition of *Gonchi*	:	*Thalipiri* and the channel are filled with grass and thorny shrubs. Channel bunds are broken and water is leaking at few points along the channel.

Details of *Gonchi* channel:

Sl. No.	Name of *Gonchi*	Water Source	Length of channel (km)	*Ayacut* farmers	Irrigated Land (acres)		Names of *gonchigallu*	MPR North Canal Distributaries	Land irrigated under MPR (acres)
					Kharif	*Rabi*			
26	Eti kaluva	*Thalipiri* from bed of River Penna	5	95	150	150	Narasimhappa Sriramulu	3 & 4	250 (Cultivated using irrigation drainage from the *ayacut* of MPR)

Specific problems relating to the *Gonchi*:

Farmers from Penakacherla (a village that lies along the southern banks of river Penna) have been drilling bore wells nearby the *Gonchi* and have encroached on the land up to the *thalipiri*. This has adversely affected seepage in the *thalipiri* and the channel

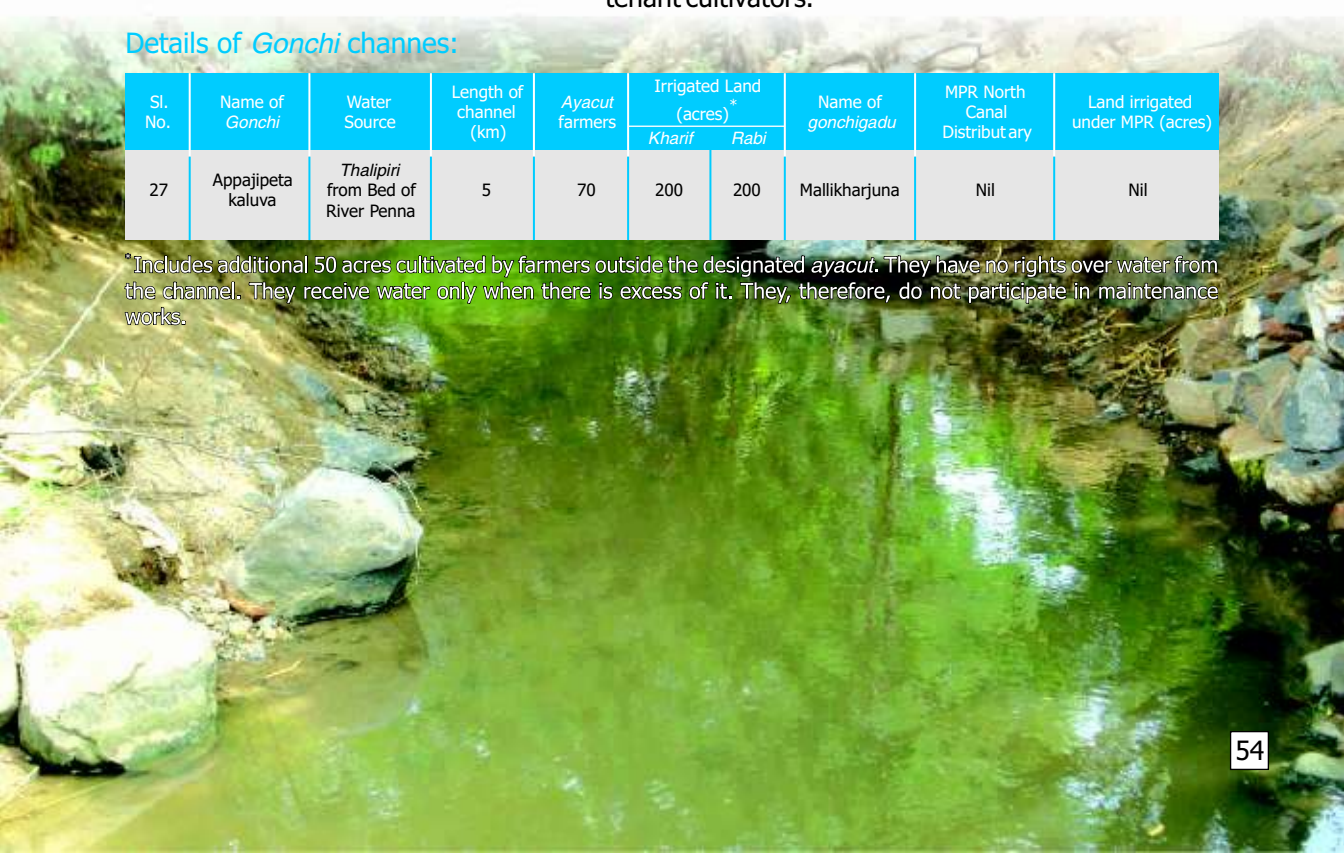
Appajipeta

Village	:	Appajipeta
Gram Panchayat	:	Palyam
Mandal	:	Pamidi
Total population of the village	:	750
Female	:	360
Male	:	390
Total families in the village	:	126
Total extent of land in the village	:	800 acres
Land under cultivation	:	750 acres
Fallow and other public lands	:	50 acres
Primary crops grown in the village	:	Groundnut, Paddy, Red Gram
Primary water sources in the village	:	*Gonchi* channels, bore wells
No. of *Gonchis* in the village	:	1
Present condition of *Gonchi*	:	*Gonchi thalipiri* and channel are filled with silt and grass. Most of the farmers under the *Gonchi* are tenant cultivators.

Details of *Gonchi* channes:

Sl. No.	Name of *Gonchi*	Water Source	Length of channel (km)	*Ayacut* farmers	Irrigated Land (acres)*		Name of *gonchigadu*	MPR North Canal Distributary	Land irrigated under MPR (acres)
					Kharif	*Rabi*			
27	Appajipeta kaluva	*Thalipiri* from Bed of River Penna	5	70	200	200	Mallikharjuna	Nil	Nil

*Includes additional 50 acres cultivated by farmers outside the designated *ayacut*. They have no rights over water from the channel. They receive water only when there is excess of it. They, therefore, do not participate in maintenance works.



Kandlapalli

Village	:	Kandlapalli
Gram Panchayat	:	Kandlapalli
Mandal	:	Pamidi
Total population of the village	:	1,750
Female	:	840
Male	:	910
Total families in the village	:	350
Total extent of land in the village	:	1,550 acres
Land under cultivation	:	1,500 acres
Fallow land	:	50 acres
Primary crops grown in the village	:	Groundnut, Paddy, Red Gram, Sweet Orange
Primary water sources in the village	:	*Gonchi* channels, bore wells
No. of *Gonchis* in the village	:	3
Present condition of *Gonchis*	:	The *thalipiri* and the *Gonchi* channels are filled with weeds and thorny bushes. Farmers have been maintaining the *Gonchis* in a cooperative manner. Some stone structures on the channels need repairs.

Details of *Gonchi* channels:

Sl. No.	Name of *Gonchi*	Water Source	Length of channel (km)	*Ayacut* farmers	Irrigated Land (acres)		Names of *gonchigallu*	MPR North Canal Distributary	Land irrigated under MPR (acres)
					Kharif	*Rabi*			
28	Eti kaluva *	*Thalipiris* are located in Government fallow lands close to river bank	4	22	45	45	Subba Rayudu Subbanna	Nil	Nil
29	Vanka kaluva **		5	65	75	75	Dhanunjaya Reddy		
30	Eti kaluva **		4						

* This *Gonchi* is exclusively meant for the SC community. The *gonchigadu* and the *neeruganti* are appointed on annual basis

** Though they have separate *thalipiris*, these two channels join at a point and irrigate common *ayacut* area

Vankaraju kalva

Village	:	Vankaraju kalva
Mandal	:	Pamidi
Total population of the village	:	2,100
Female	:	1,080
Male	:	1,020
Total families in the village	:	420
Total extent of land in the village	:	1,900 acres
Land under cultivation	:	1,750 acres
Primary crops grown in the village	:	Groundnut, Paddy, Red Gram, Sweet Orange
Primary water sources in the village	:	*Gonchi* channels, bore wells
Names of *Gonchi* channels	:	Eguva kaluva, Diguva kaluva
Present condition of *Gonchis*	:	Farmers are undertaking urgent repairs in a cooperative manner. However, parts of the *thalipiris* and the *Gonchi* channels are presently filled with grass and bushes.

Details of *Gonchi* channels:

Sl. No.	Name of *Gonchi*	Water Source	Length of channel (km)	*Ayacut* farmers	Irrigated Land (acres)		Names of *gonchigallu*	MPR North Canal Distributary	Land irrigated under MPR (acres)
					Kharif	*Rabi*			
31	Eguva kaluva	*Thalipiri* from bed of River Penna	5	120	120	0	Chenna kesavulu Fakhruddin	Nil	200 (Seepage from the MPR North Canal is used to irrigate lands)
32	Diguva kaluva	*Thalipiri* from bed of River Penna	4	150	150	150	Jaffer		

Neeluru

Village	:	Neeluru
Gram Panchayat	:	Neeluru
Mandal	:	Pamidi
Total population of the village	:	1,300
Female	:	630
Male	:	670
Total families in the village	:	240
Total extent of land in the village	:	1,250 acres
Land under cultivation	:	1,200 acres
Fallow land	:	50 acres
Primary crops grown in the village	:	Cotton, Pearl Millet, Groundnut, Paddy, Sesame
Primary water sources in the village	:	*Gonchi* channel, MPR North Canal, bore wells
No. of *Gonchis* in the village	:	1
Present condition of *Gonchi*	:	There is outgrowth of shrubs and grass in the *Gonchi* channel. Farmers jointly take up desilting activity when needed.

Details of *Gonchi* channel:

Sl. No.	Name of *Gonchi*	Water Source	Length of channel (km)	*Ayacut* farmers	Irrigated Land (acres) *		Names of *gonchigallu*	MPR North Canal Distributary	Land irrigated under MPR (acres)
					Kharif	*Rabi*			
33	Pooleti kaluva	Seepage and irrigation drainage from Pooletivanka stream	5	75	125	125	Venkat Reddy Krishna Reddy	12	320 (only irrigated-dry crops)

* Water rights are recognized for 75 acres of the *ayacut*. Remaining 50 acres are being cultivated when additional water is available

Thamballapalli

Village	:	Thamballapalli
Gram Panchayat	:	Neeluru
Mandal	:	Pamidi
Total population of the village	:	800
Female	:	380
Male	:	420
Total families in the village	:	160
Total extent of land in the village	:	780 acres
Land under cultivation	:	730 acres
Fallow land	:	50 acres
Primary crops grown in the village	:	Cotton, Pearl Millet, Groundnut, Paddy, Sunflower, Red Gram
Primary water sources in the village	:	*Gonchi* channel, bore wells
No. of *Gonchis* in the village	:	1
Present condition of *Gonchi*	:	There is outgrowth of grass and bushes in the *Gonchi* channel and the *thalipiri.* Farmers are ensuring water supply through regular desilting of channel.

Details of *Gonchi* channel:

Sl. No.	Name of *Gonchi*	Water Source	Length of channel (km)	*Ayacut* farmers	Irrigated Land (acres)		Names of *gonchigallu*	MPR North Canal Distributary	Land irrigated under MPR (acres)
					Kharif	*Rabi*			
34	Pooleti Oota kaluva	Seepage and irrigation drainage from Pooleti vanka stream	5	50	60	60	Ramachandra Reddy Rangareddy	Nil	Nil

Konduru

Village	:	Konduru
Gram Panchayat	:	Eerannapalli
Mandal	:	Pedda Vaduguru
Total population of the village	:	1,150
Female	:	500
Male	:	650
Total families in the village	:	200
Total extent of land in the village	:	900 acres
Land under cultivation	:	800 acres
Fallow land	:	100 acres
Primary crops grown in the village	:	Cotton, Pearl Millet, Groundnut, Paddy
Primary water sources in the village	:	*Gonchi* channel, bore wells
No. of *Gonchis* in the village	:	1
Present condition of *Gonchi*	:	There is outgrowth of grass in the channel and the *thalipiri.* Farmers are undertaking regular desilting activity. Only 75 out of 150 *ayacut* farmers participate in maintenance works regularly. Remaining farmers pay Rs.1300 as fine each year, as per the decisions of the *Gonchi* committee.

Details of *Gonchi* channel:

Sl. No.	Name of *Gonchi*	Water Source	Length of channel (km)	*Ayacut* farmers	Irrigated Land (acres)		Names of *gonchigallu*	MPR North Canal Distributary	Land irrigated under MPR (acres)
					Kharif	*Rabi*			
35	Oota kaluva	*Thalipiri* from River Penna	5	150	150	0	Sunki Reddy Chandrasekhar Reddy	Nil	Nil

Chittoor

Village	:	Chittoor
Gram Panchayat	:	Chittoor
Mandal	:	Pedda Vaduguru
Total population of the village	:	2,300
Female	:	1,180
Male	:	1,120
Total families in the village	:	430
Total extent of land in the village	:	3,500 acres
Land under cultivation	:	3,100 acres
Fallow and Govt. waste land	:	400 acres
Primary crops grown in the village	:	Paddy, Cotton, Groundnut, Red Gram, Pearl Millet
Primary water sources in the village	:	*Gonchi* channel, bore wells
No. of *Gonchis* in the village	:	1
Present condition of *Gonchi*	:	There is outgrowth of grass and shrubs in the *Gonchi*, as no maintenance works were done for last two years. As some farmers had drilled shallow bore wells near the *thalipiri* and have also planted guava trees, seepage came down and water is unavailable during the *Rabi* season.

Details of *Gonchi* channel:

Sl. No.	Name of *Gonchi*	Water Source	Length of channel (km)	*Ayacut* farmers	Irrigated Land (acres)		Names of *gonchigallu*	MPR North Canal Distributary	Land irrigated under MPR (acres)
					Kharif	*Rabi*			
36	Sri pinakini pedda kaluva	*Thalipiri* from the bed of River Penna	5	200	350	0	A. Sriramulu P. Kesava Reddy	Nil	Nil

Chithrachedu

Village	:	Chithrachedu
Gram Panchayat	:	Chithrachedu
Mandal	:	Pedda Vaduguru
Total population of the village	:	4,100
Female	:	2,000
Male	:	2,100
Total families in the village	:	820
Total extent of land in the village	:	4,800 acres
Land under cultivation	:	4,600 acres
Fallow land	:	200 acres
Primary crops grown in the village	:	Cotton, Pearl Millet, Groundnut, Paddy, Bengal Gram, Sunflower
Primary water sources in the village	:	Gonchi channel, bore wells
No. of Gonchis in the village	:	1
Present condition of Gonchi	:	Regular maintenance works have not been taken up in the *Gonchi* for two years, due to which a lot of silt got deposited in the *thalipiri* and the channel.

Details of *Gonchi* channel:

Sl. No.	Name of *Gonchi*	Water Source	Length of channel (km)	*Ayacut* farmers	Irrigated Land (acres)		Name of *gonchigadu*	MPR North Canal Distributary	Land irrigated under MPR (acres)
					Kharif	*Rabi*			
37	Pedda kaluva	*Thalipiri* from River Penna	6	300	650	0	Dodla Samanna	Nil	Nil

6. Quality of Water in Gonchi Channels

There is one primary difference in quality between irrigation water in the MPR and water in the *Gonchi* channels. While the water in the MPR is fresh water, water in seepage channels is a mixture of fresh water from rainfall; irrigation drainage from MPR *ayacut* areas; and sewage water from Anantapur town (only in the case of channels from Thadakaleru stream). Their proportion in this mixture keeps changing through different seasons of the year. The proportion of freshwater goes up during the monsoons reducing the concentration of irrigation drainage and sewage. The influence of irrigation drainage and sewage on the water quality goes up during the winter and the summer months.

Few water samples were collected from MPR distributary canals, *ayacut* of these canals, seepage channels, Thadakaleru stream and *ayacut* of seepage channels, with the objective of ascertaining the suitability of water for irrigation. These samples were collected and analysed in December 2012 when the influence of irrigation drainage and sewage water was at their peak.

Eight seepage channels (in eight villages) were identified for water sampling and corresponding to each channel four water samples were collected. These four water samples are from the MPR distributary located upstream of the seepage channel; drainage from the *ayacut* of that distributary; water from the seepage channel and finally the drainage from the *ayacut* of the seepage channel. In case of Thadakaleru stream and the *Gonchi* channels originating from it, water samples were collected from the MPR distributary; drainage from the *ayacut* of that distributary; and water from Thadakaleru stream. Since these seepage channels are diverting the surface flow in Thadakaleru stream most of the time in a year, it was assumed that the quality of water in Thadakaleru stream and the seepage channels originating from it are same.

Thus, life-cycle analysis of water is done right from its source (i.e., the distributary of MPR) to the *ayacut* of seepage channel to understand the quality of water at different points of its flow and application. A total of 30 samples from eight villages were analysed and the results are presented in the following tables:

MPR South Canal Distributaries and *Gonchi* channels:

Sl.	Village	Source of sample	EC	pH	Ca+Mg	Na+K	CO_3^{2-}	HCO_3^-	SAR	RSC
1	Koppalakonda	MPR South Canal Distributary (D3)	245	7.64	1.50	0.95	0.00	2.00	1.10	0.50
2	"	Drainage from D3 *ayacut*	382	8.94	2.25	1.57	0.00	4.00	1.48	1.75
3	"	Kunta Kaluva	424	7.72	3.00	1.24	0.00	3.00	1.01	0.00
4	"	Drainage from the *ayacut* of Kunta Kaluva	543	7.55	3.00	2.43	0.00	4.00	1.98	1.00
5	Kesavapuram	MPR South Canal Distributary (D3)	242	7.7 0	1.50	0.92	0.00	2.00	1.06	0.50
6	"	Drainage from D3 *ayacut*	223	8.57	1.50	0.73	0.00	2.00	0.84	0.50
7	"	Chinna Kaluva	433	7.7 6	2.25	2.08	0.00	4.00	1.96	1.75
8	"	Drainage from the *ayacut* of Chinna Kaluva	488	7.44	2.25	2.63	0.00	4.00	2.48	1.75
9	Patha Kalluru	MPR South Canal Distributary (D5)	271	7.93	1.50	1.21	0.00	2.00	1.40	0.50
10	"	Drainage from D5 *ayacut*	218	8.37	1.50	0.68	0.00	2.00	0.79	0.50
11	"	Kalluru Kaluva	486	7.67	2.25	2.61	0.00	4.00	2.46	1.75
12	"	Drainage from the *ayacut* of Kalluru Kaluva	487	7.79	2.25	2.62	0.00	4.00	2.47	1.75

Note: EC in Micro Siemens / cm (µS/cm) and concentration of Ca, Mg, Na, Carbonates and Bi-carbonates and RSC in Milli equivalents / litre (Meq/lt)

MPR North Canal Distributaries and *Gonchi* channels:

Sl.	Village	Source of sample	EC	pH	Ca+Mg	Na+K	CO_3^{2-}	HCO_3^-	SAR	RSC
13	Palyam	MPR North Canal Distributaries (D3 & 4)	211	8.26	1.50	0.61	0.00	2.00	0.70	0.50
14	"	Drainage from D3 & 4 *ayacut*	220	9.40	1.50	0.70	0.00	2.00	0.81	0.50
15	"	Palyam Kaluva	335	7.65	2.25	1.10	0.00	3.00	1.04	0.75
16	"	Drainage from the *ayacut* of Palyam Kaluva	427	7.45	0.75	3.52	0.00	4.00	5.75	3.25
17	Kandlapalli	MPR North Canal Distributary (D6)	553	7.60	2.25	3.28	0.00	4.00	3.09	1.75
18	"	Drainage from D6 *ayacut*	229	7.36	0.75	1.54	0.00	2.00	2.52	1.25
19	"	Yeti Kaluva	465	8.15	3.75	0.90	0.00	8.00	0.66	4.25
20	"	Drainage from the *ayacut* of Yeti Kaluva	551	7.84	3.00	2.51	0.00	4.00	2.05	1.00
21	Vankaraju Kalva	MPR North Canal Distributary (D7)	505	7.69	2.25	2.80	0.00	4.00	2.64	1.75
22	"	Drainage from D7 *ayacut*	208	9.44	1.50	0.58	0.00	2.00	0.67	0.50
23	"	Eguva Kaluva	634	7.85	3.00	3.34	0.00	4.00	2.73	1.00
24	"	Drainage from the *ayacut* of Eguva Kaluva	645	7.56	3.00	3.45	0.00	5.00	2.82	2.00

Note: EC in Micro Siemens / cm (µS/cm) and concentration of Ca, Mg, Na, Carbonates and Bi-carbonates and RSC in Milli equivalents / litre (Meq/lt)

Thadakaleru stream and *Gonchi* channels:

Sl.	Village	Source of sample	EC	pH	Ca+Mg	Na+K	CO_3^{2-}	HCO_3^-	SAR	RSC
25	Madirepalli	MPR South Canal Distributary (D11)	207	8.38	1.50	0.57	0.00	2.00	0.66	0.50
26	"	Drainage from D11 *ayacut*	818	8.20	3.00	5.18	0.00	5.00	4.23	2.00
27	"	Thadakaleru stream	1495	7.40	4.50	10.45	0.00	7.00	6.97	2.50
28	Boyakottala	MPR South Canal Distributary (D14)	204	8.46	1.50	0.54	0.00	2.00	0.62	0.50
29	"	Drainage from D14 *ayacut*	800	7.75	3.00	5.00	0.00	4.00	4.08	1.00
30	"	Thadakaleru stream	1486	7.30	3.75	11.11	0.00	7.00	8.11	3.25

Note: EC in Micro Siemens / cm (µS/cm) and concentration of Ca, Mg, Na, Carbonates and Bi-carbonates and RSC in Milli equivalents / litre (Meq/lt)

Three parameters are very important in determining suitability of the water for irrigation, namely Electrical Conductivity (EC), Sodium Adsorption Ratio (SAR) and Residual Sodium Carbonates (RSC).

Electrical Conductivity (EC)

EC is one of the important factors influencing crop yield. As the EC of water goes up, plants need to compete more with free ions in water for intake of water for plant growth. This means that an increase in EC reduces the availability of water to the plants. Generally, water with EC less than 700 µS/cm is suitable for irrigation. Whenever the EC exceeds 700, plants experience difficulty in adsorbing the water.

The EC values of water from the MPR South Canal distributaries, North Canal distributaries as well as that of seepage channels are well below 700. Therefore, the water from these sources may be considered suitable for irrigation.

As the EC values of water samples from the *ayacut* of MPR South Canal distributaries (D11 & D14) and the samples from Thadakaleru stream fall in the range of 700-3000, they could be considered suitable for irrigation but with some limitations. Higher EC values of water in Thadakaleru stream are directly related to the mixing of untreated sewage from Anantapur town. When this water is used for irrigation over a longer period, soil may turn saline and affect the crop yields. But, it must be noted that these samples were collected at a time when there was no run-off contribution of rainfall in Thadakaleru stream. Salinity of water is likely to go down during rainy and post-rainy months and there is likelihood of much lesser EC of water in Thadakaleru stream as well as channels originating from it.

Sodium Adsorption Ratio (SAR)

The problems associated with high sodium content in irrigation water are referred to as 'Sodium Hazards'. When such water is used for irrigation, the sodium cations in the water replace the magnesium and calcium ions lodged on the soil particles. As a result, soil texture changes and the permeability of the soil gets considerably reduced. The soil turns saline, badly effecting crop yield. Sodium Adsorption Ratio (SAR) is an effective measure of assessing sodium hazards of irrigation water. It is calculated as below:

$$SAR = \frac{Na^{+}}{\sqrt{\frac{(Ca^{2+} + Mg^{2+})}{2}}}$$

(ion concentrations in Milli equivalents/litre)

Generally, if the SAR value is between 0 and 3 that water is considered suitable for irrigation purpose in all respects. When this value exceeds 9, the water is deemed unsuitable for irrigation.

The SAR values of all the water samples from the MPR distributaries as well as from the seepage channels are lesser than or close to 3. This means the water is suitable for irrigation in all respects. However, the SAR value of irrigation drainage water from the *ayacut* areas of D11 and D14 are 4.23 and 4.08 respectively. SAR values of water from Thadakaleru stream in Madirepalli and Boyakottala villages are 6.97 and 8.11 respectively. Therefore, this water is suitable for irrigation only in certain conditions, such as when the good drainage facility is available and when the crop chosen is resistant to salinity.

Residual Sodium Carbonates (RSC)

Concentration of carbonates and bicarbonates is also a key factor influencing the suitability of water for irrigation. When water is having higher Residual Sodium Carbonates (RSC) and higher pH value, sodium carbonate in the water gets deposited in the soil making it more alkaline and infertile. This is indicated by a change in the colour of the soil in deep black. Water having an RSC value of less than 1.25 Milli equivalents/ litre is suitable in all respects for irrigation and RSC in the range of 1.25 to 2.50 indicates that water may be used with due caution. RSC can be calculated in the following manner:

$$RSC = (CO_3^{2-} + HCO_3^{-}) - (Ca^{2+} + Mg^{2+})$$

As per this study, RSC values of water samples from D3, D5, D11 and D14 of MPR South Canal and D3 & 4 of North Canal are lesser than 1.25. It may, therefore, be concluded that this water is suitable for irrigation in all respects. RSC in samples from D6 and D7 of North Canal are in the range of 1.25 to 2.50, hence the water may be used with due caution.

Three out of total six water samples from the seepage channels that originate from Penna river have RSC values below 1.25 and therefore found to be suitable for irrigation in all respects. But, samples from Kesavapuram (Chinna Kaluva) and Patha Kalluru (Kalluru Kaluva) have moderate RSC values indicating possible sodium hazards on the soils. The RSC value of water in Yeti Kaluva of Kandlapalli was found to be 4.25, making it unsuitable for irrigation purpose. Recent deepening and renovation of *thalipiri,* which is located at a distance of 200 m away from the river bank, could have increased the seepage of shallow groundwater and influenced the water quality. Further probing is required for such a higher RSC value.

It was also observed that, the pH of irrigation drainage water emerging from the *ayacut* areas of MPR distributaries are generally more than 8.00 but did not result in higher RSC values in all the cases. Tests on water samples from Thadakaleru stream brought out that even though their RSC values were higher (2.5 and 3.25 respectively) but their pH values were surprisingly normal. There is a possibility that inflows of sewage water from Anantapur, which has a mixture of different domestic and industrial wastes, into Thadakaleru stream could have affected the pH values. It may be concluded that, the water from Thadakaleru stream is not suitable for irrigation in the long run.

To sum up, following observations may be inferred from the analysis of water and soil samples:

1. Thadakaleru stream and its *Gonchi* channels

Irrigation drainage water from the MPR South Canal *ayacut* and sewage from Anantapur town merge into Thadakaleru stream. Therefore, in Thadakaleru water samples, both the EC and SAR values are found to be higher. Use of this water for a long run could render the soil saline. High RSC in water may also increase the alkalinity of the soil. It is not advisable to use this water in the long run. This problem may be addressed permanently by treating the sewage water from Anantapur town before letting it into Thadakaleru.

2. MPR Distributaries and *Gonchi* Channels from River Penna

The EC, pH and SAR values of water in MPR distributaries and seepage channels are generally at acceptable levels. But, in some channels RSC is found to be higher than the safe limit of 1.25 indicating possible sodium hazards on the soils. Quality of irrigation drainage from the MPR ayacut areas is generally found to be good with normal values of EC, SAR and RSC, except for higher values of pH in some of the cases. Since the water samples were taken during dry period of the year, there is a possibility finding much lower values of these key parameters in all these sources during rainy and post-rainy months.

7. Epilogue

History reveals that the age old tradition of *Gonchi* irrigation management and the social regulations that evolved around them declined rapidly during the last 100 years. This is proven by the fact that hundreds of larger and smaller seepage channels studied and documented by the British Government during the early 20th century vanished today.

This book does not delve deep into the history of these channels. However, it has come up with some new and interesting findings, which are summarised as follows:

1. Few of the many seepage channels in the catchment area of river Penna have survived till today; are fully functional and are the lifelines for the poor farming families
2. Many channels which functioned as 'diversion channels' earlier took the form of 'seepage channels' over a period of time to cope with the reduced inflow of water from the source river or stream. This means that *thalipiris* that we find now at the head of seepage channels did not exist earlier and are a recent addition to the *Gonchi* system
3. Seepage channels got revived and also their *ayacut* area increased significantly wherever irrigation drainage augmented their flows
4. Irrigation engineers and water managers had earlier viewed the irrigation drainage as a problem and had always tried to dispose it, as soon as possible, after the application of water to crops. This book opens up new dimensions and opportunities to re-use irrigation drainage for the purpose of irrigation.

This study on re-use of irrigation drainage water for cultivation of crops is not at all a new and startling revelation. As a part of the hydrological cycle, water from small, medium or major irrigation projects, after irrigating their respective *ayacut* areas, flows downstream; merges with rivers; and further flows to the sea. On many occasions, this water also fills smaller ponds, tanks and recharges groundwater which irrigates additional land. This is a natural process that occurs as part of the Hydrological Cycle and is familiar to most of us. But, we imagine the Hydrological Cycle of having the major components of rain water, surface run-off, groundwater recharge and evapo-transpiration but fail to visualize the 'flow of irrigation drainage' within this Hydrological Cycle. It is possible to plan and effectively utilize this irrigation drainage water by isolating the drainage water cycle from this fresh water Hydrological Cycle.

Considerable part of the irrigation drainage or sewage water that enters the Hydrological Cycle is lost to evaporation or saturates the topsoil on earth and later

evaporates. But, re-using this water for irrigating crops in a well-planned manner can help in decentralised irrigation development and sustain many livelihoods in those areas. One of the major lessons that the *Gonchi* channels offer us is that when this waste water is the irrigation drainage from existing *ayacut* areas, it may be re-used without any treatment.

Doubts may arise when it is claimed that irrigation drainage can be used without the need for chemical treatment and purification. Few samples of this water were collected and tested in order to study its quality and suitability for irrigation. Following two major findings emerge from this analysis:

- The EC, SAR and RSC values of water collected from Thadakaleru and the seepage channels that originate from it are higher than acceptable levels due to mixing of sewage water from Anantapur town. The soil may turn saline or alkaline and may become infertile if this water is used for irrigating crops over a long run.

- The EC, pH, SAR and RSC values of water samples from MPR distributaries and from *Gonchi* channels originating from Penna river are near normal. The water therefore may be considered as suitable for irrigation in all respects.

In summary, irrigation drainage may be re-used for irrigating crops without any kind of treatment as long as sewage water from urban areas or liquid waste from industries does not get mixed with it. In case of *Gonchi* channels, flow of irrigation drainage through the porous sand bed of the river before re-emerging in *thalipiris* also helped to nullify sodium hazards of irrigation drainage water. Testing of soil in *Gonchi ayacut* areas for EC, pH and ESP[8] would be required to confirm these findings.

There is every possibility of reviving hundreds of those age-old seepage channels that are not functional now. Recently completed projects such as Penna-Ahobilam Balancing Reservoir (PABR) in Anantapur district offers us new opportunities of reviving seepage channels that are located downstream of PABR irrigated area. Very little research has been done on re-use of irrigation drainage in cultivation and a lot remains to be done. There seems to be numerous unimaginable ways in which irrigation drainage from the *ayacut* areas of various existing irrigation projects could be re-used. I hope this book would inspire scientists, technologists and enthusiasts and motivate them to explore further in this direction.

8 Exchangeable Sodium Percentage (ESP) is used to classify sodic and saline-sodic soil conditions. It is measured in percentage (%) units of the total sodium in relation to the total exchange capacity of the soil.

8. References

1. CWC (2006): *Integrated Hydrological Data Book -Non-classified River Basins* (New Delhi, India: Central Water Commission)

2. --- (2009): *National Register of Large Dams* (New Delhi, India: Central Water Commission)

3. GoAP (2006): *Handbook of Statistics 2004-05 Anantapur District* (Anantapur, India: Government of Andhra Pradesh)

4. --- (2007): *Handbook of Statistics 2005-06 Anantapur District* (Anantapur, India: Government of Andhra Pradesh)

5. --- (2008): *Handbook of Statistics 2006-07 Anantapur District* (Anantapur, India: Government of Andhra Pradesh)

6. --- (2009a): "4th Minor Irrigation Census 2006-07" (Hyderabad, India: Directorate of Economics and Statistics, Government of Andhra Pradesh)

7. --- (2009b): *Handbook of Statistics 2007-08 Anantapur District* (Anantapur, India: Government of Andhra Pradesh)

8. Madras Presidency (1922): "Descriptive Memoirs of Irrigation Works in the Kalyandrug Minor Basin (Anantapur, Bellary Districts and Mysore Territory) of Upper Pennar River Basin" (Bellary, India: Irrigation Department, Madras Presidency)

9. Vundavalli, Subbalakshmi (1995): "Some Aspects of Irrigation Development in Rayalaseema:1858-1947", Ph.D. thesis, University of Hyderabad.

GPS Coordinates of Gonchi Villages and Channels

Village	GPS coordinates of Village*	*Gonchi* channel	GPS coordinates of *Thalipiri**
Koppalakonda	N 14 49.148, E 77 35.849	Konda Kaluva	
		Kunta Kaluva	N 14 54.309, E 77 29.344
Kesavapuram	N 14 53.759, E 77 32.369	Pedda kaluva	
		Chinna kaluva	N 14 54.003, E 77 30.279
Muntimadugu		Konda kaluva	
		Eguva kaluva	N 14 54.111, E 77 31.904
Patha Kalluru	N 14 55.353, E 77 35.866	Patha Kalluru kaluva	
Illuru		Pedda kaluva	N 14 56.245, E 77 34.941
Kallumadi	N 14 55.457, E 77 39.304	Kallumadi kaluva	N 14 56.657, E 77 37.538
Nidanavada	N 14 54.188, E 77 43.915	Pedda kaluva	N 14 55.021, E 77 42.798
Rachepalli	N 14 53.263, E 77 45.654	Kotha kaluva	
		Pedda oota kaluva	N 14 55.032, E 77 43.193
Podaralla	N 14 45.489, E 77 37.085	Oori kaluva	N 14 43.261, E 77 36.451
Regadi Kotturu	N 14 46.555, E 77 37.687		
Guruguntla	N 14 48.409, E 77 40.242	Oota kaluva	N 14 46.961, E 77 39.717
Madirepalli	N 14 47.755, E 77 39.316	Kondaraju kaluva	N 14 45.693, E 77 37.730
Somuladoddi	N 14 43.546, E 77 36.293	kaluva	N 14 43.959, E 77 36.356
Govindampalli	N 14 43.176, E 77 36.524	Oori kaluva	
Boyakottala		Oori kaluva	N 14 43.178, E 77 36.527
Neelampalli	N 14 45.916, E 77 39.164	Kondaraju kaluva	
		Enugumadugu Eti kaluva	
		Erra Vanka	
Janthuluru	N 14 45.314, E 77 38.621	Nagala kaluva	N 14 45.205, E 77 38.317
		Chendrayuni kaluva	N 14 45.205, E 77 38.317
Kathrimala	N 14 53.470, E 77 27.509	Eguva kaluva	
		Diguva kaluva	N 14 53.051, E 77 26.095
Palyam	N 14 54.986, E 77 28.230	Eti kaluva	N 14 52.956, E 77 26.831
Appajipeta		Appajipeta Eti kaluva	
Kandlapalli	N 14 54.522, E 77 31.089	Eti kaluva (belonging to SCs)	
		Vanka kaluva	
		Eti kaluva	
Vankaraju Kalva		Eguva kaluva	N 14 54.153, E 77 30.880
		Diguva kaluva	
Neeluru	N 14 58.531, E 77 37.631	Pooleti kaluva	N 14 59.923, E 77 36.682
Thamballapalli	N 14 58.682, E 77 38.227	Pooleti Oota kaluva	N 14 59.515, E 77 37.031
Konduru	N 14 56.815, E 77 38.743	Oota kaluva	N 14 56.763, E 77 36.781
Chittoor	N 14 56.138, E 77 42.016	Sri pinakini pedda kaluva	N 14 56.237, E 77 39.666
Chithrachedu	N 14 55.348, E 77 43.878	Pedda kaluva	N 14 55.724, E 77 41.213

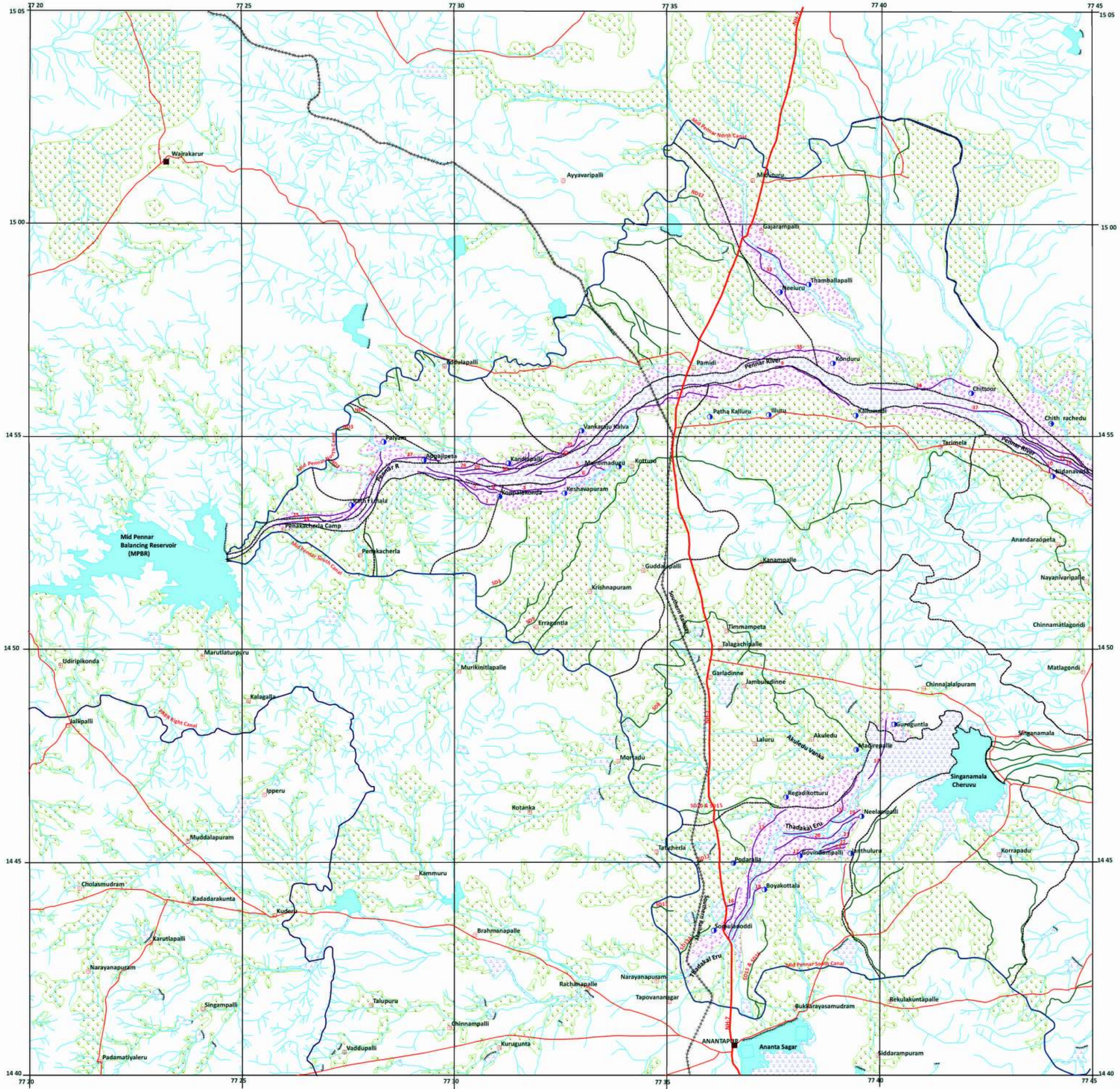
* GPS points for some of the villages and *Gonchi thalipiris* could not be collected due to inaccessibility of those locations

Annexure II

Local Terminology Associated with Gonchi System

Ayacut	Command area of an irrigation source
Pulusu Neeru	Irrigation drainage water that flows out from the *ayacut* of a dam / reservoir / lake / tank or any other such source
Kaluva	Channel that carries the irrigation water to the *ayacut*
Oota kaluva	Channel that carries the seepage water from a *thalipiri* to the *ayacut*
Gonchi	A traditional system of irrigation management wherein farmers divert seepage water from a river (or) stream through a gravity-flow channel and collectively manage water distribution adhering to age-old social norms and regulations
Thalipiri	A deep basin-shaped pit or trench dug in the bed of a river or stream to collect seepage water and direct the same into the channel
Pinnapedda / Gonchigadu	Leader of the *Gonchi* committee, who is collectively appointed by all farmers having lands in the *ayacut* of a seepage channel
Gonchigallu	Plural for *Gonchigadu*
Kuntu / Thappu	A fine imposed by the *Gonchi* committee on those farmers who do not participate in desilting and maintenance works on seepage channels or in *thalipiri* as scheduled by the *pinnapedda*
Neeruganti	A person employed to over-see water management and ensure equitable water distribution to all the farmers in the *ayacut*
Pantham Moddu	A wooden plank with slots on one of its sides, used to release water to *ayacut* areas in proportionate measure from the main or distributary channel
Dasabandham	Bestowal of rights on a part of the *ayacut* area (or) over part of the revenue generated by an irrigation source to a bigger farmer or landlord who invested in the construction and maintenance of such irrigation source. Our kings and rulers in the past encouraged this system, particularly in Anantapur district.

Annexure III : *Gonchi* Seepage Channels in Pennar River Basin in Ananthapur District, Andhra Pradesh



Location map

Details of Gonchi Seepage Channels

Village	No.	Gonchi Seepage Channel
Koppalakonda	1	Konda Kaluva
	2	Kunta Kaluva
Kesavapuram	3	Pedda Kaluva
	4	Chinna Kaluva
Muntimadugu	5	Konda Kaluva
	6	Eguva Kaluva
Patha Kalluru	7	Patha Kalluru Kaluva
Illuru	8	Pedda Kaluva
Kallumadi	9	Kallumadi Kaluva
Nidanavada	10	Pedda Kaluva
Rachepalli	11	Kotha Kaluva
	12	Pedda Kaluva
Podaralla	13	Oori Kaluva
R.Kotturu		
Guruguntla	14	Oota Kaluva
Madirepalli	15	Kondaraju kaluva
Somuladoddi	16	kaluva
Govindampalli	17	Oori Kaluva
Boyakottala	18	Oori Kaluva
Neelampalli	19	Kondaraju kaluva
	20	Enugumadugu Eti Kaluva
	21	Yerra Vanka
Janthuluru	22	Nagala Kaluva
	23	Chendrayuni Kaluva
Kathrimala	24	Eguva Kaluva
	25	Diguva Kaluva
Palyam	26	Eti Kaluva
Appajipeta	27	Appajipeta Eti Kaluva
Kandlapalli	28	Eti Kaluva (belongs to SCs)
	29	Vanka kaluva
	30	Eti kaluva
Vankaraju Kalva	31	Eguva Kaluva
	32	Diguva Kaluva
Neeluru	33	Pooleti Kaluva
Thamballapalli	34	Pooleti Oota Kaluva
Konduru	35	Oota Kaluva
Chittoor	36	Sri pinakini pedda kaluva
Chithrachedu	37	Pedda kaluva

1:65,000

1 0.5 0 1 2 3 4 5 6 Kilometers

DATE : 01-MAR-2011

LEGEND

- Habitations
- Distric Headquarters
- Gonchi Villages
- Metalled Roads
- National Highway (NH-7)
- Tank Bunds
- Railway Line
- Streams
- Watershed Boundaries
- Mid Pennar Balancing Reservoir(MPBR) North & South Canal
- Distributory Canals(ND1, ND2,.....SD1,SD2,.....)
- Gonchi Seepage Channels
- Penna Ahobilam Balancing Reservoir (PABR) Right Canal
- Island
- Dry Water Bodies
- Water Bodies
- Tank / Canal Irrigation Area
- Gonchi Irrigation Area

SOURCE

1. Soi Toposheet Nos.57E/8, 57E/12 , 57F/5, 57F/6, 57F/9 and 57F/10 (Surveyed 1974-75).
2. Satellite Data IRS-P6, LISS-III, Acquisition Date : 17-Dec-2005, Path : 099, Row : 062

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