A Case Study of South Vellar Sub Basin

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Scope

The aim and objective this thesis is to study the south vellar sub basin area regarding the water potential and demand and to recover a right solution for the problems by executing some of the imperative techniques.

Abstract

Earth is the only plant, so far known to have water and this makes it fit for human living. This paper was focussed on south vellar sub basin area to reduce the scarcity of water and to improve the water potential. The scarcity on the sub basin is 77.74Mcm. Some of the valuable techniques are suggested to improve the potential of water to meet the demand in present and future. PIM and Water Budgeting are very important techniques in this current situation to overcome the demand and for an effective utilisation of water resources.Micro and Sprinkler irrigation is also mentioned for preventing the wastage of water and spoiling the water resources. Whatever the technique we can implement, the complete success is purely depends on the awareness of public on optimum usage of water. So the training programme to the public and farmers was sturdily recommended to achieve the success on any water related project or methods.

Irrigation System

Irrigation is the artificial application of water to the land or soil. It is used to assist in the growing of agricultural crops, maintenance of landscapes, and revegetation of disturbed soils in dry areas and during periods of inadequate rainfall. Additionally, irrigation also has a few other uses in crop production, which include protecting plants against frost, suppressing weed growing in grain fields and helping in preventing soil consolidation.

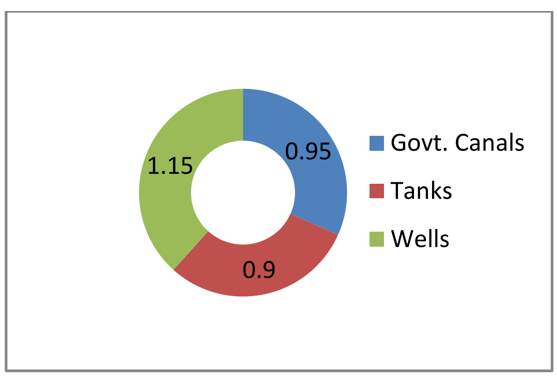
Status of Irrigation in Tamilnadu

Tamilnadu with a geographical area of 13million heactares is ranked eleventh in size among the Indian States. The net area sown in Tamilnadu is about 6million hectares ofwhich about 3million heactares or 50% get irrigation facilities from sources as given below:

1. Governmentcanals: 0.95 million hectares

2. Tanks: 0.90 million hectares

3. Wells, Tube wells etc.:1.15million hectares



Development of Irrigation in Tamilnadu:

The ultimate irrigation potential of Tamilnadu through major and medium irrigation sources was assessed as 1.5million hectares by the National Commission on Agriculture in 1976.

Under the water Resources Organization the water management in the state has been decentralized along Basin lines and for effective control, the entire state has been divided into 4 regions as

- Chennai
- Tiruchi
- Pollachi
- Madurai

Chennai

Araniyar, Kosasthalaiyar, Cooum, Adyar, Palar, Ongur, Varahanadhi, Malattaru, Penniyar, Gadilam, Vellar.

Tiruchi

Cauvery, Agniyar, Ambuliyar, Vellar, Koluvanar, Pambar.

Pollachi

Amaravathi, Bhavani, Noyyal,KorangamPallam,Palar,Periyapallam and West flowing rivers.

Madurai

Manimuthar,Kottkkariyar,Vaigai,Uthrakosa mangayar,Gundar,Vemabaru,Vaippar,Kallar Korampallamaru,Tambaraparani, Karumeniyar,Nambiar,Hanumanadhi, Palayaru,Valliyar,Kodayar.

Based on the Geographical conditions, there are 16 River Basins in Tamil Nadu. The 16 River Basins are further divided into 42 Sub Basins**.**

Our case study was focussed on south vellar which was come under Agniyar River Basin.

Agniyar River Basin is one among the River Basins covering Trichy, Pudukkottai and Thanjavur Districts and has 3 Sub Basins namely.

1. Agniyar Sub Basin
2. Ambuliar Sub Basin
3. South Vellar Sub Basin

South Vellar Sub-Basin

The south vellar sub basin in bounded on north byagniar and ambuliyar sub basin, east by Bay of Bengal, west by velamalai hills and Cauvery basin and south by pambarbasin. The sub basin is located at the latitude from 100 0’ 40” n to 100 29’ 50” n and the longitude from 780 13’ 50” E to 790 15’ 50”E

The basin area of the south vellar sub basin is 2010 sq.km. Southvellar river originates as a stream in kumarikatti reserve forest area of velamali hills near manjinampatti village 20kms North West of thuvarankurichi in manapparaitaluk of trichy district. It begins as a river from the surplus of vembanoor big tank in illappur talk of pudukkottai district. The river runs for distances of 137 kms from its orgin and confluences with bay of bangal near mumbalai village in manamelkuditaluk of pudukkottai district.

The Main Tributaries of South Vellar River are

- Nerungikudiyar
- Gundar

Nerungikudiyaroriginates from the surplus of maravamadurai tank in thirumayamtaluk of pudukkottai district. It travels to a distances of 30 km and joins with vellar river near kummakudi village.

Gundaroriginates from the surplus of kavinadu big tank near pudukkottai town. It travels to distances of 7.50km and joins with vellar river near kadayakkudi village in pudukkottai district.

There is another river called narasingaCauvery, originating from the surplus of narpavalakudi tank and runs on the northern side south vellar river. It travels to a distances of 36km and confluences with Bay of Bengal near kattumavadi village in pudukkottai district.

In the south vellar sub basin, there are 46nos of OPEN off- takes from the river and 316nos of minor irrigation tank, having an ayacut of 21079.18, being maintained by the water resource organization of PWD.

In addition to the above, there are 2086 nos of tanks with total ayacut of 15341.39Ha, being maintained by the panchayat union. Hence the total ayacut under the sub basin is 36420.57Ha

Exactly for South Vellar River:

Sl.No	Name of the River	No. of Anicuts	No. of Open off takes	No. of Tanks benefited	Ayacut (Ha)
01	South Vellar River	18	4	164	11766.45

Water Balance

- **Surface Water**

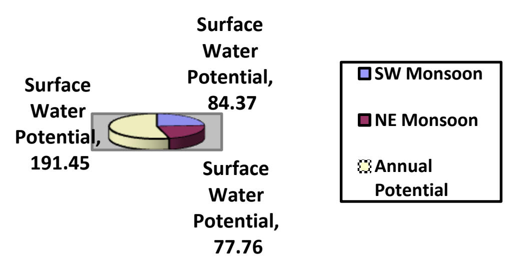
South Vellar Sub Basin is having 46 Anicuts and 316 Nos of P.W.D. Tanks and 2086 Nos of Panchayat Union tanks. There is no Reservoir in the Sub Basin. The approximate Storage Capacity of the Tanks is 267.13 Mcm.

- **Surface Water Potential**

The Basin Area of the Sub Basin is 2010 Sq Km. The 75% Annual Rain fall of the Sub Basin is 634.56 mm. (SW 279.85mm and NE 257.90mm) Total Surface Water Potential for 75% probability for South Vellar.

River Sub Basin is given below:

- South West Monsoon Surface Water Potential-84.37 Mcm
- North East Monsoon Surface Water Potential -77.76 Mcm
- Annual Surface Water Potential -191.45 Mcm



Ground Water Potential

- The Annual Ground Water Potential of this Sub Basin is 404.99 Mcm.

Total Water Potential

Sl.No	Description	Water Demand in Mcm
1	Surface Water Potential	191.45
2	Ground Water Potential	404.99
Total Potential		**596.44**

Water Demand

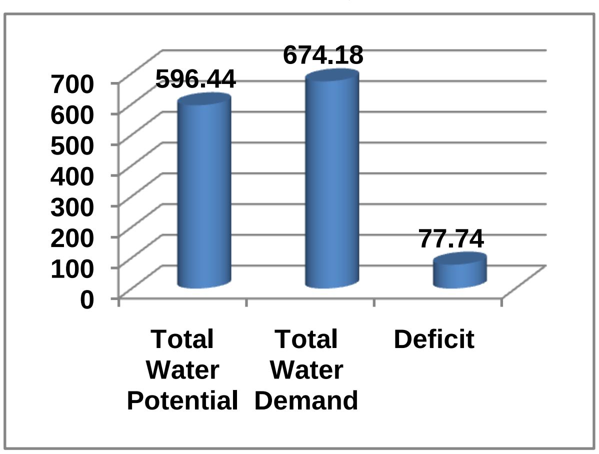
Sl.No	Description	Water Demand in Mcm
1	Irrigation Water Demand	640.27
2	Drinking	13.85
3	Live Stock	6.52
4	Industries Small, Medium & Major	13.54
Total Demand		**674.18**

Water Balance

Total Water Potential - 596.44 Mcm

Total Water Demand - 674.18 Mcm

Deficit – 77.74Mcm



From the above data we can easily conclude that the problems are arisen because of lacking of knowledge in rain water harvesting and less number of water storage units. We are in a condition to implement some noteworthy techniques for an effective utilisation of rain water and to sustain the ground water level. Such kinds of techniques are described below:

Suggested Techniques

The techniques are RWH, PIM, Water Budgeting, Modern Irrigation System.

1. Rainwater Harvesting

Rainwater harvesting provides an independent water supply during regional water restrictions and in developed countries is often used to supplement the mains supply. Rainwater harvesting systems are appealing as they are easy to understand, install and operate. They are effective in 'green droughts' as water is captured from rainfall where runoff is insufficient to flow into dam storages. The quality of captured rainwater is usually sufficient for most household needs, reducing the need for detergents because rainwater is soft. Financial benefits to the users include that rain is 'renewable' at acceptable volumes despite climate change forecasts, and rainwater harvesting systems generally have low running costs, providing water at the point of consumption.

1.1Artificial Recharge to Ground Water:

Artificial recharge to ground water is a process by which the ground water reservoir is augmented at a rate exceeding that obtaining under natural conditions or replenishment. At man-made scheme or facility that adds water to an aquifer may be considered to be an artificial recharge system.

1.2Rainwater Harvesting Techniques

The two main techniques of rainwater harvesting are:

- Storage of Rainwater on surface for future use.
- Recharge of Ground water

The storage of rain water on surface is a traditional techniques and structures used were underground tanks, ponds, check dams, weirs etc.

The ground water can be recharged by different ways like

- Diversion of runoff to dried-up / defunct wells
- making a series of farm ponds from ridge to valley
- Construction of check dams etc

1.3Advantages of Rainwater Harvesting:

- Enhanced sustainability of water supply projects and structures;
- Improved well yields and reduced pumping lifts and cost;
- Improved water quality through dilution especially fluoride, nitrate and salinity.
- Conservation of water lost to run off and evaporation.
- Reduces flood hazard and soil erosion.
- Treated urban effluent can be recharge and quality beneficiated by re-circulation through the aquifers.

2.Participatory Irrigation Management

2.1What is PIM?

The term participatory irrigation management refers to the participation of users, the farmers in the management of the irrigation system. PIM usually refers to the level, mode or intensity of user participation that would increase farmer responsibility and authority in the management process.

A more comprehensive variant of PIM is Irrigation Management Transfer (IMT). IMT is the full or partial transfer of responsibility and authority for the governance, management and financing of irrigation systems from the government to water user associations.

In India, the easement act 1832 specifically recognized customary rights of people. Thus as per the custom and convention, people were entitled to tap water, which flows through an upper plot or another person’s land. However, this act was not applicable to ground water. In the Tamil Nadu context, in particular tank and traditional canal irrigated areas; the customary rights over water were well codified much before the British period. The britishgovt approved these codified laws(which were locally called Mamulnamas) and printed them as a document as early as 1813.

2.2Desired Impacts of PIM

1. Sense of ownership and secure water rights
2. Increased transparency of the water allocation process
3. Greater accessibility to government and system personnel

4. Right to fix and collect water fees appropriately
5. Improved maintenance
6.Participation in decisions concerning irrigation service
7. Reduced conflicts among users

3.Water Budgeting

Water Budgeting is one of the key activities under "Community Collaborative Water Management" at village level. It envisages a rough estimation of the water resources available in the village and also the requirements of water for various sectoral uses and equating them to arrive at "water balance". The net deficit/surplus indicates the water scenario in the village and will form the basis for micro level water management plan in the village to ensure optimum use of water.

3.1Scope of Water Budgeting

- To estimate the existing condition of water resources through farmer led participatory methods
- To device village level water management strategies
- Preparing a water budget at the village level
- Designing water resources management at the village level
- To reinforce the sanitization process of village people on water by providing the substantial data on water crisis of that village

3.2Steps involved in Water Budgeting

The following base line data of the village are to be collected

1. Geographical Area in hectare(ha)
2. Annual Average rainfall of the village in mm
3. Number of tanks in the village (including tanks and capacities maintained by Panchayat)
4. Number of artificial recharge structures if any and their capacities
5. Other sources of irrigation water village from anicuts, from canals etc.
6. Population (both human & animals)
7. Crop wise details like (types of crops etc.,)
8. Other sectoral demands if any

4.Increasing Storage Units

The district has the region of Gantharvakkottai, Karambakudi and Alangudi which was almost become drought area because of less number of storage units and unawareness about harvesting and water usage.

Even though the areas are getting average rainfall and getting enough recharge of ground water, due to sloppy nature the rainwater was easily runoff to the lower regions. The only solution to prevent the loss of water is construction of Check Dams.

A **check dam** is a small dam, which can be either temporary or permanent, built across a minor channel, swale, bios wale, or drainage ditch. Similar to drop structures in purpose, they reduce erosion and gullying in the channel and allow sediments and pollutants to settle. They also lower the speed of water flow during storm events. They are also called Jack Dams

4.1The following points have to be kept in mind regarding site selection:

- Check dams can be of various sizes and built with a variety of materials including stone, clay and cement.
- Individual farmers can build small check dams of clay.
- Masonry and cement concrete structures require some degree of construction skills and high investment.
- The structure should be able to store a high volume of rain-water over a long duration of time. It should provide a long length of stored water.
- There should be a high percentage of cropped area on either side of the length of stored water.
- Minimises risk of submergence of cropped lands during flash floods. It should have a high cost-benefit ratio.

To determine how far apart to space check dams, use the following formula:

Distance between check dams = 100ft ÷ (%Slope of channel/3)The following chart summarizes this formula:

Slope of Channel (%)	Spacing of Rock Silt Checks (Ft)
3	100
6	55
9	33
12	25
15	20

5.Modern Irrigation System

Modern Irrigation is the process of supplying optimum water, in addition to natural precipitation, to field crops, orchards, vineyards, or other cultivated plants. Irrigation water is applied to ensure that the water available in the soil is sufficient to meet crop water needs. The role of irrigation is to improve production and the effectiveness of other inputs. The two significant irrigation systems are described below.

5.1 Micro Irrigation

It is also known as trickle or drip or localised irrigation, functions as its name suggests. This method can saves water and fertilizer by allowing water to drip slowly to the roots of plants, either onto the soil surface or directly onto the root zone, through a network of valves, pipes, tubing, and emitters. It is done through narrow tubes that deliver water directly to the base of the plant. This method can be the most water-efficient method of irrigation, if managed properly, since evaporation and runoff are minimized.

The advantages of drip irrigation are:

- Fertilizer and nutrient loss is minimized due to localized application and reduced leaching.
- Water application efficiency is high.
- Fields with irregular shapes are easily accommodated.
- Recycled non-potable water can be safely used.
- Moisture within the root zone can be maintained at field capacity.

- Soil erosion & Weed growth is minimized.
- Water distribution is highly uniform, controlled by output of each nozzle.
- Labour cost is less than other irrigation methods.

The disadvantages of drip irrigation are:

- Expense: initial cost can be more than overhead systems.
- Waste: the sun can affect the tubes used for drip irrigation, shortening their usable life.
- Clogging: if the water is not properly filtered and the equipment not properly maintained, it can result in clogging.
- Drip irrigation might be unsatisfactory if herbicides or top dressed fertilizers need sprinkler irrigation for activation.
- Waste of water, time and harvest, if not installed properly. These systems require careful study of all the relevant factors like land topography, soil, water, crop and agro-climatic conditions, and suitability of drip irrigation system and its components.

5.2 Sprinkler Irrigation

In sprinkler or overhead irrigation, water is piped to one or more central locations within the field and distributed by overhead high-pressure sprinklers or guns. A system utilizing sprinklers, sprays, or guns mounted overhead on permanently installed risers is often referred to as a solid-set irrigation system.

Higher pressure sprinklers that rotate are called rotors and are driven by a ball drive, gear drive, or impact mechanism. Sprinklers can also be mounted on moving platforms connected to the water source by a hose. Automatically moving wheeled systems known as traveling sprinklers may irrigate areas such as small farms, sports fields, parks, pastures, and cemeteries unattended.

Conclusion

It's not an easy way to conclude this public related project with a single solution. The multi problems are binded together, so the solutions are also to be multi to diminish the problems. Thus the several techniques like RWH, PIM, water budgeting, micro and sprinkler irrigation are suggested to decrease the wastage and for an improvement in efficient usage of water. Based on the criteria the techniques can implement in a single or in a combined form to achieve the optimum practice and sustain the water potential.

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