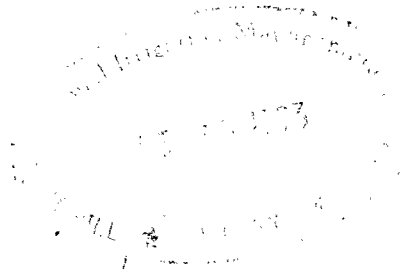


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**DATA AVAILABILITY SURVEY IN
TAMIL NADU STATE, INDIA**



**SAMPLE SYSTEMS SURVEYED : SATHANUR RESERVOIR
SRIVAIKUNDAM ANICUT
KAVERIPAKKAM TANK**

REPORT

BY

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JANUARY 1990

CONTENTS

Page no.

Preface	i - ii
I Overall report on the general data availability in irrigation systems of Tamil Nadu	
The State of Tamil Nadu - An introduction	1
Historical development of irrigation systems in Tamil Nadu	1 - 3
Historical development of data acquisition for irrigation management in Tamil Nadu	3 - 6
Present practice in data acquisition in the State	6 - 16
Institute for Water Studies	16 - 17
Quality of data acquired	17
State level information	18 - 20
Annexures	
A. Districtwise list of tanks in Tamil Nadu	21
B ₁ . List of Hydro meteorological Stations (Weather Stations) existing and proposed in the irrigation commands of Tamil Nadu River Basins	22 - 23
B ₂ . List of automatic recording rain gauges installed by Public Works Department	24 - 27
C. Format for daily report of flow data at anicut site	28
D. Government Order on Opening of Reservoirs and Category	29 - 31
E. List of Wireless Stations	32 - 33
F. List of gauge discharge sites where discharge computations are now being made and those where discharge computations are proposed to be made in the various River Basins in Tamil Nadu	34 - 37

	Page no.
G. Cropped area and the area irrigated as finalised at the district level	38 - 39
H. Recommended doses of fertilisers for different crops in the State	40
II Data availability survey of Sathanur Reservoir System	
1. System description	1 - 3
2. Data list	3 - 16
Appendices:	
I (a) (b) (c) Daily water report (Forms I, II, III)	17
II (a) Format for daily water reading at Sathanur Reservoir	18
II (b) Format for daily water reading at Sathanur pick-up anicut	19
III Annual field wise cultivation account	20
IV Yield trend particulars in Chengam taluk	21
III Data availability survey of Srivaikundam Anicut System	
1 Tambaraparani river basin	1
2 Brief description of Srivaikundam system	2 - 3
3 Data list	4 - 22
Appendices:	
I Proforma of weather data (Daily)	23
II Water readings of reservoirs and channels and tanks under Srivaikundam Subdivision (Daily)	24
III Water report form V P.W.D. Irrigation (daily)	25
IV Water report form VI - Srivaikundam Anicut	26
V Water report form VII - Srivaikundam Anicut (Daily)	27
VI Water report form VIII - Srivaikundam Anicut (Daily)	28

Appendices:

VII	Village Account No.2 Annual field wise cultivation account	29
VIII	Yield particulars of crops in Tirunelveli - Kattabomman and Chidambaranar Districts for 1987-88	30
IV	Data availability survey of Kaveripakkam tank irrigation system	
1	System description	1 - 3
2	Data list	4 - 23
Appendices:		
I	Rainfall register	24
II	Register of weather data	25
III	Daily water report - Palar Anicut	26
IV	Kaveripakkam tank water reading register (Daily)	27
V	Village Account No.2 Annual field wise cultivation account	28
VI	Yield particulars of crops in North Arcot district and Kaveripakkam. Ayacut for 1987-88	29
VII A	Consumption of N P K fertilisers for 1987-88	30
VII B	Departmental distribution of plant protection chemicals	30
VIII A	Cost of cultivation (Rs/irrigated ha)	31
VIII B	Cost of cultivation (Rs/ha rainfed)	31
IX	Water level data in control wells	32

P R E F A C E

P R E F A C E

This report made for the Tamil Nadu State will serve as the first step towards assessment of general data availability in the irrigation systems in the State. Three live systems each a representative sample of the three predominant segments of gravity irrigation systems of the State, namely the reservoir system, the diversion system and the tank system, have been selected for conducting the data availability survey. The lift irrigation practised from dug wells, dug-cum bore wells and tube wells, though serving about one third of the irrigated area in the State has not been included in this survey for the reason that it is mostly private owned and individually managed and our objective is to develop performance evaluation techniques for public owned irrigation systems.

A short note has been given for each of the sample systems surveyed and the data availability is discussed itemwise adopting the 'Data list'.

In the overall Tamil Nadu State report the historical development of irrigation in the State and the earlier attempts made to acquire data have been traced, the general data availability has been discussed, the source and quality of data has been stated and the extent to which disaggregation can be attempted with the basic data available at the sub system level has also been indicated. A few suggestions for improving the data list both in quantity and quality have been given. Formats and forms in which data is collected and compiled have been obtained for a number of items and appended. The organisations in the State engaged in the collection and storing of

data relating to irrigation and agriculture have been named and the earlier attempts made to centralise storage and retrieval of such data briefly narrated.

It is hoped that this report will meet the needs of the researcher in his attempt to develop a conceptual framework and an associated methodology for assessing irrigation system performance which is the objective of the IIMI-IFPRI Project on 'Developing Assessment Criteria for Irrigation System Performance'.

Prof. A. MOHANA KRISHNAN

Prof. C.R. SHANMUGHAM

**OVERALL REPORT ON THE GENERAL DATA AVAILABILITY
IN IRRIGATION SYSTEMS OF TAMILNADU**

OVERALL REPORT ON THE GENERAL DATA AVAILABILITY IN IRRIGATION SYSTEMS OF TAMILNADU

1. THE STATE OF TAMILNADU - AN INTRODUCTION

Tamil Nadu State lying in the southernmost part of India is 4.08% of its geographical size but has only 1.3% of its total surface water potential. The percapita availability of water in the State is among the lowest in the country working out to only about 735 m³ as against the national average of 2500 m³. But it holds 7.67% of the country's population. Its population is 48.4 million as per 1981 census and is steadily on the increase. Efficient management of the available water resources so as to maximise the production per unit of water is hence a necessity for production of food for its people on a sustainable basis. Evaluating irrigation system performance periodically and devising methods for improving on the performance becomes important in this context.

2. HISTORICAL DEVELOPMENT OF IRRIGATION SYSTEMS IN TAMILNADU

Tamil Nadu State is served by thirty three river systems very many of which drain limited catchments with moderate to low precipitation and that too during the monsoons. Most part of the State lying on the leeward side of the Western Ghats virtually misses the benefit of the more dependable south west monsoon. The north east monsoon brings intense rains to coastal regions in spells, triggered by depressions, often intensifying into cyclones, the intensity of course fast getting reduced towards the interior.

Irrigation has been practised in this State from time immemorial. There are several stone edicts carrying information on the interests the local rulers took in providing irrigation facilities to the

farmers in the early centuries. The Grand Anicut across the principal river Cauvery built in the second century AD to serve the vast delta of 0.38 million hectares is claimed to be one of the most ancient structures in the world, still in service.

While dug wells for lift irrigation might have been presumably the earliest mode of irrigation source, creation of the numerous small tank systems and the diversion works locally called 'anicut' on streams and rivers soon followed. Formation of the tank system in chains by the ancients, the surplus of one flowing down to fill the other formed in the lower contour and so on can be easily seen to be the most appropriate technology for harnessing the north east monsoon rainfall running down the gradually sloping eastern plains descending down the Deccan plateau. For instance the Kaveripakkam tank selected as the sample system for data availability survey in this report is referred to in a stone edict of the ninth century Pallava period as having been in service maintained by the irrigation committee consisting of elected representatives of farmers. Its creation is to be dated as atleast the seventh century if not earlier. The tank besides getting substantial flow from its own catchment is also fed from the river Palar, through a feeder channel taking off from a diversion work on the river, namely, the Palar Anicut. The surplus of this tank runs into a chain of tanks downstream. Statistical information on the number of such small tank systems in service in the State, district wise with the break up of the irrigated command served is given in the Annexure A. With regard to the river diversion works or anicuts big and small, the total count is around 880 most of which have been built in the early centuries of the Christian Era.

Major and medium projects to create large storage reservoirs by building dams across river courses started towards the end of the last century and were continued through the Five Year Plans after independence. There are forty two reservoirs big and small in service in the State on date. Efforts are continuously on to create new sources wherever possible which is becoming practically very difficult and costly. The emphasis is on modernising the existing system for better management.

3. HISTORICAL DEVELOPMENT OF DATA ACQUISITION FOR IRRIGATION MANAGEMENT IN TAMILNADU

For centuries irrigation administration has been village centered and essentially by the beneficiary. The management and control by the suzerain, be it a local chieftain or small kingdoms like the Cholas, Cheras and Pandias was generally limited to the levy of the cess due to the king which was collected through intermediaries, mostly in kind. There are epigraphical evidences to show that data required to assess the land tax were collected from ancient times. For instance

a) the extent irrigated by individual tank was measured and recorded.

b) the extent in the possession of individual farmer was measured and recorded with details of the boundaries within which each such unit lay.

c) the extent of land available in the village for public purposes like cattle grazing, thrashing floors, public ways etc., was measured and recorded.

d) the soil nature obtaining in each such unit was noted and brought as a factor for categorisation into 'tarams' a local term for relative divisions as good, average or bad soil with reference to the yield potential.

and e) some measure of the storage that could be expected in the tank by noting the depth over the sluice sill was adopted. The dependability of supply was related to this depth over sill and the land cess levied.

Data collection on irrigation and agriculture related activities got organised gradually as the administration got centralised at the taluk and district levels. That is how the first few rain gauges were installed at the taluk office compounds and the rainfall data collected and utilised by the revenue administration to decide on the success or failure of crops in the region.

As the colonial rule of the Britishers got established in the Madras Presidency, the first thing they did in civil administration was to create the office of the Superintendent of Tank repairs as early as 1809. The inflows into the tanks were assessed through gauge measurements and needed repairs undertaken for the upkeep of the tank and the supply channels. It is this nucleus that developed into the organisation of the Madras Public Works Department in 1858. From then on this department has been administering the irrigation systems in the State and has been responsible for the further development and upkeep of the irrigation sources. Collection of flow data in the river systems and also in the irrigation channels, at the irrigation control structures and the distribution points became the responsibility of the Public Works Department. Long time records of such flow data in important systems are available with the Public Works Department and it is this data that became the source of information for planning the irrigation projects of larger magnitude in the pre-independence and post independence decades.

In principal rivers, at the sites of diversion works continuous gauging of flow was done and data maintained and annual river diagrams were drawn which gave a wealth of useful information on the daily flows, the flow distribution at the diversion work, the peak floods discharged, the maximum ever flood that occurred, the rainfall at the site and its distribution and so on.

Over the years the method of gauging the flows was refined, the current meter was extensively used, the rating curves were drawn and periodically updated in major irrigation canals. The flow formulae to be adopted for discharges through sluices and over diversion weirs were communicated to the field officers and the flow information obtained and maintained at the head office.

By the turn of the century with the frequent occurrence of droughts and famines, the need for forecasting food production figures and improving agricultural production was keenly felt. Statistical information on crop production was obtained from the village, taluk and district levels and compiled by a special statistical cell formed in the Board of Revenue from about 1930 onwards. This cell was later organised as a full fledged Statistical Department in 1944 and was continuously developing in its functions.

To increase agricultural production it was clear that the need was more on the research and development of the crop strains and seeds rather than on the production process and the agronomic practices at the farm level in which the farmers were already well trained traditionally. The pre-independent British Government hence organised agricultural research stations and propagated the research findings through establishing demonstration farms. Soon after

independence, the agricultural department was fast expanded and with the ushering in of the Green Revolution, and the evolution of the hybrid varieties, inorganic fertilizers and the pesticides, data on cropwise production and cropwise yield started flowing in. The Agriculture Department and the Statistical Department among themselves organise these data collection and make them available to Government for planning the production, storage, marketing and distribution of the produce.

An organisation was also created to conduct soil survey in the cropped area in the State and this data is made available for land use and crop planning and also to prescribe correctives for improving the crop yield.

4. PRESENT PRACTICE IN DATA ACQUISITION IN THE STATE

A. HYDROMET DATA

(i) Rainfall

Rainfall is one parameter in which data collection has started very early and long term data is readily available in many cases for more than fifty years.

At present rainfall stations are maintained by a number of organisations in the State as detailed below. These are all non-recording stations.

Revenue Department	222 stations
Public Works Department	173 stations
Forest Department	53 stations
Tamil Nadu Tea Plantation Association	5 stations
Southern Railway	15 stations
Indian Meteorological Department	32 stations

Total	500 stations

The above Departments which maintain their stations in the various parts of the State keep a record of the daily rainfall and utilise the information for their purposes. Each of them has an access to the Department of Statistics which is the nodal agency for the State to get the details of other stations if they need.

The Department of Statistics has a Block Statistical Inspector in each Block. Block is a unit below the taluk level comprising of a few village panchayats. There are 384 Blocks in the State.

Each month the Block Statistical Inspector visits the rainfall stations in his jurisdiction, collects the daily rainfall for the month from the agency maintaining the station and mails it to the Director of Statistics at the headquarters. At the Directorate monthly, seasonal and annual rainfall for each district and the State are compiled and recorded.

Annual reviews are made districtwise and also season wise and published, which brings out the percentage deviation from normal and also the number of rainy days.

The seasonal break up adopted is as below.

South West monsoon period	June to September
North East monsoon period	October to December
Winter period	January and February
Hot weather period	March to May

This information is made available to the Agricultural Production Commissioner, Revenue, Agriculture and Revenue Administration Departments in the State Government, Director of Agriculture, Chief Engineer, Irrigation, Chief Conservator of Forests and the Regional Meteorological Centre, Madras.

Stationwise daily rainfall for each month is sent by the Director of Statistics to the Indian Meteorological Department, Pune for record at the National level. This Pune Centre has the rainfall statistics from 1891 onwards.

(ii) Temperature, Humidity, Wind, Evaporation

These observations are made only in the mini weather stations that are now being set up in different parts of the State. The stations are only a few at present. All agricultural research stations have one each. In the Periyar Vaigai modernisation project taken up under the World Bank aid one station has been established in the command area. A few stations are being organised in the command areas of the irrigation tanks which have been taken up for modernisation through the European Economic Community grant. Some more such stations have been established by the Ground Water Wing of the Public Works Department under the UND Programme. Recorded observations are maintained in these stations themselves properly registered and no attempt has yet been made to centralise these data.

A list of mini weather stations where observations are made and recorded is given in Annexure B₁.

(iii) Recording rain gauges

Automatic recording rain gauges have been installed in a few stations by the Irrigation Wing of Public Works Department and the recorded weekly charts are ordered to be sent for analysis and safe record in the Institute For Water Studies, Taramani, Madras. Stations where recording rain gauges are installed are given in Annexure B₂.

B. HYDRAULIC FLOW DATA AND WATER DISTRIBUTION

Hydraulic flow data for irrigation purposes is maintained by the Irrigation Wing of the Public Works Department in the State. Flow measurements at the various discharging sites, reservoir water levels and related data are recorded by the Section Officer, the lowest official in the engineering cadre, with the assistance from Irrigation Inspectors/Gauge readers/Luskars as the case may be and maintained in the section.

All measurements are made at 8.00 AM and again at 4.00 PM repeating the measurements at more frequent intervals if the necessity warrants.

MANAGEMENT OF IRRIGATION SYSTEMS IS WELL DECENTRALISED

(i) Tank systems

Tanks are divided into two groups, one having the benefit of feed from the rivers and streams in the basin through diversion works(anicuts) and the feeder channels which are called the system tanks, and the other having no such feeding link from any river or anicut which are called the non system tanks. All system tanks irrespective of the command they serve are managed by the Public Works Department while among the non system tanks those having a command of 40 hectares and above are under the control of the Public Works Department and those below 40 hectares command are under the control of the local Panchayat Unions.

Management of the storages in the non-system tanks is by the beneficiaries through their formal or informal committees. The date of release in the irrigation channels is decided by them and they

regulate the distribution in the channels according to some unwritten custom or tradition and no records of flow in the channels or the storages in the tanks are kept.

System tanks on the other hand are regulated as a part of the diversion systems benefiting them by the Public Works Department. Records of inflow into the tanks and the depth of storages maintained in the tank during the irrigation season are kept at the Section Officer level for the limited purpose of monitoring the delivery of the waters into the tank to meet the needs of the commands under those tanks. These records are not compiled or stored but are mostly destroyed with the closure of the season. Water distribution in the commands even in system tanks is only done by the beneficiaries themselves.

In a very few special cases of large tanks in either group, system or non system, where a P.W.D. Section is directly in charge, records of inflow, outflow through the irrigation supply sluices and the surplus weirs and day to day storages are maintained in section registers. Examples are the Chembarambakkam tank in Chengai Anna district and the Kadamba in the Nellai-Kattabomman district which are system tanks and the Madurantakam tank in the Chengai Anna district in the non-system group. These data generally do not move upto the higher officers. Exception is in Chembarambakkam tank which is the largest tank in the State the storage level of which is monitored by the Chief Engineer, Irrigation not because of its irrigation interest which is also substantial but because of its proximity to the City of Madras and its flood flow impact on the City of Madras.

(ii) Diversion System or Anicut System

Regulation of flows and management of the anicut systems are governed by the Rules of Regulation prescribed for each such system by the Government. This applies to all main anicut systems in the different river basins in the State which number 23. The Controlling Officer for each of these systems is indicated in the rule book itself. The operation comes under the purview of the Executive Engineer who takes decisions on their operation in consultation with the District Collector.

Flow data collected at the diversion point including the inflows, the distribution among the channels taking off from the anicut, the surpluses over the anicut and the releases through the scour vents etc., are promptly registered at the anicut site and copied to the Assistant Executive Engineer and the Executive Engineer. These records are preserved over a period of about ten years and more and are available at the anicut office itself. In most cases flow measurements are not taken in the channels, below the anicut head sluices. In a few cases where major channels bifurcate or trifurcate to feed the sub systems, the flow data based on the depth gauge reading is maintained which is also given the same importance as the anicut site readings.

A format in which such data is reported is enclosed in Annexure C.

(iii) Reservoir Systems

Irrigation Reservoir Systems in the State have been grouped under three categories with reference to their size and importance. A copy of the Government orders on this is given in Annexure D.

Flow data in reservoir systems is maintained in fairly elaborate detail. Daily inflow, storage and outflow data are maintained at the reservoir site. In the canals that take off to feed the command, besides the discharge data at the head, discharge at the distributory heads are also maintained. The disaggregation is generally only upto the distributory or minor head and does not go below to individual farm outlet.

The officer in charge of the reservoir, who may be in the rank of the Section Officer or Sub Divisional Officer depending on the size, maintains this data and submits daily data to the Executive Engineer and the Superintending Engineer. Salient information like the reservoir level, the storage, the inflow and the outflow is also communicated over wireless to the Chief Engineer direct in respect of reservoirs in category I and II. Twelve wireless communication stations are functioning for this purpose operated with the assistance from the Police Radio Officer and a V.H.F. net work is functioning in the Periyar Vaigai system as listed in Annexure E.

(iv) Data Analysis and Compilation

In pre independence days when most of the irrigation systems were anicut systems and the management was at the Executive Engineer or the Superintending Engineer level in respect of regulation of flow, analysis and compilation of data was done at the system level itself. The inflow outflow quantities were computed in volumes from the discharge rates and water levels observed and presented in the shape of 'River Diagrams' referred to earlier, to the Chief Engineer, Irrigation. River Diagrams for all the 23 systems were thus made and kept on record in the head office.

Soon after independence, a decision was taken to centralise the system of data acquisition and storage and a separate Division in charge of an Executive Engineer was formed in 1948 and named as 'Gauging Division'. This Division obtained the flow data duly computed at the field level itself and compiled them in the form of data books for each such site. In 1963 a decision was taken that raw data as observed at site might be obtained from the field and the computations in terms of quantities be done at the Gaugings Division to ensure better quality of the final presentation. From then on the field officers are mailing the actual observations at the anicut and reservoir sites to this Division. Computations are made in this Division adopting the appropriate formulae and the results are published as Water Year Books for each such site. This centralisation though commendable has left much to be desired since the publishing of the Water Year Books has fallen into bad arrears for the reason that field data have not been promptly communicated from many discharge sites. This requires to be improved.

A list of sites 46 in number for which discharge computations are made and the Water Year Books are published in this division is given in Annexure F, codified river basin wise.

C. CROPPED AREA/IRRIGATED AREA

The department of Statistics takes the lead in compiling this data and furnishes the same to the Government for administrative purposes.

The source of information on cropped area and irrigated area any time for any organisation is only the basic data maintained by the Village Administrative Officer in his registers at the village.

The Village Administrative Officer sends a monthly return of area cultivated under different crops and the area irrigated to the Revenue Inspector by the 26th of each month. On the 27th of each month the Tahsildar of each taluk holds a meeting of the Taluk Team with the Revenue Inspectors, the Block Statistical Inspectors and the Agricultural Officers & Horticultural Officers at the taluk level and prepares a cropped area statement for the month for the taluk. As per Government orders this meeting is mandatory and is to be held any day between the 27th and 29th at any cost. The figures brought by the Revenue Inspectors are checked with the figures if any produced by the other officers in the meeting and reconciled before the taluk level statement is finalised in the meeting. The Revenue Divisional Officer may preside over this meeting by turn. A copy of this finalised monthly statement is mailed to the Director of Statistics direct by the Tahsildars.

District level coordination meeting is then conducted by the District Revenue Officer on the third working day every month when other district officials representing Agriculture, Horticulture, Oil Seeds and Statistics attend and the final reconciled figures at the district level are sent to the Director of Statistics in the proforma given in Annexure G.

In the Directorate of Statistics, the Joint Director of Statistics holds a meeting with the representatives from Agriculture, Horticulture and Oil Seeds and finalises the monthly statement for the State as a whole, which is furnished to the Agricultural Production Commissioner at the Government, the Commissioner for Land Administration and other concerned officials of the State.

Unfortunately these cropped area figures are not compiled irrigation systemwise at this stage in the monthly reports. However they are detailed seasonwise, and source wise in the yearly Season and Crop Report for the State, compiled and issued by the Director of Statistics.

D. AGRICULTURE-PRODUCTION/YIELD PER HECTARE

In the assessment of yield and the production for the year, crop wise, the Department of Statistics, guides the crop cutting experiments for 'Crop Estimation Survey' while the Agriculture Department physically conducts the survey in the field. The Department of Statistics specifies the area for the experiment by adopting random sampling techniques and the National Sample Survey Organisation of the Government of India also collaborates in this process. As many as about 9,000 experiments are conducted at present from which the yield per unit area is assessed for each district crop wise. From this the production is estimated districtwise and crop wise.

Annually the Department of Statistics publishes the Season and Crop Report in which the total production of each crop is detailed district wise with break up under irrigated and non irrigated conditions in respect of some principal crops, season wise. Production figures are however not compiled irrigation system wise.

Similarly the Department of Statistics does not compile figures of agricultural inputs like fertilisers, pesticides, seeds etc. These are expected to be dealt with in the Agricultural Department. They too have only information of the departmental distribution and not what goes through the private outlets which are many. The Agriculture

Department has information on the certified seeds of principal crops distributed monthwise and also district wise. Plant protection chemicals distributed as dust in tonnes or liquid in litres are also recorded monthwise and district wise. The distribution of the fertilisers N P K and also biofertilisers like Azospyrillum is also available monthwise and districtwise. But they do not have systemwise nor even a breakup between irrigated and unirrigated areas.

With regard to fertilisers, the recommended dosage for different crops in the State in general is furnished in Annexure H. But adequate facilities for conducting soil tests both in agricultural laboratories and also in mobile laboratories at site are available in the State and site specific recommendations for the different crops are given by the soil scientists.

5. INSTITUTE FOR WATER STUDIES

The Institute for Water Studies was established by the Government of Tamil Nadu in 1974 at Taramani, Madras and has been developed since then to achieve the capability of assessing the water resource potential river-basinwise and also to evaluate the present and future water needs for the State.

As one of the objectives, a computerised data bank has been created in the Institute's Computer Centre. The intention is to develop this Computer Centre as the repository of all data for the State pertaining to rainfall, other meteorological parameters like temperature, humidity, wind velocity, pan evaporation and sunshine hours and the monthly stream flow data in reservoirs, diversion systems and canals. Data on irrigation tanks including storage, water spread, command area etc., are also proposed to be stored. This

activity is in progress. So far rainfall data for 181 stations (for 45 years) streamflow for 15 gauge sites (for 40 years) ground water levels for 820 observation wells (for 19 years) and data on 1700 tanks have been obtained and taken in.

The software developed and currently in use at this data bank are based on commercially available software which are popular and familiar.

6. QUALITY OF DATA ACQUIRED

Principal basic data either on flow parameters or area irrigated and the production output has to come from the field level staff of the Irrigation Wing of the Public Works Department or the Village Administrative Officer of the Revenue Department. In general this data can be taken to be correctly gathered and furnished. Still there can be a few delinquents who may not pay the necessary attention on this part of the work and may not be sincere in their job and that percentage may be taken to be very small.

With the available basic data obtained the Irrigation Wing of the Public Works Department and the Directorate of Statistics have developed enough expertise in compilation and analysis of the data and in the presentation of the output. Both these departments have facilities for training their personnel who collect and process and have also gone in for computerisation in the recent years. The statistics are made available to the Government in the various departments who make use of this data for their planning and funding.

7. STATE LEVEL INFORMATION

A. Tube Wells

The data given below is for the year 1987-88 and the source is 'Season and Crop Report of Tamil Nadu' for the year 1987-88 or Fasli 1397. A Fasli year is for the period July to June of next year. All statistics of irrigation and agriculture are maintained for this duration of the year.

The average command area of a pump can be taken to be about one to two hectares. This would of course depend on the water potential in the well. Lifting device is not generally a constraint for the farmers. Normally they increase the horse power or seek other modes of lifting once they know ground water is available. Even if they do not own enough land at the site of the well they sell the surplus water for cost.

The average power of the pump utilised is 5 horse power. In a few cases in deep tube wells they may go in for higher horse power.

The average length of the distributory from the well to the farm can be taken to be just 100 metres, as is seen from the largest number of dug well in use.

B. State Irrigated Area

The source is the 'Season and Crop Report' of Tamil Nadu prepared by the Director of Statistics. Past data is available for over 20 years. Data prior to this can also be obtained from the Commissioner of Land Administration in the erstwhile Board of Revenue.

TUBE WELLS

GOVERNMENT						PRIVATE				GRAND TOTAL	
With Electrical pump	With Diesel pump	Total	With Electrical pump	With Diesel pump	Other methods	Total					
3933	74	4007	56379	12777	48	69204				73211	
FILTER POINT WELLS											
7	—	7	4172	4640		8812				8819	
DUG WELLS (MASONRY)											
GOVERNMENT						PRIVATE				GRAND TOTAL	
Elec. pump	Diesel pump	Bullock bailing	Bucket manual	Other methods	Total	Elec. pump	Diesel pump	Bullock bailing	Bucket manual		Other methods
1786	72	101	35	44	2038	795372	216062	557925	51565	12215	1633139
DUG WELLS (NON MASONRY)											
232	4	16	—	—	252	53347	25581	132439	17562	1549	230418
DUG CUM BORE WELLS											
GOVERNMENT						PRIVATE				GRAND TOTAL	
Electrical	Diesel	Total	Electrical	Diesel	Total						
40	—	40	6409	79	6488				6528		

Note: District wise break up for all these wells is also available

The current data given below is for the year 1987-88 and in the past data, information for 1985-86 is filled in. Information is also available for 1986-87 and all other past years.

Irrigated area crop wise and also district wise is also available.

	Current data	Past data
	----- 1987-88 (all figures in hectares)	----- 1985-86
i) Original command area under Govt. Reservoirs, Canals and Tank systems by gravity flow	14,96,000	14,96,000
ii) Annual Planned area by Govt. Reservoirs, Canals and Tank systems by gravity flow	13,29,883	14,45,544
iii) Area actually irrigated		
By Gravity-Govt. canals	7,19,941	7,73,820
By Tanks	6,09,942	6,71,724
By lift-wells and other sources	11,07,153	10,54,635
By ownership	Individual farmers	
By size	Not available	

C. State Agricultural Production

The source is the 'Season and Crop Report of Tamil Nadu' prepared by the Directorate of Statistics for over twenty years and the Commissioner of Land Administration in the Board of Revenue even earlier.

The current data given below is for 1987-88 and in past data column figures for 1985-86 are furnished as a sample. Information is also available for 1986-87 and other past years. Crop wise production is also available district wise. Seasonwise information is available only for a few crops.

(All figures in kg/hectare except sugarcane & cotton)

Principal crop	Current data 1987-88		Past data 1985-86	
	For the State	For the Irrigated Area	For the State	For the Irrigated Area
(1)	(2)	(3)	(4)	(5)
<u>Food Crops</u>				
Rice	2872	3281	2372	2693
Sorghum	1017	2316	1057	1663
Bajra	1075	2195	1215	2357
Ragi	1710	2651	1542	2402
Pulses	400	680	440	670
Sugarcane (Tonnes/hectare)	107	Not available	105	Not available
Turmeric	5677	"	7908	"
Tamarind	3210	"	3180	"
Tapioca	29290	"	28303	"
Potato	24024	"	17181	"
<u>Non food crops</u>				
Cotton (lints)	188	449	324	518
Tobacco	1392	-	1389	-
Groundnut	1321	1898	1262	1841
Sunflower	445	878	505	1139

Past data (1985 - 86)
(All figures in Tonnes)

Current data (1987 - 88)

Principal Crops	Season															
	I Crop		II Crop		III Crop		Total		I Crop		II Crop		III Crop		Total	
	June - Sept.	Oct. - Jan.	Oct. - Jan.	Jan. - April	Jan. - April	June - Sept.	June - Sept.	June - Sept.	Oct. - Jan.	Oct. - Jan.	Jan. - April	Jan. - April	Jan. - April	Jan. - April	Jan. - April	Jan. - April
(1)	(2)	(3)	(4)	(4)	(5)	(5)	(6)	(6)	(7)	(7)	(8)	(8)	(8)	(9)	(9)	
Rice	345930	4754600	513000	5613530	4026510	1279210	64770	5370490								
Sorghum.	107780	592330	--	700110	108820	665730	--	774550								
Bajra	72980	241780	--	314760	100560	271080	--	371640								
Wheat	--	200	--	--	--	380	--	380								
Maize	--	31560	--	31560	--	28800	--	28800								
Ragi	136280	151680	--	287960	137060	163720	--	300780								
Pulses	--	283130	--	283130	--	275220	--	275220								
Sugarcane	--	20765890	--	20765890	--	20004750	--	20004750								
Potatoes	34240	175440	--	209680	21180	112340	--	133520								
Groundnut	598240	710650	--	1308890	482250	692770	--	1176020								

D. Production for Irrigated Area

The source for this information is also the Season and Crop Report of the Director of Statistics. Production figures in irrigated areas are available for a few principal crops.

Crop	Current data 1987-88	Past data 1985-86
	All figures in Tonnes	
Rice	56,13,530	49,38,444
Sorghum	1,07,780	1,11,142
Bajra	72,980	90,130
Ragi	1,36,280	1,43,508
Sugarcane	2,07,65,890	1,78,05,574

Note: In these, both rice and sugarcane crops are taken to be all in irrigated area which is of course an approximation.

F. State Yield Data

The source is again the Season and Crop Report of the Director of Statistics who gets the crop cutting surveys done as explained earlier. Yield levels of principal crops for the State as a whole and for irrigated areas separately are also available district wise and in some cases seasonwise.

**ANNEXURE A
DISTRICTWISE LIST OF TANKS IN TAMILNADU**

Sl.No.	Name of District	In charge of Panchayat Unions			In chage of Public Works Dept.			Ex-zamin tanks	Total
		Less than 20 ha	From 20 ha to 40 ha	Total	Rain fed tanks more than 40 ha	Sys-tem tanks *	Total		
1.	Chengalpattu	1241	542	1783	1202	5	1207	756	3746
2.	North Arcot	1482	602	2084	632	537	1169	482	3735
3.	South Arcot	1213	553	1766	573	184	757	79	2602
4.	Salem	449	100	549	188	---	188	---	737
5.	Dharmapuri	1451	128	1579	89	3	101	154	1834
6.	Coimbatore	42	22	64	57	2	59	---	123
7.	Periyar								
8.	Thanjavur	338	153	491	5	680	685	---	1176
9.	Pudukottai	4609	725	5334	369	161	530	58	6394
10.	Tiruchi				173	85	258	214	
11.	Madurai &								
12.	Anna	3142	249	3391	288	483	771	331	4493
13.	Pasumpon Thevar Thirumaganar	642	691	1333	1378	130	1508	7367	10208
14.	Ramanathapuram								
15.	Kamarajar								
16.	Nellai - Kattabomman &	806	159	965	289	397	686	445	2096
17.	Chidambaranar								
18.	Kanyakumari	1062	12	1074	24	960	984	---	2058
19.	Nilgiris	---	---	---	---	---	---	---	---
20.	Madras	---	---	---	---	---	---	---	---
Total		16477	3936	20413	5276	3627	8903	9886	39202

* Includes tanks having ayacut less than 40 hectares also

ABSTRACT

1. Panchayat Union Tanks	20,413
2. P.W.D. Tanks	8,903
3. Ex-zamin Tanks	9,886

Total	39,202

ANNEXURE B1

Lit of Hydrometeorological stations (weather stations) existing and proposed in the Irrigation commands of Tamilnadu River Basins.

No.	Basin	Existing	Proposed
1.	Araniar		
2.	Kortalayar	Tiruttani Ennore	
3.	Cooum	Nuñgambakkam	
4.	Adyar	Meenambakkam Tiruporur	
5.	Palar	Vellore Mahabalipuram	Vaniambadi Thiruvathipuram
6.	Ongur		
7.	Varahanadhi		
8.	Malattar		
9.	Ponnaiar	Melumalal Dharmapuri Paiyur Thirupathur Kilanchipattu Pondicherry	Krishnagiri dam Tirukoilur Anicut
10.	Gadium	Cuddalore	
11.	Vellar	Mangalapuram Kallakurichi Lakkur Portonovo	
12.	Cauvery	Mettur dam Mettupalayam Ooty Coonor Bhavanisagar Coimbatore Coimbatore Agri. University Coimbatore Aero- drome Sundakkampalayam Salem Paramathi kamachipuram Tiruchy City Tiruchy Aerodrome Ariyalur Aduthurai Karaikkal Thanjavur Koradachery Nagapattinam Vedaranyam	Erode Gobichettipalayam Palani Upper Anicut Lower Anicut Nannilam Mannargudi Thiruthuraipoondi Nagapattinam

No.	Basin	Existing	Proposes
13.	Agniar	Kuringulam Adiramapattinam	Pattukottai
14.	Ambuliar		
15.	Vellar	Kudumiamalai	
16.	Koluvanar		
17.	Pambar	Karaikudi	
18.	Manimuthar	Tondi	Devakottai
19.	Kottakaraiyar		
20.	Vaigai	Kodaikanal Viralipati Peranai Pariyapatti Pulipatti Madurai City Madurai Aero- drome Madurai Agri. Collge Pamban	Uthamapalayam Ramanathapurm Parthibanur Regulator
21.	Utharakosamangiar	Valinokkam	
22.	Gundur	Aruppukkotai	
23.	Vembar		
24.	Vaippar	Kavalur	Srivilliputhur
25.	Kallar	Kovilpatti Malaipatti	
26.	Korambalamar	Tuticorin old port Turicorin new port	
27.	Tambaraparani	Palayamkottai	Kudiyiruppu Manimuthar dam Srivaikuntam Nanguneri
28.	Karumaniyar		
29.	Nambiar		
30.	Hanumanadhi		
31.	Pavalar	Aramboly Kanyakumari	
32.	Valliyar		
33.	Kodayar		Perunchani dam
34.	Parambikulam-Aliyar Project		Thirumurthi dam Pollachi Pongalur

ANNEXURE B2

Statement showing the list of automatic recording rain gauges installed by
Public Works Department

Sl.No.	Basin	Name of Rainfall station
	ARANIAR	
1.		Lakshmipuram
	KORTALAYAR	
2.		Poondi Right Flank
3.		Poondi Left Flank
4.		Sholavaram
	PALAR	
5.		Vaniyambadi
6.		Chengam
7.		Chengalpattu
	ONGUR	
8.		Cheygar
	VARAHANADHI	
9.		Tindivanam
	PENNAIAR	
10.		Krishnagiri Reservoir
11.		Shulagiri Reservoir
12.		Sathanur Dam
13.		Tirukoilur Anicut
14.		Villupuram
	GADILAM	
15.		Cuddalore
	VELLAR	
16.		Gomukhi dam
17.		Sankarapuram
18.		Attur
19.		Permbalur
20.		Vridhachalam
21.		Chidambaram

Sl.No.	Basin	Name of Rainfall station
CAUVERY		
22.		Ooty
23.		Coonur
24.		Gobichettipalayam
25.		Erode
26.		Tiruppur
27.		Komaralingam
28.		Amaravathinagar
29.		Mulanur
30.		Pongalur
31.		Ayilur
32.		Kakkadesam
33.		Mettur dam
34.		Salem
35.		Tiruchengode
36.		Palani
37.		Dindigul
38.		Thathaiyangarpettai
39.		Kulithalai
40.		Turaiyur
41.		Upper Anicut
42.		Lower Anicut
43.		Pullambadi
44.		Grand Anicut
45.		Kumbakonam
46.		Sirkazhi
47.		Nannilam
48.		Tiruvarur
49.		Nagapattinam
50.		Mannargudi
51.		Thiruthuraipoondi
52.		Thoppur
53.		Koppampatti
54.		Ariyalur
AGNIYAR		
55.		Pattukottai

Sl.No.	Basin	Name of Rainfall Station
	VELLAR	
56.		Pudukottai
	KOLUVANAR	
57.		Minisal
	PAMBAR	
58.		Tirumayam
	MANIMUTHAR	
59.		Natham
60.		Devakottai
	KOTTAKARAIYAR	
61.		Sivaganga
	VAGAI	
62.		Periyar
63.		Thekkady
64.		Uthamapalayam
65.		Bodinaickanur
66.		Kodaikkanal
67.		Manjalar Dam
68.		Madurai
69.		Manamadurai
70.		Ramanathapuram
71.		Gandamanaikanur
72.		Pallapatti
73.		Partibanur
	GUNDAR	
74.		Usilampatti
75.		Aruppukottai
76.		Sayalkudi
77.		Elumalai
	VAIPPAR	
78.		Watrap
79.		Srivilliputhur
80.		Rajapalayam
81.		Vasudevanallur
	KORAMBALLAM	
82.		Tuticorin

Sl.No.	Basin	Name of Rainfall Station
	TAMBARAPARANI	
83.		Manimuthar dam
84.		Tenkasi
85.		Palayamkottai
86.		Srivaikuntam
87.		Tiruchendur
	KARAMANIYAR	
88.		Nanguneri
	VALLIAR	
89.		Thuckalay
90.		Colachal
	KODAIYAR	
91.		Balamore
92.		Kulasekaram
93.		Perunchani dam
	PARAMBIKULAM-ALIYAR PROJECT	
94.		Makkinaickanpatti

ANNEXURE C

FORMAT FOR DAILY REPORT OF FLOW DATA AT ANICUT SITE

Name of Anicut : Section : Date
 Name of River : Subdivision :
 Division :

Time of observation	Gauge reading upstream of anicut	Canal Head sluice		Canal Head sluice		Scour vents		Over anicut Length of crest	Gauge readings downstream of anicut in river
		No. of vents.... Size of vent.... Sill level +	No. of vents.... Size of vent.... Sill level +	No. of vents.... Size of vent.... Sill level +	No. of vents.... Size of vent.... Sill level +	Crest Level	Height Dis-charge flow above crest		
		Ft	Cusecs	Ft	Cusecs	Ft	Cusecs	Ft	Cusecs
8.00 AM									
12.00 Noon									
8.00 PM									

Note: The details and the column may vary depending on the diversion structure

G.O. Ms.No.1116 Public Works Department dated 21st July 1977

Subject: Irrigation - Opening of Irrigation Reservoirs-Delegation of powers to officials of Public Works Department - orders issued

Reference:

- (i) From the Senior Deputy Chief Engineer, Irrigation D.O.Lr.No.N3/107056/75 dt.28th January 1976.
- (ii) From the Board of Revenue (Food Production) D.O.Lr.No.A1/6371/76.
- (iii) From the Board of Revenue D.O. Letter No.A2/6371/76-2 (Food Production) dt. 2nd July 1976.
- (iv) From the Chief Engineer (Irrigation) letter No.N3/107056/76-12 dt. 11th April 1977.

ORDER

The question of delegating powers to Public Works Department officials for declaring open of reservoirs for irrigation purposes has been engaging the attention of the Government for some time. The issue has been examined in consultation with the Chief Engineer (Irrigation) and the Board of Revenue.

2. The Government after careful consideration, have decided to classify the Irrigation systems into three categories with reference to their size and importance.

Category I - The reservoirs/systems to be grouped under this category as detailed in Annexure I, shall be opened only with the prior orders of Government.

Category II - The reservoirs/systems under this category, as detailed in Annexure II, shall be opened by the Chief Engineer (Irrigation) in consultation with the Commissioner for Food Production, under immediate intimation to the Government. If there is

any difference of opinion between Chief Engineer (Irrigation) and Commissioner for Food Production, the matter should be referred to Government for orders.

Category III - The reservoirs below 2 T.M.C. will fall under this category and they shall be opened by the Executive Engineer in charge of the District after prior consultation with the Collector concerned subject to conformity with rules of regulation of reservoirs and availability of adequate storage as enumerated in the rules of regulation and under immediate intimation to the Chief Engineer (Irrigation) and the Government. Any deviation in the opening date upto a month of these reservoirs shall also be done by the Executive Engineer in-charge of the District after prior consultation with the concerned Collector and under immediate intimation to the Chief Engineer, Irrigation and Government. When there is any difference of opinion between the Executive Engineer and the Collector, the matter should be referred to the Government for orders (as amended in Government Public Works Department No.62571/XI/80-5 dt.20th Feb.1981.

3. The Government also direct that extension of supplies upto 15 days may be made by the Executive Engineer or Chief Engineer in consultation with the Collector, in anticipation of Government orders and there shall be no extension thereafter.

4. Any special release other than as envisaged in the rules of regulations will require prior approval of Government.

(By order of the Governor)

B.VIJAYARAGHAVAN
Commissioner and Secretary to Government

/ True copy/

S.No.	Name of Reservoir	Effective capacity in TMC	Name of irrigation system to be regulated
	(1)	(2)	(3)
Category I			
1.	Mettur Reservoir	93.470	(i) Cauvery delta system and Cauvery Mettur Project (ii) Mettur Canals (iii) New Kattalai High Level Canal (iv) Pullambadi Canal
2.	Bhavanisagar	32.800	(i) Lower Bhavani Canal turn (ii) Lower Bhavani Canal IP Turn
3.	Periyar Vaigai Basin		
	(a) Periyar Reservoir	10.570	(i) Periyar Main Canal Double crop area
	(b) Vaigai Reservoir	6.825	(ii) Periyar main canal single crop area (iii) Periyar main canal extension area (iv) Thirumangalam canal
4.	Sathanur Reservoir	8.100	(i) Sathanur left side canal (ii) Second crop under Tirukoilur anicut
5.	Manimuthar Reservoir	5.511	Manimuthar Canal
6.	Kodayar Basin		
	(a) Pechiparai reservoir	4.450	(i) Kodayar system
	(b) Perunchani reservoir	2.890	(ii) Pattanamkal
	(c) Chittar dam II	0.600	(iii) Radhapuram canal
	(d) Chittar dam I	0.391	
7.	P.A.P. GROUP		
	(a) Sholayar Reservoir	5.392	(i) Aliyar Feeder Canal
	(b) Parambikulam Reservoir	17.820	(ii) Sethumadai Canal
	(c) Tunacadavu and Peruvavipallam Reservoir	1.177	(iii) Pollachi Canal
	(d) Aliyar Reservoir	3.864	(iv) Vettaikaranpudur canal (v) Parambikulam main canal
	(e) Thirumoorthy Reservoir	1.935	(vi) Udumalpet canal (vii) The High Level Canal*
Category II			
1.	Amaravathi Reservoir	4.047	Amaravathy Canal
2.	Krishnagiri Reservoir	2.334	Krishnagiri Canals

* Amendment issued in government P.W.D. Memo No.140470/XI/77-4 dt.9th September 1978.

ANNEXURE E**LIST OF WIRELESS STATIONS**

Wireless sets have been installed at the following places for communicating flow messages

CAUVERY BASIN

1. Mettur Dam
2. Bhavanisagar
3. Thanjavur
4. Grand Anicut
5. Lower Anicut
6. Upper Anicut

PERIYAR BASIN

7. Madurai
8. Thekkadi

TAMBARAPARANI BASIN

9. Tirunelveli

VAIPPAR BASIN

10. Ramanathapuram

PARAMBIKUMAL - ALIYAR BASIN

11. Pollachi

HEAD QUARTERS

12. Madras

Besides when the Periyar-Vaigai System has been modernised with world Bank aid V.H.F. net work has been created with the following communicating points

1. I.B. at Dam site, Periyar Dam
2. I.B. P.W.D., Thekkady
3. Office of the Asst. Exe. Engr., P.W.D., Uthamapalayam
4. Office of the Asst. Exe. Engr., P.W.D., Vaigai Dam
5. Hillock P.W.D. Section, Kodaikanal
6. Manjalar dam
7. Exe. Engr's. Office, P.W.D., Periyakulam
8. P.W.D., Peranai
9. P.W.D., Tallakulam
10. Section Office, Kallandiri
11. T. Shed, Palipatti

12. Dam Superintendent, Parthibanur
13. Office of the Section Officer, Ramnad
14. Office of the Section Officer, Andipatti
15. Office of the Section Officer, Mettupatti
16. I.B. Melur
17. Office of the Section Officer, Thaniamangalam
18. Exe. Engineer's Office, Sivaganga
19. Old Tower, Virahanur regulator
20. Lascars shed, Awadiyarpuram
21. T. Shed, Palanichettyatti
22. Sathiar dam Section Office
23. Section Office, P.E.D. Cumbum

Mobile V.H.F. Stations:

Uthamapalayam

Vaigai dam

Madurai & Paramakudi

ANNEXURE F

4. List of Gauge Discharge sites where Discharge computations are now being made and those where Discharge Computations are proposed to be made in the various River Basins in Tamilnadu

Sl.No.	Name of main river basin	Name of sub-basin	G.D. sites where measurements are being made and computation books prepared by the Gauging Division	G.D. sites where computation books are proposed to be made by the Gauging Division
(1)	(2)	(3)	(4)	(5)
1.	Araniyar	—	—	Annappanaickenkuppam Anicut Laskhmipuram Anicut
2.	Kortaliyar	—	Kesavaram Anicut Tamaraipakkam Anicut Vallur Anicut	Poondi Reservoir
3.	Cooum	—	Korattur Anicut	—
4.	Adayar	—	NIL	NIL
5.	Palar	Poiney Cheyyar Kamandalar	Palar Anicut Poiney Anicut Cheyyar Anicut Thandarai Anicut Aliabad Anicut	— — — — —
6.	Ongur river	—	NIL	Last Anicut
7.	Varahanadhi	—	Vidur Reservoir	—
8.	Malattaru	—	NIL	NIL
9.	Pennai Aru	—	Krishnagiri Reservoir Nedungal Anicut Sathanur Reservoir* Sathanur Pickup Anicut Tirukoilur Anicut Ellischoultry Anicut	Eachambadi Anicut Sornavur Anicut*

Sl.No. Name of main River basin	Name of sub-basin	G.D. sites where measurements are being made and computation books prepared by the Gauging Division	G.D. sites where computation books are proposed to be made by the Gauging Division
(1)	(3)	(4)	(5)
10. Gadilam	Pullampatti R Pambar Vaniar Kallar —	— — — — —	Thumbalahalli Reservoir Pambar Reservoir Vaniar Reservoir Sulagiri Chinnar Reservoir Thiruvethi Anicut Thiruvethipuram Anicut
11. Vellar (North)	—	Tholudur Regulator Pelandurai Regulator Sethiathope Anicut* Manimukthanadhi Reservoir Vridhachalam Anicut Gomukhi Reservoir	Memathur Anicut
Vellar (cont)	Manimukthanadhi Gomukhi —	Mettur Reservoir* Upper Anicut Grand Anicut* Lower Anicut* Chinnar Reservoir	—
12. Cauvery	Chinnar Bhavani	Bhavanisagar Reservoir*	Nagavathi Reservoir Thoppaiyar Reservoir Gunderipallam Reservoir Varattupallam Reservoir
	Noyyal Amaravathy	Kodivery Anicut Kalingarayan Anicut Chitrachavadi Anicut Amaravathy Reservoir* Pallapalayam Anicut*	Uppar Reservoir Vattamalaikarai Odai Reservoir Varadhananathi Reservoir Palar Porandalar Reservoir Parappalar Reservoir

Sl.No.	Name of main river basin	Name of sub-basin	G.D. Sites where measurements are being made computation books prepared by the Gauging Division	G.D. sites where computation books are proposed to be made by the Gauging Division
(1)	(2)	(3)	(4)	(5)
13.	Agniaru	Ariyavurar	---	Ponnaiyar Reservoir
14.	Ambuliaru	---	---	Last Anicut
15.	Vellar (South)	---	---	Last Anicut
16.	Koluvanaru	---	---	Last Anicut
17.	Pambar	---	---	Last Anicut
18.	Manimuthar	---	---	Last Anicut
19.	Kottakaraiaru	---	---	Last Anicut
20.	Periyar-Vagai	---	Periyar lake*	---
			Vagai Reservoir*	Ramnad Big Tank
			Peranai Regulator*	
			Parthibanur Regulator*	
		Manjalar	Manjalar Reservoir	
		Marudhanadhi	---	---
21.	Utharakosamangai Aru	---	---	Marudhanadhi Reservoir
22.	Gundar	---	---	Utharakosamangai Tank
23.	Vembaru	---	---	Kamuthi Regulator
24.	Vaipparu	---	---	Last Anicut
			---	Pilavukal Reservoirs - Periyar & Koilar
			---	Golvarpatti Reservoir
25.	Kallaru	---	---	Atankarai Anicut
26.	Korampallamaru	---	---	Last Anicut
27.	Thambaraparani	---	Srivaikuntam Anicut*	Last Anicut
		Manimuthar	Manimuthar Reservoir*	Marudur Anicut
		Chittar	Gatana Reservoir	
		Uppodai	Ramanadhi Reservoir	
28.	Karamaniaru	---	---	Karuppanadhi Reservoir
29.	Nambiyaru	---	---	Gangaikondan Anicut
30.	Hanumanadhi	---	---	Last Anicut
			---	Last Anicut
			---	Last Anicut
			---	Last Anicut

Sl.No. Name of main river basin	Name of sub-basin	G.D. sites where measurements are being made and computation books prepared by the Gauging Division	G.D. sites where computation books are proposed to be made by the Gauging Division
(1)	(3)	(4)	(5)
31.	Palavaru	---	Last Anicut
32.	Valliar	---	Last Anicut
33.	Kodaiyar	Pechiparai Reservoir	Chittar Dam I
34.	P.A.P. System	Perunchani Reservoir	Chittar Dam II
			Last Anicut*
			Upper Nirar*
			Lower Nirar
			Sholayar Reservoir
			Parambikunal Reservoir
			Thunavakkadavu Reservoir
			Peruvaripallal Reservoir
			Aliyar Reservoir*
			Thirumoorthy Reservoir*
			Manakkadavu Weir*

* Automatic water level recorders to be installed

ANNEXURE G

**STATEMENT OF CROPPED AREA AND AREA IRRIGATED AS FINALISED
AT THE DISTRICT LEVEL**

District	Month	Cropped area in hectares					
		During the month			To the end of the month		
Sl.No.	Crop	Irrigated	Unirrigated	Total	Irrigated	Unirri- gated	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1.	Paddy						
2.	Sorghum						
3.	Bajra						
4.	Ragi						
5.	Millet						
6.	Wheat						
	<u>Other</u>						
	<u>Cereals</u>						
7.	Bengalgram						
8.	Blackgram						
9.	Horsegram						
10.	<u>Other</u>						
	<u>Pulses</u>						
11.	Sugarcane						
	Planted						
	Ratoon						
	Total						
12.	Cotton						
13.	Tobacco						
14.	Gingelly						
15.	Groundnut						
	Summer						
	Winter						
	Total						

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
16.	Castor						
17.	Sunflower						
18.	Potato						
	Summer						
	Winter						
	Total						
19.	Tamarind						
20.	Sugarbeet						
21.	Tapioca						
22.	Plantain						
23.	Cashewnut						
24.	Ginger						
25.	Pepper						
26.	Coriander						
27.	Chilly						
28.	Onion						
29.	Cardomam						
30.	Muster						
31.	Garlic						
32.	Turmeric						

ANNEXURE H

RECOMMENDED DOSES OF FERTILISERS FOR DIFFERENT
CROPS IN THE STATE

Crops	Kg/Ha		
	N	P	K
1. HYV Paddy	100	50	50
2. Local Paddy	53	35	18
3. Maize	125	63	50
4. Sorghum (Cholam)	90	45	45
5. Bajra (Cumbu)	80	35	75
6. Ragi	60	30	30
7. Pulses	25	50	--
8. Sugarcane	275	60	113
9. Groundnut	17	34	34
10. Cotton	80	40	30

DATA AVAILABILITY SURVEY OF SATHANUR RESERVOIR SYSTEM

1. SYSTEM DESCRIPTION

Sathanur Reservoir is the first storage formed on the river Ponnaiyar and is also the largest in capacity 229 Mm^3 (8100 Mcft). Since then five more reservoirs have been formed in this basin both on the main river and its tributaries, but they are much smaller in capacity.

Sathanur dam is built in the Reserve Forest area in Chengam Taluk, 32 kilometres from the pilgrim town of Thiruvannamalai connected by a good black topped road. The dam is 780 m long with a masonry gravity structure of 427 m abutting the steep hill on the left and continued as earth dam on the right. The masonry part houses a gated spillway of 9 vents $12.20 \text{ m} \times 6.10 \text{ m}$ capable of discharging a flood of 3280 cumecs (1,15,900 cusecs), along with 11 more vents of size $12.30 \text{ m} \times 4.58 \text{ m}$ (40' x 15') which have been provided in the saddle beyond the right end of the dam. Five numbers of river sluices of size $1.52 \text{ m} \times 1.83 \text{ m}$ (5' x 6') are provided in the dam for downstream releases. The storage depth is 119 ft. above the river sluice sill fixed at RL +610 ft. and the Full Reservoir Level is RL +729 ft.

Seven kilometres downstream a 122 m long pick-up anicut is built across the river with six scour vents of size $1.52 \text{ m} \times 1.83 \text{ m}$ (5' x 6'). Two irrigation canals on each flank take off from this pick up anicut.

The left side main canal is 35.4 km long and is lined for the first 13.6 kilometre length below which it is unlined. The head sluice has 3 vents of size $2.74 \text{ m} \times 1.75 \text{ m}$ (9' x 5'-9") designed to discharge 11.33 cumecs (400 cusecs). There are 15 distributories and

26 direct irrigation sluices taking off from the main canal. The distributories total upto 88 kms in length. The command area is 9678 hectares (23,904 acres) of which 7142 ha (17,641 acres) lie in the Chengam and Thiruvannamalai taluks of the present Sambuvarayar district and the rest 2536 hectares (6263 acres) lie in the Thirukoilur Taluk of South Arcot District. There are 41 existing irrigation tanks within the command whose ayacut has been absorbed in the canal command. This canal started serving the command from 1958.

The right bank canal was taken up later in 1975 and completed in 1982. The canal is 28.64 km in length and is lined for the full length. The head sluice is designed to discharge 7.08 cumecs (250 cusecs). There are four branch canals six distributories and 17 direct irrigation sluices on this main canal. The command area is 8487 ha (20,962 acres) in extent of which 6946 ha (17,157 acres) are irrigated for dry crops and 1541 ha (3805 acres) are irrigated for wet crops. There are 49 existing irrigation tanks within the command whose ayacut has been retained as wet and for the rest water is given only for growing dry crops. Of this 738 ha (1822 acres) lie in the Chengam Taluk of the present Samburayar District and the rest in the Kallakurichi Taluk of the South Arcot District.

The total command under the Sathanur Reservoir system is thus 18165 hectares (44,866 acres).

Irrigation under the Sathanur Left Bank Canal is between 15th December and 30th April and that under the Right Bank Canal is between 1st October and 15th February.

There are Government approved Rules of Regulation for the Sathanur Reservoir and also the two Canals from the pick-up anicut, which ensure that impounding is done in the reservoir in due consideration of the irrigation rights of the systems downstream in the Ponnaiyar basin.

2. DATA LIST

1. Hydromet Data

Rainfall

Measurement is recorded at 8.00 AM every day. Data available from non recording stations.

Dam site	P.W.D.	1958 onwards
Pick up anicut site	P.W.D.	1958 onwards
Vanapuram Section Office	P.W.D.	1958 onwards
Chengam Taluk Office	Revenue	earlier than 1958
Thiruvannamalai Taluk office	Revenue	earlier than 1958

Vanapuram is fairly central to the left side command of the system

Chengam is about 35 km from centre of left command.

Thiruvannamalai is about 20 km from centre of left and right command.

Only one recording station has been installed at the dam site in 1986 which is currently not functioning.

Temperature

One thermometer is kept at the dam site office and only maximum and minimum temperature is recorded from 1973 onwards.

Humidity
Wind
Evaporation

Not available

2. Hydraulic Data

Volume of water in reservoir in Million cubic feet, River discharge in cubic feet/sec.

Reservoir level in feet

Reservoir outflow in cubic feet/sec.

All the above are recorded at the dam site everyday from 1958 onwards at 8.00 AM, 12 noon, 4.00 PM and 8.00 PM; sometimes at closer intervals when warranted. Data is available in the registers with the Assistant Executive Engineer's office at dam site.

Flow delivered in the main canal

This is measured at the pick-up anicut 7 km downstream of dam from where the canals on the left and right take off. Flow delivered is recorded at 8.00 AM every day when the canals flow and also in between if the flow rate is ordered to be changed. Flow data are available in the office of the Assistant Executive Engineer at dam site who controls the operation from 1958 onwards when the system started functioning.

Flow delivered to distributories

Data is available with the Section Offices, P.W.D. located at Thenmudiyapur and Vanapuram in the command area. Readings are recorded of water deliveries whenever they are made by the field staff.

Other deliveries from/to the main	No such
Other deliveries from/to the laterals	delivery
Estimated leakages from reservoirs canals, distributories	No data is available

Flow delivered from the distributories to farm outlets

Data is available for all deliveries from the distributories to the minors with the canal Section Officer, P.W.D. No readings are kept for deliveries from minors to the farm outlets. In the case of farm outlets taking off direct from the main canal, data of deliveries at the direct irrigation sluices is available with the canal Section Officers for a few cases. All quantities of flow are only assessed through theoretical calculations noting the vent openings and the head causing flow. Gauge readings are made at the head sluices and at different delivery points along the canal. Data is collected by the field staff in employment with the P.W.D. and is occasionally checked by the Section Officers and recorded in registers in the sections. Copies are marked to the Assistant Executive Engineer at the dam site. In respect of important operation data at the dam site and the pick up anicut, the details are mailed to the Executive Engineer and also to the Superintending Engineer. Reservoir details are furnished to the Chief Engineer, P.W.D. at Madras by the Section Officer at dam site directly everyday through wireless in the formats given in Appendix I. The formats in which the flow registers are maintained at the dam site for the reservoir and the pick up anicut are in Appendix II.

It is possible to construct an issue tree with the data recorded by the Section Officers P.W.D. Wastages through leakages and seepage, though not measured, can be derived from flow quantities measured at the different points along the line.

Size of the originally planned command area by acres

Available by system basis and also by sub system basis.

Size of the Canals

Available at all points both for the main and for the distributories and minors. Total length of the main and the distributories, each distributory or minor wise is available. Can be obtained from the 'Component Register' maintained by the Assistant Executive Engineer and the Executive Engineer, P.W.D. Cross sectional areas of the flow can be obtained both systemwise and also subsystem wise from this Register.

3. Water Distribution

Source of water

Surface water

Nature of sources

From the river through the reservoir and the canal system. Besides there are tanks within the command which get some storages from their own command and thus add on to the resource.

Nature of flow

Gravity

Types of regulation

Movable gates operated by the field staff of P.W.D. Mostly screw gear.

Types of Canal

Lined for 13.6 km at the head reach of the left main canal. The entire right main canal is lined. The rest of the left main canal and all distributories and minors are unlined. No chutes are formed but drop structures are available.

From main canals through distributories and minors upto the sluice, operation and maintenance is by the P.W.D. Below the sluice where the command is generally below 25 acres, the water courses and farm channels are operated and maintained by the farmers themselves.

What is the grievance or complaint handling procedure in distributions of water?

When the complaint is made by the farmers either individually or in groups the Section Officer on the canal inspects the area, checks the reasons for such a grievance and tries to rectify the shortcomings. Sometimes complaints are taken to the higher levels ~~of~~ Assistant Executive Engineer or the Executive Engineer direct, when information is passed down to the Section Officers with instructions to look to the grievance. Inspection of site by higher officers is also made.

What is the mechanism for checking whether the planned target in distributions are fulfilled?

Site inspections on the canals and the commands. The field staff, Laskars and the Irrigation Inspectors are the feed back.

How does the irrigation organisation know whether the farmers or users are satisfied

When there are no complaints and the farming activity is going on smoothly without hitch in the command, farmers are satisfied.

What is the planned and actual total supply(cusecs

or any volumetric measure) of water to farms by year, by season, by crop, by month, by sub-areas (defined by

particular lateral, sublateral, distributory command area, group of farm outlets, etc.)

The total supply both by cusecs and in volumetric quantity for the entire irrigation season is planned to be delivered at the head of the canals for the left and right command and the actual supply made is also measured. There is no planning by crop or by month in the distributories or minors. The distribution is made by apportioning the flows according to the command area to be served by each such sublateral.

4. Irrigated Area

Planned area for irrigation is given in the system description. Area actually irrigated by year is not readily available. This figure is maintained by the Revenue Department and is reported by Village Administrative Officer through his No.2 Village accounts in 'Adangal' books to the Tahsildar every year. This is the basic account from which all other required information viz. area irrigated by year, by crop and by season can be compiled. This account which is maintained for all the survey field numbers in one compilation will contain irrigated and unirrigated crop details, the period of the crop, the source of irrigation etc. A list of columns seen in that account book is given in the Appendix III and this is maintained in the local language. The information sub-systemwise is not readily available. There is however possibility of breaking it down distributory wise with great effort by picking out the field survey numbers fed by a particular distributory. It will of

course be time consuming. The segregation can be done even upto the farm outlet since the field survey numbers to be fed by each outlet are available in the irrigation plan. Another factor is that this No.2 account which is compiled and kept in the taluk office for the whole taluk is maintained in record only for 10 years after which it is destroyed.

5. Agriculture

Yield and production of each crop are reported only Block wise and Taluk wise and are not system based. The Director of Statistics selects the plots for crop cutting experiments which in some years may not even fall within the command area in a Taluk. The Assistant Director of Agriculture conducts the crop cutting experiments in those selected plots, arrives at the average yield for each crop and works out the production based on the acres under that crop in the taluk and reports; which is finally compiled and given for the State by the Director of Statistics. There is no possibility of getting at the production quantity systemwise or subsystem wise. However from the data of the crop cutting experiments maintained by the Assistant Director of Agriculture in the taluk, yield can be obtained for any year (data upto 3 to 4 years is generally available) and production worked out on that basis for the acreage in the sub system around the sample plot. The yield trend in Chengam Taluk ascertained from the Assistance Director of Agriculture Chengam is in Appendix IV.

Other agricultural inputs, fertilisers, pesticides, seeds, quantity supplied for the area, system wise.

Inputs such as fertilisers, pesticides and seeds are only met partly by the Agricultural Department. Farmers obtain their requirements mostly from private traders. For instance the Assistant Director of Agriculture is asked to plan only for 20% of the seed and fertiliser requirement for the taluk in his jurisdiction. Hence there is no data available now for the agricultural inputs, much less systemwise.

Average quantity prescribed systemwise

This is available with the Assistant Director of Agriculture in each taluk for fertilisers and not for pesticides.

Average quantity used system wise

This is not available and no such data is collected.

6. Soil Types

The Joint Director of Agriculture (Soil Survey) with his headquarters at Coimbatore is in charge of the soil surveys in this and a few other adjacent districts. The soil map for the Sathanur command has been prepared by him and is available. The survey is on a macro scale and if requested detailed surveys are undertaken by his organisation. There is no alkaline or saline soil in the Sathanur command.

Ground Water

Observation wells are selected and continuous observations are maintained by the Ground water wing of the P.W.D. from 1971 onwards to study the annual fluctuations. There are

sixteen observation wells in the Sathanur command and the detailed analysis of the fluctuations are available with the Chief Engineer, Ground Water. No routine seepage or percolation observations are made either by the ground water wing or the irrigation wing of the P.W.D.

7. Cost Elements and Structure

The source of all this information is the office of the Executive Engineer, Thiruvannamalai Division, Tiruvannamalai under whose jurisdiction this system lies. He has other works in the district including maintenance of the public buildings and about one fourth of his time can be taken as spent on this system.

Operation and maintenance both rest on the same personnel and are attended to by the Assistant Executive Engineer and his staff.

Information is available only for the total system and not for subsystem.

Yearly data as far back as five years is available but may have to be compiled from the office registers in respect of the following Establishment cost

- Fuel cost
- Depreciation cost
- Office overhead
- Labour cost
- Material cost
- Contract cost

No rehabilitation has been done since the system is fairly new. But under the World Bank aided National Water Management Project recently taken up, certain rehabilitation

works are contemplated not for enhancement of the capacity or the command area but for improving on the existing physical system and its operation.

Man power used

Data can be culled out from the office records for the past five years. Information is available for the whole system and can be approximately allocated to the sub systems. Establishment chart of the current organisation is given below.

Exe.Engr.,

Assistant Exe.Engr. (1)

Other non system
works

SECTION OFFICERS (4)

Technical Assistants and skilled

operators (37)

Unskilled irrigation labour
(53)

8. Farming Systems

The source of all information under this item is the office of the Assistant Director of Agriculture in each Taluk.

Farm size

Distribution of farms by farm size

There is no information readily available on this. When the Government introduces schemes for benefiting the marginal or small farmers by way of subsidies in the supply of inputs etc., details are gathered for the purpose and that too not systemwise. Marginal farmer is one who owns less than 1.25

acres wet or 2.5 acres dry. A small farmer is one who owns between 1.25 to 2.50 acres wet or 2.5 to 5.00 acres dry.

Type of farming

Different crops for different seasons are seen but mixed crops are also seen in the same season

Type of Technology

Ploughing both by traditional methods and by tractors are seen in the command. There is no data collected.

Seeds

No traditional seeds are used in the command. Local improved and local new strains are used and also external strains which are derivatives of the I.R. variety are used. Data on the breakup is not available. Approximate quantities can be assessed if necessary by conducting a survey of both the departmental godowns and the private sales depots. Such a survey can be conducted only with the help of the Assistant Director of Agriculture.

Seeding and Transplanting

In respect of paddy, transplanting is adopted extensively with direct seeding resorted to in a very few places during drought years. Traditional method is adopted.

Harvesting

Only manual; no machine is used in the command.

Economic basis of farming

Essentially subsistence with a few big farmers resorting to local commercial farming. Certainly there is no export.

Farm incomes

No systematically collected data is available. Now and then in small pockets social survey by oral enquiry is done for specific purposes.

Land tenure

Both owner cultivation and tenancy are prevalent in the command but no data is available

Ownership size

Please see farm size.

Family size

No data is readily available. It is possible to derive from the ration cards for public distribution system or the census enumeration.

Sources of farm labour

Mostly family members work in the farm hiring labour also on occasions of intensive work. There is no communal exchange of labour.

9. Farmers' Organisation

The source of information for this item is the Assistant Executive Engineer of Agricultural Engineering Department in charge of the on-farm development works in the command. Only since 1986 after they constructed the on farm development works in most of the command they started organising farmers' organisations as Sluice Committees. These committees are made responsible for the maintenance of the on-farm works some completed under the sluice and are also guided to adopt a suitable rotational system among themselves to ensure equity between the headender and the

tail-ender. They are not involved in the collection of water dues or irrigation fees. Such farmers' organisations have not been formed in the entire command as yet, and hence it is too early to judge their effectiveness.

Prior to 1986 also there were informal committees for the distribution of water delivered at the farm outlet but there is no data on that. These informal committees did not function effectively with the result equity in distribution could not be ensured. These farmer organisations are expected to maintain the water courses below the sluices, either the farmers doing work by their own physical labour or contributing equivalent money for that labour. At present maintenance is being done to the extent of leading the waters delivered at the farm outlet to the farm but cannot be said to be satisfactory. The other source of information on farmers' organisation is the Farmers' Training Centre located at Navlok in the district. There is such a training centre in each district. They organise convenors' groups in the command for purposes of transmitting farm messages and function in collaboration with the Assistant Director of Agriculture.

10. National level information

Covered in the Overall State report

APPENDIX I (a)

DAILY WATER REPORT

FORM I

Name of Reservoir: Sathanur Dam

Date: _____

Reservoir level in feet	Storage in Mcft	Inflow in cusecs	Outflow in cusecs	Rainfall in mm	Cumulative from 1st June Inflow Mcft	Outflow Mcft

BY V.H.F. TO CHIEF ENGINEER IRRIGATION MADRAS

APPENDIX I (b)

DAILY WATER REPORT

FORM II

Temperature, Max Min F F

Date	Time	Reservoir level in feet	Storage in Mcft	River sluice	Spillway/saddle
				Height opened Ft.	Height opened Ft.
			No. of vents opened	Discharge cusecs	Discharge cusecs

APPENDIX I (c)

DAILY WATER REPORT

FORM III

Date: _____

AT PICK UP ANICUT

Date	Time	Left side head sluice			Right side sluice		
		No. of vents opened	Heights opened Ft.	Discharge cusecs	No. of vents opened	Heights opened Ft.	Discharge cusecs

APPENDIX II (a)

FORMAT FOR DAILY WATER READING AT SATHANUR RESERVOIR

Date	Time	Water level in feet	Capacity difference in Mcft	Capacity difference in cusecs	River sluice			Saddle			
					No. of vents opened	Height opened ft.	Dis-charge cusecs	No. of vents opened	Dis-charge cusecs		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
11.10.86	6AM	107.05	4892	36	417	--	--	--	5 nos.	0.70	2100
	8AM	107.05	4892						7 nos.	0.85	3600
	12Noon	107.00	4883						7 nos.	"	3600
	4PM	107.00	4883						7 nos.	"	3600
	8PM	106.90	4865						7 nos.	"	3600
12.10.86	8AM	106.65	4822	70	810	--	--	--	7 nos.	"	3600

An Extract From the Register

Spillway	No. of vents opened	Heights opened ft.	Dis-charge cusecs	Total dis-charge (Q) in cusecs	Average dis-charge (Q) in cusecs	Evapo-ration loss in cusecs	Inflow in cusecs	Rain-fall in mm	Cumulative from 1st June	
										Outflow Inflow in mcft mcft.
(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	
--	--	--	--	2100	2100	25	2542	Nil	1140.48	5181.99
--	--	--	3600	3600						
--	--	--	3600	3600						
--	--	--	3600	3600						
--	--	--	3600	3600						
--	--	--	3600	3600	25	2815	Nil	1451.52	5425.21	

APPENDIX (6b)
 FORMAT FOR DAILY WATER READING
 AT SATHANUR PICK UP ANICUT

Date	Time	Depth over the crest: Ft.	Discharge below pickup anicut in Cusecs	Left side Head sluice				Right side head sluice				Realisation at anicut Cusecs	Rainfall mm	Remarks
				Front gauge Ft.	Rear gauge Ft.	No. & height of vents opened Ft.	Discharge in Cusecs	Front gauge Ft.	Rear Gauge Ft.	No. & height of vents opened Ft.	Discharge in Cusecs			
27.12.86	5 A.M	0.85	1000	2.45	2.10	3/1.40	350	7.00	—	1.10	3/0.3	250	1600	
28.12.86	8 A.M	1.30	2000	2.60	2.05	3/1.15	350	6.75	—	1.10	3/0.20	250	2600	
29.12.86	8 A.M	1.30	2000	2.60	2.05	3/1.15	350	6.75	—	1.10	3/0.30	250	2600	

APPENDIX III

Village Account No. 2

District Sub Division Village

Annual field wise cultivation account

1. Survey field number	X	
2. Sub division of the field	X	As per details seen in
3. Extent	X	the land cess
4. Land cents (as fixed in the Land Survey Settlement)	X	Assessment register
5. Eligible for one crop or two crops	X	
6. Owner's Name		
7. Cultivator's name/Whether the whole field or part has been cultivated		
8. When did the cultivation start and when was the harvest made	X	
9. Name of the crop	X	First season
10. Extent cropped/harvested	X	
11. Irrigation source/Canal/Well	X	
12. Percentage of yield assessed	X	
13. When did the cultivation start and when was the harvest made	X	
14. Name of crop	X	Second season
15. Extent cropped/harvested	X	
16. Irrigation source/Canal/Well	X	
17. Percentage of yield assessed	X	
18. Village administrative Officer's remarks		
19. Reasons in detail if a field is left follow		
20. Signature		

Note: 1. Translated from the original in local language, Tamil

2. The columns are to be spread horizontally and read

APPENDIX IV

YIELD TREND PARTICULARS IN CHENGAM TALUK

1.	Paddy	4600 Kgs/ha		
2.	Cholam (irrigated)	3000 Kgs/ha	Rainfed	800 kgs/ha
3.	Cumbu (irrigated)	3000 Kgs/ha	Rainfed	750 kgs/ha
4.	Ground nut (irrigated)	2200 Kgs/ha	Rainfed	600 Kgs/ha
5.	Ragi (irrigated)	3200 Kgs/ha	Rainfed	850 kgs/ha
6.	Sugarcane (irrigated)	105 M.T/ha		
7.	PULSES			
	Redgram	--	Rainfed	300 kgs/ha
	Blackgram (irrigated)	800 Kgs/ha	Rainfed	200 kgs/ha
	Greengram (irrigated)	750 Kgs/ha	Rainfed	200 kgs/ha
	Other Millets (irrigated)	1200 Kgs/ha	Rainfed	200 kgs/ha

DATA AVAILABILITY SURVEY OF SRIVAIKUNDAM ANICUT SYSTEM

DATA AVAILABILITY SURVEY OF SRIVAIKUNDAM ANICUT SYSTEM

Srivaikundam Anicut (a diversion structure) has been chosen as a representative diversion system for this data availability survey. Srivaikundam anicut is in the Tambaraparani river basin. It was built in the year 1879.

1. Tambaraparani river basin

River Tambaraparani runs in the southernmost part of Tamilnadu State. It originates in the Western Ghats and drains an area of 4500 sq.km of its eastern slopes. This basin gets the benefit of both the South West and North East monsoons. The river has a number of major tributaries by name Servalar, Gatana, Chittar, Manimuthar and Pachaiyar. It is one of the basins in which the water potential has been optimally utilised with a number of harnessing schemes executed since early times. There are as many as 37 diversion structures both on the main river and on the tributaries, some of which date back to the very early centuries. In the recent decades storage reservoirs have been built on the main river and its tributaries, for irrigation and hydro power.

There are eight anicuts (diversion structures) on the main river itself from which eleven irrigation channels take off and Srivaikundam is the last anicut in the series. The total area irrigated by these eight anicuts is 34934 hectares.

2. Brief description of Srivaikundam system

Srivaikundam Anicut was built during the British period near Srivaikundam town in Chidambaranar district. It is a masonry structure 382 metres long, built across the river Tambaraparani, with two channels taking off one on either flank. Eighteen scour vents of size 4'-0" x 8'-0" have been provided in the Anicut structure to pass the silt down during the floods. The crest of the anicut is at +39.4 ft. (12.009 m), about 10 ft. above the average bed level of the river.

The North Main Channel which runs on the north bank of the river has its head sluice with six vents of size 4'-0" x 8'-0" (1.22 x 2.44 m). This channel runs on contour for a length of 36.32 km supplying water to 1331 hectares of direct ayacut (command area) and also supplementing the storage in six irrigation tanks lying within its command. The total extent of ayacut both direct and indirect under this channel is 5181 hectares.

The South Main Channel takes off on the South bank of the river and also runs on contour to supply water to a total ayacut of 5166 hectares of which 1090 hectares are directly serviced by the channel and its net work. It also feeds the 15 tanks lying within the command, which have their own ayacut of 4076 hectares within the total command. The head sluice of this channel has 5 vents, 3 Nos. of size 4'-0" x 8'-0" (1.22 x 2.44 m) and 2 Nos. of size 6'-0" x 6'-0" (1.83 x 1.83 m) built along with the anicut structure.

Both these channels were originally excavated as unlined channels and were subsequently lined with the intention of saving the water which was getting lost through seepage and utilising that water to feed the major industries that have developed in the region. The Southern Petrochemicals Industries, Tuticorin Alkali Chemicals & Fertilisers Ltd. Tuticorin Harbour Project and the Tamilnadu Electricity Board Thermal Station are the four major units at the tail end of this system which depend upon the flows in the system for their water supply.

Many of the irrigation and drainage channels of this system are silted up and have lost their carrying capacity. Many of the sluices are leaky. It is proposed to undertake rehabilitation of this system shortly under the National Water Management Project (NWMP), to improve its water use efficiency.

Paddy is the main crop raised under this system and it is grown in both the seasons. Banana, Betalvine and sugarcane are being developed in recent years in the tail end of this system and are very popular with the farmers as they are providing them high cash returns.

There is an Assistant Executive Engineer of the Public Works Department (P.W.D.) who is in charge of the operation and maintenance of this anicut system and also the command area below this anicut. He is responsible for the regulation of flows at the anicut and in the canal system, following the Rules of Regulation approved by the Government. He maintains all the hydraulic data of the system.

3. DATA LIST

(1) Hydromet Data

Data availability and source

Temperature
Humidity
Wind

Data is available by day from Agricultural Research Stations. Measurements are recorded daily at 7.15 AM and 2.30 PM from 1969 onwards at Kovilpatti Agricultural Research Station of Tamilnadu Agricultural University (TNAU) situated outside the command area at about 60 km from centre of command area. Also at Agricultural Research Station, Ambasamudram of TNAU situated inside the command area at about 40 km from the centre of the command area.

Rainfall

Data is available by day from three sources. Measurements are recorded daily at 8.30 AM from 1937 onwards at Agricultural Research Stations, Kovilpatti and Ambasamudram. Also available at several taluk offices within the command area at Srivaikundam, Tirunelveli and Palamkottai and also at the P.W.D. sub division office at Srivaikundam within a radius of 30 km from the centre of command area, from 1969 onwards.

Note: The format in which the weather data are recorded at the TNAU Agricultural Research Stations is enclosed in Appendix I

River discharge

River discharge in cusecs

Reservoir level

Reservoir level in feet

Reservoir outflow

Reservoir outflow in cusecs

Flow delivered to main canals

Flow delivered to main canals in cusecs

Flow delivered to distributories

Flow delivered to distributories in cusecs.

These are measured at the respective sites by gauge readings at 8 AM every day or more often when change in flow is ordered. The proforma in which these measurements are recorded are given in Appendices II to VI.

Other deliveries from/to the main

There is generally no flow except the drainage and return flow which are not measured.

Other deliveries from/to the laterals

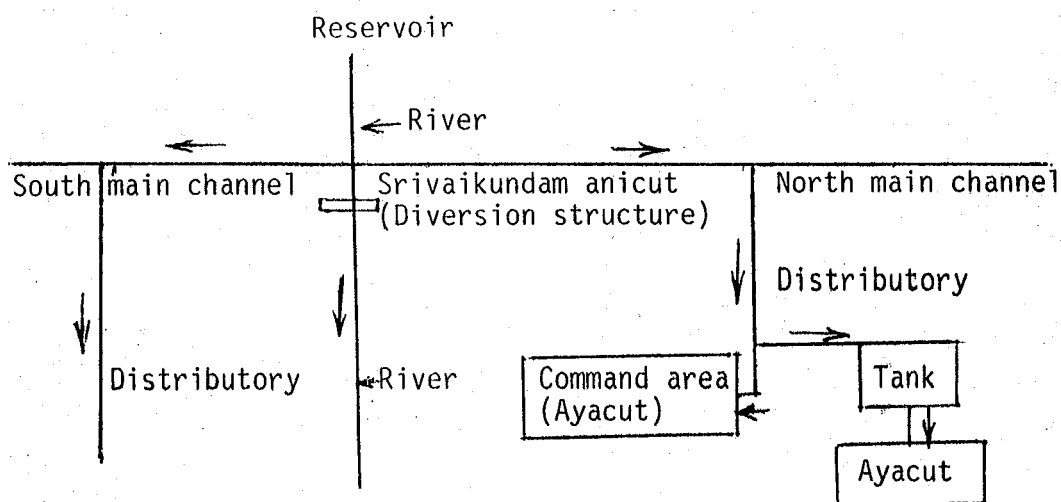
The deliveries made for industrial and drinking water purposes from the system are measured by installing V notches or from duration of pump operation.

Estimated leakages/seepage from reservoirs, canals, distributories and

Flow delivered from the distributories to farm outlets

Not measured. Can be measured by installing measuring devices when needed.

An issue tree is drawn below:



The wastages and deliveries to farm outlets from anicuts and tanks cannot be gathered from the existing documents. They can be measured by installing measuring devices and recording the flows at vantage points. Total wastages by leakage and seepage in the anicut sub system can however be computed from inflow/outflow records available. The computations of the flows delivered are made by installing depth gauge plates at the outlets and gates and by measuring the area of opening and the head causing flow. These data are collected at Section (JE/AE) level by field staff and submitted to the Assistant Executive Engineer and Executive Engineer. All compilation is done manually. The National Water Management Project (NWMP) staff proposes to collect the data on seepage loss as well as weather data through measuring devices at various points and a weather station to be installed shortly at Tirunelveli, which is almost the central point of the command area.

Data availability and source

	System basis	Sub system basis
Size of the originally planned command area by acres/ha	Available from P.W.D. in hectares	Available for each anicut main canal, distributory and tank system
	System basis	Sub system basis
Size of the canal	Available from P.W.D. in km	Available from P.W.D in km and
Total length in miles or metres	and in cusecs	cusecs for main canals and distributories and not for earthen channels from tanks and farm outlets.
Total discharge in cubic feet or cubic metres		

(3) Water Distribution

All the current information for the various items given below is available from P.W.D.

Source of water:

Surface water, from the reservoir upto the distributory or tank.

Note: Information on distribution of surface and ground water and ground water alone are not available.

Nature of sources:

River Tambaraparani and its tributaries Besides there are tanks within the command area of the irrigation system which get some run off from their own catchment and thus add to the resource.

Nature of flow:

Gravity

Types of regulation:

Movable gates with screw gear operated shutters.

Types of Canals:

North Main Channel of Srivaikundam anicut is lined over its entire length of 36km. South Main Channel of this anicut is partly lined out of the total length of 34 km. Distributories and minors are not lined. Information on lining is available with P.W.D.

Any lining in the farm outlets or field channel

None

Type of flow:

Continuous flow in the mains and distributories and intermittent flow in minors and farm outlets as well as tanks. During scarcity periods, continuous flow in the mains and intermittent flow below. But date of release of water scheduled for 1st June every year is postponed when the water storage in the reservoir is low, with advance intimation to the farmers.

Scheduling procedure:

Generally on demand, with the supply maintained throughout the irrigation season. When the reservoir storage/river flow is low, scheduling is resorted to, through mutual agreement between suppliers and users, with rationing done by P.W.D.

What is the method of calculating crop water requirements or demands:

Deliveries are made at present at a duty of 50 acres/cusec flow for wet crop over the entire command area. Crop water requirements have just been calculated by using Modified Penman method for individual crops like

paddy and plantains, by the N.W.M.P. but they are yet to be adopted for the irrigation deliveries. Crop water requirements are yet to be calculated for sugarcane and betelvines which are now raised in the command.

The size of originally planned command area by crop, by season:

The size of the originally planned command area for the whole system is 34934 ha and for Srivaikundam anicut it is 10347 ha. The entire area is planned for paddy crop. Season wise planned command area is available with the P.W.D.

What organisations are responsible for each stage of water distribution (main canals to farm outlets)

From reservoir to river

Electricity Board and P.W.D.

From river to main canals (diversion by anicuts)

From main canals to distributories, minors and irrigation tanks:

P.W.D.

From minors and irrigation tanks through farm outlets

Farmer's Committees/representatives

There are Rules and Regulations prescribed by the Government for water distribution.

What is the grievance or complaint handling procedure in distribution of water?

Whenever a complaint is made by the farmers individually or in groups, the Section Officer, P.W.D. in charge of that segment of the irrigation sub system inspects the area and the water control structure, verifies the reasons

for the complaint and rectifies the defect if any noticed. Sometimes complaints are made to the higher officials of P.W.D. who examine the matter in consultation with the field staff and if necessary make field inspections and solve the difficulties.

What is the mechanism for checking whether the planned targets in distribution are fulfilled?

By field inspections and verification of the flows through gauge measurements by P.W.D. staff. In future the N.W.M.P. staff proposes to install stage level recorders in all main channels and flumes in other channels to measure the flows.

How does the irrigation organisation know whether the farmers or users are satisfied?

Through field visits by the P.W.D. staff during their routine inspections. If there are no complaints from the farmers, it is assumed that the distribution system is functioning to the satisfaction of the users.

What is the planned and actual total supply (cusecs or any volumetric measure) of water to farms by year, by season, by crop, by month, by sub areas (defined by particular lateral, sub lateral, distributory command area, group of farm outlets etc.)

The planned quantity of water (by volume) to be supplied at the head of each main channel/distributory/group of farm outlets, for the cropped area under its command, for the irrigation season is converted into rate of delivery

by day and the actual supply through each channel is measured daily through gauge readings. Planning of water supply by crop is not done.

(4) Irrigated area

Planned area for irrigation is given in the system description and is available for system, sub system, main canal and distributory.

Area actually irrigated and irrigated area harvested every year are not readily available. These figures are maintained by the Revenue Department and are reported by Village Administrative Officer through his No.2 Village Account in 'Adangal' books to the Tahsildar every year. This is the basic account from which all other required information viz. area irrigated by year, by crop and by season can be compiled. This account which is maintained for all the survey field numbers in one compilation will contain irrigated and unirrigated crop details, the period of the crop, the source of irrigation etc. A list of columns seen in that account book is given in Appendix VII and this data is maintained in the local language. The information by sub system or main canal/distributory is not readily available. There is however the possibility of breaking it down to distributory level with great effort by picking out the field survey numbers fed by a particular distributory. It will of course be time consuming. The segregation can be done even upto the farm outlet, since the field survey numbers to be fed by each

outlet are available in the irrigation plan. This No.2 account which is compiled and kept in the taluk office for the whole taluk is maintained in record only for 10 years after which it is destroyed.

(5) Agriculture

Production and yield

Production and yield of each crop are reported only Village, Block and Taluk wise and are not system based. The Director of Statistics selects the plots for crop cutting experiments, which in some years may not even fall within the command area in a taluk. The Assistant Director of Agriculture conducts the crop cutting experiments in those selected plots, arrives at the average yield for each crop and works out the production, based on the area under that crop in the taluk and reports to other authorities.

This is finally compiled for the State by the Director of Statistics. There is no possibility of getting at the production quantity systemwise or subsystem wise. However from the data of the crop cutting experiments maintained by the Assistant Director of Agriculture in the taluk, yield can be obtained for any year (data upto 3 to 4 years is generally available) and production worked out on that basis for the acreage in the sub system around the sample plot. The yield trend for paddy, the predominant crop grown in this irrigation system was ascertained from the crop cutting experiments conducted. It was 4.40 tonnes/ha. in June to September season and 3.50 tonnes/ha

in October-March season in terms of rice. The Season and Crop Report published by Director of Statistics contains the yield data for the principal crops grown. An extract of the crop yield data for the two districts covered by the irrigation system is given in Appendix VIII. Other agricultural inputs, fertilisers, pesticides, seeds, quantity supplied for the area system wise.

Inputs such as fertilisers, pesticides and seeds are supplied only in part by the Agricultural Department. Farmers obtain their requirements mostly from private traders and Agro Service Centres. For instance the Assistant Director of Agriculture is asked to plan only for 20% of the seed requirement for distribution as certified seed for the taluk in his jurisdiction. Hence complete data is not available now for the agricultural inputs even taluk wise, much less systemwise.

Particulars of tractor hours and other machines are not available. But the number of tractors and power tillers as well as farm implements and animals in each village are available from the survey of agricultural statistics and livestock census conducted by the Director of Statistics once every five years. The last survey was conducted in 1985. Particulars of extension staff's time are available for the whole Agricultural Division from which they have to be compiled for the system.

Average quantity prescribed systemwise (per acre or per hectare)

This is available with the Assistant Director of Agriculture for each crop for fertilisers and seeds and not for pesticides.

Average quantity used system wise

This is not available and no such data is collected.

(6) Soil Types

The Joint Director of Agriculture (Soil Survey) with his headquarters at Coimbatore is in charge of the soil surveys in this and a few other adjacent districts. The soil survey map for the various taluks covered by the system command has been prepared by him and is available. The survey is low intensive and at a macro level. Detailed surveys will be undertaken by that organisation in due course. There are some alkaline or saline areas in the system which extends over a total area of 1800 ha. in Srivaikundam and Tiruchendur taluks. The salinity and alkalinity is partly due to improper drainage in the tail end of the system near the coastal area.

Broad classification of soil series, morphology and textural classification has been made in the low intensity soil survey report. The percentage given under each soil type and degree of salinity/alkalinity is only approximate. Only detailed survey will furnish precise information on these soil characteristics.

Ground water

Records of observation wells maintained by the Ground Water Wing of the P.W.D. gives the annual fluctuations. There are a few observation wells in the system command and the detailed analysis of water table fluctuations is available with the Chief Engineer, Ground Water. No routine seepage or percolation observations are made either by the Ground Water wing or the Irrigation Wing of the P.W.D. But these studies are undertaken by P.W.D. under special programmes whenever required.

(7) Cost Elements and Structure

Cost of Operation and Maintenance

The source of all this information is the office of the Executive Engineer under whose jurisdiction this system lies. He has other works in the district including maintenance of the public buildings. About one fourth of his time can be taken as spent on this system.

Operation and maintenance both rest on the same P.W.D. personnel and are attended to by the Assistant Executive Engineer and his staff.

Information is available only for the total system and not for sub system but can be disaggregated proportionate to the sub system command area.

Yearly data as far back as five years is available,

but may have to be compiled from the Executive Engineer's

office records in respect of the following:

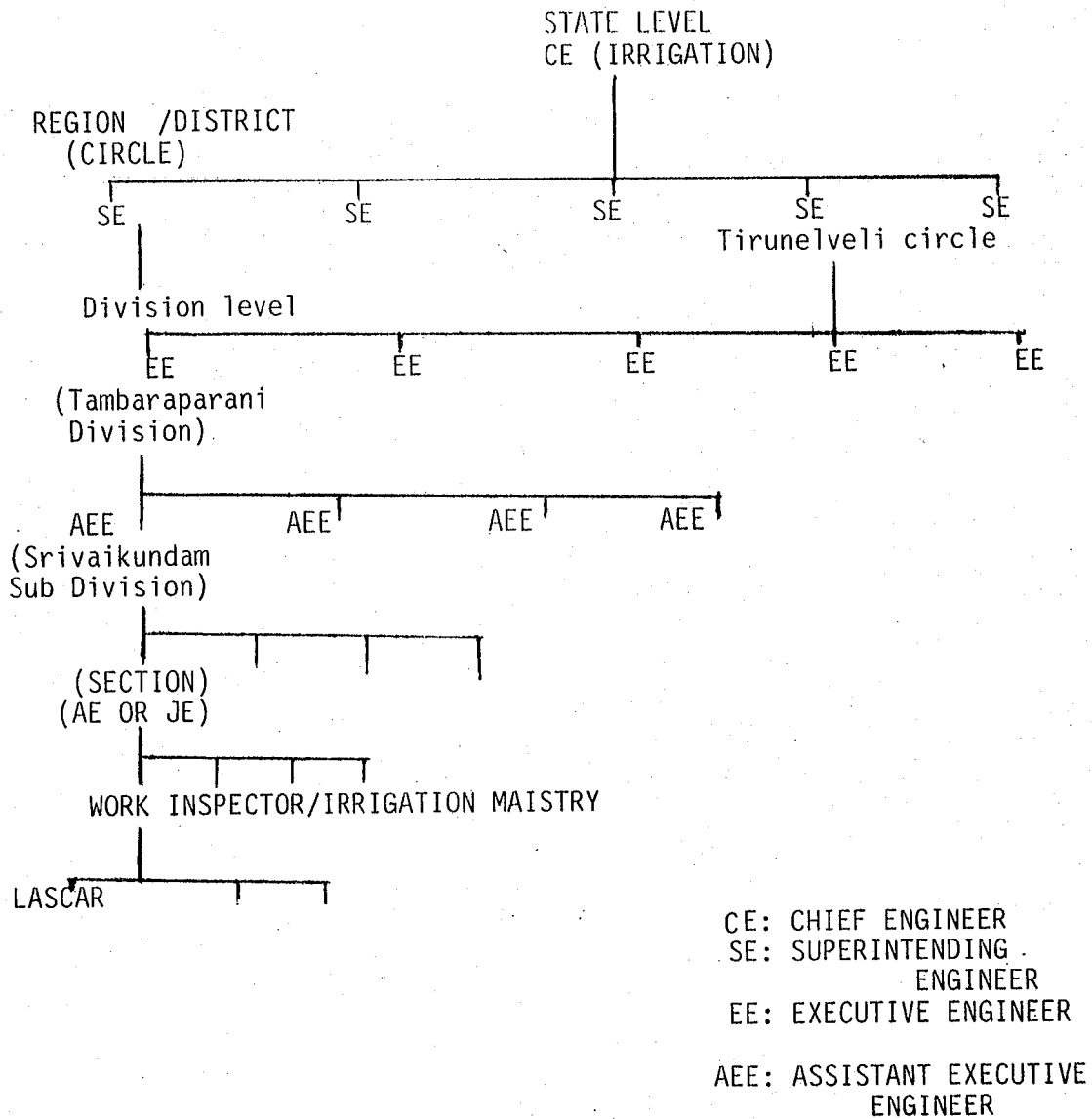
- Establishment cost
- Fuel cost
- Depreciation cost
- Office overhead
- Cost of major repairs
- Cost of routine maintenance
- Labour cost
- Material cost
- Contract cost

Cost of Rehabilitation

No rehabilitation has been done. But under the World Bank aided National Water Management Project recently taken up, certain rehabilitation works are contemplated, not for enhancement of the capacity of the command area but for improving the existing physical system and its operation for increased water use efficiency and prevention of water losses.

Man power used

Data can be culled out from the office records for the past five years. Information is available for the whole system and can be apportioned to the sub systems. Establishment chart of the current irrigation organisation is given below:



Note 1: Cross classification of the man power by type of organisations is possible by contacting the officials of different organisations such as Irrigation, N.W.M.P. Ground Water, Agriculture (T & V) and (Soil Survey), Revenue, Cooperation, Rural Development etc. by a time consuming process of ascertaining the time spent by their staff on matters relating to irrigated agriculture in the system command.

2. Collection of the same data by system is possible, but it will be very approximate by sub system or canalwise. Since many organisations are involved, only approximate apportionment of the time spent by each category of staff by job classification will be possible.

(8) Farming Systems

The source of all information under this item is the office of the Assistant Director of Agriculture in each taluk.

Farm size

Distribution of farms by farm size

There is no information readily available on this. When the Government introduces schemes for benefiting the marginal or small farmers by way of subsidies in the supply of inputs etc., or to provide agricultural loans, details are gathered for the purpose and that too only village wise but not systemwise. Marginal farmer is one who owns less than 1.25 acres wet or 2.5 acres dry. A small farmer is one who owns between 1.25 to 2.50 acres wet or 2.5 to 5.00 acres dry land.

Type of farming

Different crops for different seasons are seen but mixed crops are also seen in the same season.

Type of technology

Ploughing both by traditional methods and by tractors is done in the command. No data is collected on the different types of technology adopted.

Seeds

No traditional seeds are used in the command. Local improved and local new strains are used and also external strains which are derivatives of the I.R. variety are used. Data on the breakup is not available. Approximate quantities can be assessed, if necessary by conducting a survey of both the departmental godowns and the private sales depots. Such a survey can be conducted only with the help of the Assistant Director of Agriculture and his staff.

Seeding and Transplanting

In respect of paddy, transplanting is adopted extensively with direct seeding resorted to in a very few places during drought years. Traditional method is adopted.

Harvesting

Only manual; no machine is used in the command.

Economic basis of farming

Essentially subsistence, with a few big farmers resorting to local commercial farming. There is no export oriented farming done.

Farm incomes

No systematically collected data is available. Now and then in small pockets, socio-economic survey by oral enquiry is done for specific purposes.

Land tenure

Both owner cultivation and tenancy are prevalent in the command but no data is available.

Ownership size

Please see farm size

Family size

No data is readily available. It is possible to derive this information from the ration cards for public distribution system or from the census enumeration or by conducting a survey for the purpose.

Sources of farm labour

Mostly family members work in the farm with hired labour also on occasions of intensive work. There is no communal exchange of labour.

(9) Farmers' Organisation

Farmers' organisations for management of water delivered from farm outlets and irrigation tanks in the system/sub system are in existence for the last several years. Some of them are organised while many of them are adhoc or informal. The dates of their establishment are not readily available, but can be collected by contact with individual organisations managing every outlet or tank.

These organisations mainly liaise with P.W.D. officials in the demand for water for crops and also control the distribution of water among the farms within the command of the farm outlet/tank. They do not undertake collection of water dues or irrigation fees. These farmer organisations are expected to maintain the water courses below the sluices, the farmers doing work either by their own physical labour or by contributing equivalent money for that labour. At present maintenance is being done to the extent of leading the water

delivered at the farm outlet to the farm but cannot be said to be satisfactory. The other source of information on farmers' organisation is the Farmers' Training Centre located at Palayamkottai in the district. There is such a training centre in each district. It organises convenors' groups in the command for transmitting farm messages and functions in collaboration with the Assistant Director of Agriculture.

(10) National level information

Given in the Overall State Report

APPENDIX I
PROFORMA OF WEATHER DATA (Daily)

1. Temperature:

Date	Dry		Wet		Minimum	Relative Humidity	Set Reading	Wind vane	Rainfall in mm	No. of rainy days
	7.15 AM	2.30 PM	7.15 AM	2.30 PM						
(1)	(2)	(3)	(4)	(5)	(6)	(8)	(9)	(10)	(11)	(12)

2. Humidity:

Dry bulb	Wet bulb	Refer to Hydrometric table
(1)	(2)	(3)

3. Rainfall (at 8.30 AM)

Date	Rainfall in mm
(1)	(2)

APPENDIX II

WATER READING OF RESERVOIRS AND CHANNELS AND TANKS
UNDER SRIVAIKUNTAM SUB DIVISION ON (Daily)

24

Name of Reservoir	Level	Capacity	Dam Inflow	Servolar Inflow	River Discharge
PAPANASAM MANIMUTHAR					
Name of anicut and name of channel	Front reading	Rear reading	Dis-charge	No. of sand vents opened	
Kodamelalagan-North Channel South Channel					
Nathiyunni-Nathiunni Channel					
Kannadian-Kannadian Channel					
Arianayagipuram-Kodagan Channel					
Palavoor-Palayam Channel					
Suthamalli-Thirunelveli Channel					
Marudur-Marudur Melakkal Channel					
Marudur-Kilakkal Channel					
Srivaikuntam-South Main Channel North Main Channel					

Sl. No.	Name of Tank	FTL (ft)	Reading	Sl. No.	Name of Tank	FTL (ft)	Reading
I. MARUDUR MELAKKAL CHANNEL				III SOUTH MAIN CHANNEL			
1.	Muthalamkuri chi	6.4		1.	Kadamba Tank	12.7	
2.	Kuttaikal	0.66		2.	Authoor	14.0	
3.	Kolivoi	7.3		3.	Sethukuvoithan	5.0	
4.	Nattarkulam	7.31		4.	Ammanpuram	10.0	
5.	Seidunganallur	10.3		5.	Nallur Melakulam	5.3	
6.	---			6.	---		
7.	---			7.	---		
15.	Themankulam	6.5		15.	Ellappaicken Tank	7.0	
II. MARUDUR KEELAKKAL CHANNEL (ft.)				IV NORTH MAIN CHANNEL (ft.)			
1.	Butterkulam	9.7		1.	Korkai	7.9	
2.	Chenthilampanni	7.97		2.	Arumugamangalam	12.15	
3.	Kasba	13.31		3.	Pottakulam	9.3	
4.	Peroor	12.8		4.	---		
5.	Sivagulam	11.6		5.	---		
6.	---			6.	---		
7.	---			7.	---		
15.	Sedunkulam	6.16		9.	Aguram	6.8	

APPENDIX III

WATER REPORT FROM V P.W.D. IRRIGATION (Daily)

Name of Anicut:	SRIVAİKUNTAM ANICUT		DATE
Water Level in Front NM	Irrigation Diversion		Surplusses
Metres	Cumecs		Cumecs
Feet	Cusecs		Cusecs
Rainfall	Cumulative from 1st June		
	Irrigation Diversion		Surplusses
	M.Cu.m		M.Cu.m
mm	M.cft.		M.cft

Note: Observations pertain to 8.00 AM on the day and the flows are average of previous 24 hours.

No. PDL Dated

Submitted to the Chief Engineer, P.W.D. Irrigation, Madras - 600 005.

Section Officer, P.W.D.
Marudur Keelakal Section
Srivaikundam

Assistant Executive Engineer, P.W.D.
Srivaikundam Sub division
Srivaikundam

**APPENDIX IV
WATER REPORT FORM VI
SRIVAİKUNTAM ANICUT**

North Main channel		South Main Channel		Irrigation Supply		24 hours average		C	
No. of vents 6 Nos.		No. of vents 5 Nos.		North Main channel		Surplus		Recreation at Anicut	
Size of vents		Size of vents		Main channel		Anicut Through		Anicut	
4:0"x 8:0"(1.22 x 2.44m)		3 Nos. 4:0" x 8:0" (1.22 x 2.44m)		cusecs		Over-flow		cusecs	
SILL + 31.40 ft		2 Nos. 6:0" x 6:0" (1.83m x 1.83m)		cusecs		flow		cusecs	
+ 9.57 m		Sill + 31.40 + 9.57 m		cusecs					
Rear rearing m/ft	No. of vents opened	Height of opening m/ft	Discharge cusecs	Rear rearing m/ft	No. of vents opened	Height of opening m/ft	Discharge cusecs		

DATE TIME

8 AM
12 N
4 PM
8 PM
8 AM

Irrigation Inspector P.W.D.
Srivaikunam.

Submitted to the Chief Engineer,
P.W.D. (Irrigation) Madras - 600 005

Assistant Exe. Engineer,
Srivaikunam sub divn.
Srivaikunam.

**APPENDIX VI
FORM VIII**

SRIVAİKUNTAM ANICUT

P.W.D. IRRIGATION

WATER REPORT (Daily)

Date	Day	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Cumulative flows in the year from 1st June upto the end of this week
<hr/>									
<p>1. Water Level in Front m/ft</p>									
<p>2. Irrigation supplies</p>									
				$\frac{\text{Cumecs}}{\text{Cusecs}}$					
a. North Main Channel									
b. South Main Channel				$\frac{\text{Cumecs}}{\text{Cusecs}}$					
<p>3. Surplusses</p>									
a. Through under sluices				$\frac{\text{Cumecs}}{\text{Cusecs}}$					
b. Over Anicut Portion				$\frac{\text{Cumecs}}{\text{Cusecs}}$					
<p>4. Total (24 hours average)</p>									
				$\frac{\text{Cumecs}}{\text{Cusecs}}$					
5. Total outflow for the day				$\frac{\text{M.Cum.}}{\text{M.cft.}}$					
<p>6. Rainfall</p>									
				mm					

M.Cum/M.cft.

Note: Levels and observations on the day at 8.00 AM. This proforma need be sent only between _____ and _____

Submitted by _____ Chief Engineer, P.W.D. Irrigation, Madras - 600 005.

APPENDIX VII
VILLAGE ACCOUNT NO.2

Fasli Year ----- District ----- Taluk ----- Village -----

Annual field wise cultivation account

1. Survey field number	<p>As per details seen in the land cess assessment register</p> <p>First season</p> <p>Second season.</p>
2. Sub division No. of the field	
3. Extent	
4. Land cess (as fixed in the Land Survey Settlement)	
5. Eligible for one crop or two crops	
6. Owner's name	
7. Cultivator's name/whether the whole field or part has been cultivated	
8. When did the cultivation start and when was the harvest made	
9. Name of the crop	
10. Extent cropped/harvested	
11. Irrigation source (Canal/well/tank)	
12. Percentage of yield assessed	
13. When did the cultivation start and when was the harvest made	
14. Name of crop	
15. Extent cropped/harvested	
16. Irrigation source (Canal/Well/Tank)	
17. Percentage of yield assessed	
18. Village Administrative Officer's remarks	
19. Reasons in detail if a field is left fallow	
20. Comments of crop inspecting officer and Signature.	

- Note: 1. Translated from the original in local language.
2. The columns are to be spread horizontally and read.

APPENDIX VIII

**YIELD PARTICULARS OF CROPS IN TIRUNELVELI-KATTABOMMAN
AND CHIDAMBARANAR DISTRICTS FOR 1987 - 88**

(All figures in kg/ha except for Sugarcane which is in tonnes/ha)

Sl.No.	Name of crop	Tirunelveli-Kattabomman		Chidambaranar	
		Irrigated	Unirrigated	Irrigated	Unirrigated
1.	Paddy	4510	--	4970	--
2.	Sorghum (Cholam)	1440	920	1440	920
3.	Bajra (Cumbu)	1580	1080	1580	1080
4.	Ragi	1980	1300	1980	1300
5.	Sugarcane	107	--	107	--
6.	Chillies	1530	--	770	--
7.	Banana	42038	--	42038	--
8.	Cotton (in terms of lint)	529	281	529	205
9.	Groundnut (unshelled)	1900	1050	1900	1050
10.	Sunflower	880	330	880	330

**DATA AVAILABILITY SURVEY OF
KAVERIPAKKAM TANK IRRIGATION SYSTEM**

DATA AVAILABILITY SURVEY OF KAVERIPAKKAM TANK IRRIGATION SYSTEM

1. SYSTEM DESCRIPTION

Kaveripakkam tank which is one of the largest tanks in Tamilnadu is situated very close to Kaveripakkam village in North Arcot district. It is a system tank receiving supply from river Palar through a feeder channel taking off Palar anicut, besides the run off from its own catchment. It has a free catchment of 31 sq.kms and a combined catchment of 127 sq.kms. This tank is also one of the oldest, having been in existence for more than 500 years. The average annual rainfall of Palar basin is 880 mm and that of Kaveripakkam village is 1100 mm. The tank has a present storage capacity of 32.91 Mm³ and it caters to its 2542 ha. ayacut (command area) for about 10 to 12 months. About 75 percent of supply to the tank is received by diversion from river Palar and the rest as runoff from its own catchment. The river water is diverted through four supply channels from Palar anicut (diversion structure) one of which feeding Kaveripakkam tank. The carrying capacity of Kaveripakkam supply channel is 1753 cusecs. The 13.66 km long channel is lined for about 1 km just below the Palar anicut. The head sluice of Kaveripakkam supply channel at Palar anicut has 18 vents of 1.5 m x 1.5 m size each.

The other salient features of Kaveripakkam tank are:

Length of tank bund	8.35 km
Top width of tank bund	3.66 m
Waterspread area	16.05 sq.km
Depth of water above deepest sluice	10.08 m
Free board	2.40 m
Number of irrigation sluices	10
Number of surplus weirs	2
Total ayacut (command area)	2542 ha
Ayacut fed by surplus course	4250 ha
Number of villages benefitted	14
Duty adopted	3 ha/M.cft (for wet crop)

Although the tank command was originally proposed for irrigating paddy crop, crop diversification has taken place over the years, with various crops as detailed below:

Crop	Paddy	Sugarcane	Banana	Mulberry	Fallow
Percentage of command area	25	20	40	10	5

The original capacity of the tank when constructed was 1473 M.cft. This is found to have been reduced to 1164.78 M.cft. during the silt survey conducted in the year 1978 and to 1162.42 M.cft. in the year 1981. Three proposals, one for modernisation of the tank at an estimated cost of Rs.400 lakhs (40 million rupees) another for raising the F.T.L. of the tank by 0.20 m at an estimated cost of Rs.80.00 lakhs (Rs.8 million) and the third for desilting-cum-reclamation of

the tank at an estimated cost of Rs.700 lakhs (Rs.70 million), were made at different points of time. But none of these was sanctioned and the tank had been functioning with its reduced storage capacity. However some special repairs to the tank were carried out on two occasions during the last decade at a cost of Rs.82,000 and Rs.84,000 respectively.

The ground water potential of the tank command being rich, several hundreds of wells (mainly open dug wells and a few shallow tube wells) have been constructed by the farmers and used for supplemental irrigation when tank water gets exhausted. This conjunctive use of surface (tank water) and ground water enables the farmers to raise long term crops like sugarcane, banana and mulberry besides double crop of paddy.

The crop rotation followed in the ayacut is

Well owners	Sugarcane - paddy - banana or sugarcane or groundnut
Others depending on tank water only	Paddy - paddy with vegetables as mixed-crop-groundnut

The operation and maintenance of the tank irrigation system rests with P.W.D. through a Junior Engineer stationed at Kaveripakkam with 3 Work Inspectors and 3 lascars to assist him. A farmers' committee which is in existence for several decades, manages the water distribution from the tank.

2. DATA LIST

(1) Hydromet Data

Data availability and source

Temperature

Humidity

Data is available by day, from Large Scale Orchard cum Elite Banana Garden of the State Horticulture Department, at Navlock, situated about 25 km away from the Centre of Kaveripakkam tank command. Measurements are recorded daily at 8.00 AM since January 1988 only.

Rainfall

Data is available by day, right in the command area of the tank, just 1/2 km below the tank. This rainfall station is maintained by the Public Works Department (P.W.D.). Daily measurements are taken at 8.00 AM and recorded in a rainfall register from 1962 onwards. There is one other rainfall recording station at Palar Anicut situated about 18 km away from the centre of tank command which is also maintained by the P.W.D. Daily measurements of rainfall are recorded by the P.W.D. at 8.00 AM from the year 1963 onwards. This station is outside the tank command but in its catchment area. There are two other rainfall recording stations in the taluk offices at Walajahpet situated 16 km away from the centre of the command area and at Arakonam situated at about 30 km away from the centre of the tank command, both maintained by the Revenue Department. The measurements are taken at 8.30 AM daily at these stations and are

available in registers dating back to 1968. The earlier registers are not easily traceable in the record room. The annual average rainfall at the tank site is 1100 mm.

Wind

Evaporation

Not available

A format in which the rainfall data is collected and maintained by P.W.D. at this tank system is enclosed as Appendix I. Similarly a format in which temperature and humidity are measured by Horticulture Department is given in Appendix II. These weather data are accessible and can be collected by addressing the Public Works, Horticulture and Revenue Department authorities concerned and taking extracts from their registers. The quality of the data appears to be reliable.

(2) Hydraulic Data

The following data is available by day from 1968 onwards from P.W.D. registers in the Assistant Executive Engineer's office.

Volume of water

Volume of water in Kaveripakkam tank is in million cubic feet. Its full capacity is 1162 M.cft. (32.91 Mm³.)

River discharge

River discharge is in cusecs at Palar anicut.

Reservoir level

Water storage level in Kaveripakkam tank is in feet.

Flow delivered to main canals

Flow delivered to feeder channel from Palar anicut to Kaveripakkam tank is in cusecs.

These are measured at the respective sites by gauge readings at 6 AM and 6 PM every day or more often when change in flow is ordered. Gauge readings of flow from anicut to tank and the storage level in the tank are also measured twice daily at 6 AM and 6 PM. The proformae in which these measurements are recorded are given in Appendices III and IV.

Reservoir outflow

Flow delivered to mains and distributories

Not measured.

Other deliveries from/to the main

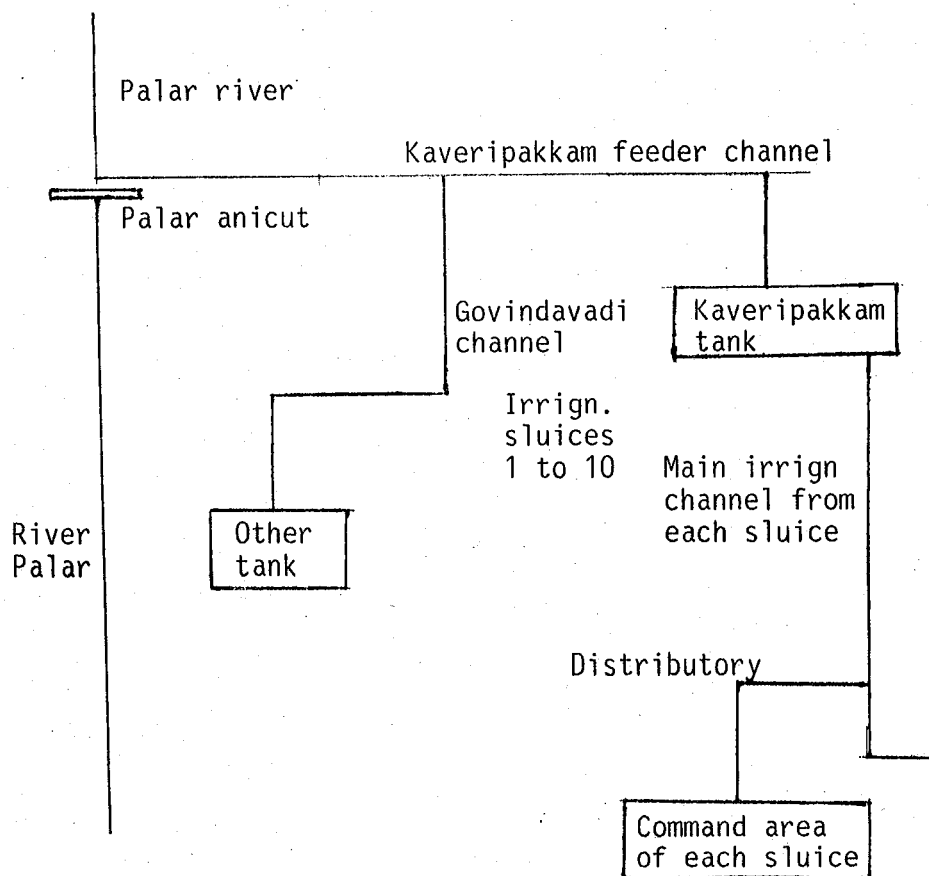
There is generally no flow except the drainage and return flows which are not measured.

Estimated leakages/seepage from reservoirs, canals distributories

Flow delivered from the distributores to farm outlets

Both are not measured. They can be measured by installing measuring devices when needed.

An issue tree is drawn below:



While the outflow from Palar anicut to Kaveripakkam tank feeder channel is measured at the head regulator of anicut and at a bifurcation point below, the actual inflow into Kaveripakkam is not measured. The wastages and transmission losses from anicut to Kaveripakkam tank cannot be individually collected from the existing documents. They can be measured by installing measuring devices and recording the flows at vantage points. Total wastages by leakage in the anicut and seepage in the feeder channel can however be computed from the anicut outflow and water level measurements made at the tank. The computations of the flows delivered are made by

installing depth gauge plates at the outlets and gates, both up and downstream and by measuring the area of opening and the head causing flow. These data are collected at Section (JE/AE) level by field staff and submitted to the Assistant Executive Engineer and Executive Engineer. All compilation is done manually.

Data availability and source

	System basis	Sub system basis
Size of the originally planned command area by acres/ha	Available from P.W.D. For the whole tank it is 2541 ha.	Available with P.W.D. for each sluice main channel from the tank system.
Size of the canals	Available from P.W.D. in km and in cusecs for the feeder channel from Palar anicut to Kaveripakkam tank.	Not available for the earthen main channels from tank and farm outlets.
Total length in miles or metres		
Total discharge in cubic feet or cubic meters		

(3) Water Distribution

All the current information for the various items given below is available from P.W.D.

Source of water

Surface water, from Palar anicut to tank only is available. Water delivered from the tank to the command area is not measured at present.

Note: Information on distribution of surface and ground water as well as ground water alone are not available.

Nature of sources

River Palar. Besides, the tank receives run off from its own catchment as well as the surplusses from six upper tanks thus adding to the resource.

Nature of flow

Gravity

Type of regulation

Movable gates with screw gear operated shutters

Types of canals

The 13.66 km long earthen feeder channel from Palar anicut to Kaveripakkam tank is lined for about 1 km length immediately below the head regulator with sand cement slabs. It is also provided with dry stone revetment at bends and curves. For the rest of its length it is unlined. Its carrying capacity is 3538 cusecs at Palar anicut and 1753 cusecs below the bifurcation point. Irrigation channels from tank to command are unlined earthen channels. Information on lining is available with P.W.D.

Any lining in the farm outlets or field channel

None.

Type of flow

Continuous flow in the feeder channel from anicut to tank during September-October, until the tank gets filled up or until feeder channel is able to draw water from anicut and intermittent thereafter. Main irrigation channels from tank to ayacut (command area) have continuous flow, unless rainfall in the ayacut is 25 mm or more on any day when sluices are closed. Other distributories flow intermittently.

Scheduling procedure

Generally on demand, with the supply maintained throughout the irrigation season. When rainfall exceeding 25 mm is received on any day, all the sluices are closed until the farmers demand the supply again. When the tank storage/river flow is low, scheduling is resorted to, through mutual agreement between suppliers and users, with rationing done by P.W.D. Turn system of water supply is practised in the distributories and field channels by the farmers themselves.

What is the method of calculating crop water requirements or demands

Deliveries are made at present at a duty of 7.5 acres/million cubic feet for wet crop over the entire command area. Crop water requirements have not been calculated for individual crops like paddy, banana, sugarcane and vegetables which are now raised in the command.

The size of originally planned command area by crop, by season

The size of the originally planned command area for the whole system is 2541.70 ha. The entire area is planned for paddy crop. Season wise planned command area is available with the P.W.D.

What organisations are responsible for each stage of water distribution (main canals to farm outlets)

From tank to sluice: P.W.D.

From distributories through farm outlets: Farmers' Committees/Representatives.

What is the grievance or complaint handling procedure in distribution of water

Whenever a complaint is made by the farmers individually or in groups, the Section Officer, P.W.D. in charge of the tank inspects the area and the water control structure, verifies the reasons for the complaint and rectifies the defect if any noticed. Sometimes complaints are made to the higher officials of P.W.D. who examine the matter in consultation with the field staff and if necessary make a field inspection and solve the difficulties.

What is the mechanism for checking whether the planned targets in distribution are fulfilled.

By field inspections and visual observation of the flows through sluice main channels by P.W.D. staff. This is based on experience of the field staff and not on measurement of flow. It is possible atleast to compute the discharge through each sluice as the area of opening and the head causing flow can be measured, even if the actual flow is not measured.

How does the irrigation organisation know whether the farmers or users are satisfied?

Through field visits by the P.W.D. staff during their routine inspections. If there are no complaints from the farmers, it is assumed that the distribution system is functioning to the satisfaction of the users.

What is the planned and actual total supply (cusecs or any volumetric measure) of water to farms by year, by season, by crop, by month, by sub-areas (defined by particular lateral, sub lateral, distributory command area, group of farm outlets etc.)

The planned quantity of water (by volume) to be supplied at the head of each main channel for the cropped area under its command for the irrigation season is converted into rate of delivery by day and the actual supply through each sluice channel is made by measuring shutter opening. Planning of water supply by crop or sub areas is not done.

(4) Irrigated area

Planned area for irrigation is given in the system description and is available for the tank system and the sluice sub system.

Area actually irrigated and irrigated area harvested every year are not readily available. These figures are maintained by the Revenue Department and are reported by Village Administrative Officer through his No.2 Village Account in 'Adangal' books to the Tahsildar every year. This is the basic account from which all other required information viz. area irrigated by year, by crop and by season can be compiled. This account which is maintained for all the survey field numbers in one compilation will contain irrigated and unirrigated crop details, the period of the crop, the source of irrigation etc. A list of columns seen in that account book is given in Appendix V and this data is maintained in the local language. The

information by sub system or main canal/distributory is not readily available. There is however the possibility of breaking it down to sluice level with some effort, by picking out the field survey numbers fed by a particular sluice channel. It will of course be time consuming. The segregation cannot be done upto the farm outlet since there is no ayacut (command area) map prepared for the tank showing the survey numbers of fields. This No.2 account which is compiled and kept in the taluk office for the whole taluk is maintained in record only for a period of 10 years, after which it is destroyed.

(5) Agriculture

Production and yield

Production and yield of each crop are reported only Village, Block and Taluk wise and are not system based. The Director of Statistics selects the plots for crop cutting experiments which in some years may not even fall within the command area of a tank. The Assistant Director of Agriculture conducts the crop cutting experiments in those selected plots, arrives at the average yield for each crop and works out the production, based on the acreage under that crop in the taluk and reports. This is finally compiled for the State by the Director of Statistics. There is no possibility of getting at the production quantity systemwise or subsystem wise. However from the data of the crop cutting experiments maintained by the Assistant Director of Agriculture in the taluk, yield can be obtained for any year (data upto 3 to 4 years

is generally available) and production worked out on that basis for the acreage in the sub system around the sample plot. The yield trend in Kaveripakkam tank ayacut for paddy, sugarcane and banana crops which are the predominant crops grown in this irrigation system was ascertained from the crop cutting experiments conducted. It was 5.60 tonnes/ha for paddy, 80 tonnes/ha for sugarcane and 15000 kgs/ha for banana as presented in Appendix VI. The Season and Crop Report published by Director of Statistics contains the yield data for the principal crops grown. An extract of the crop yield data for North Arcot district covered by this irrigation system is also given in Appendix VI.

Other agricultural inputs, fertilisers, pesticides, seeds, quantity supplied for the area system wise.

Inputs such as fertilisers, pesticides and seeds are supplied only in part by the Agricultural Department. Farmers obtain their requirements mostly from private traders and Agro Service Centres. For instance the Assistant Director of Agriculture is asked to plan only for 20% of the seed requirement for distribution as certified seed, for the taluk in his jurisdiction. Hence complete data is not available now for the agricultural inputs even taluk wise, much less system wise. The quantity of fertilizers consumed district wise in terms of N P K and azospyrillum, pesticides in terms of dust and liquids and certified seeds distributed through Agricultural Department, are given in Appendices VII-A and B for North Arcot district in which the tank is situated.

Similarly the cost of cultivation of principal crops grown in a district, both for irrigated and rainfed, calculated by the Agricultural Department are given in Appendices VIII A and B. Such information can be collected for the system separately by some special staff. Particulars of tractor hours and other machines are not available. But the number of tractors and power tillers as well as farm implements and animals in each village are available from the survey of agricultural statistics and livestock census conducted by the Director of Statistics once every five years. The last survey was conducted in 1985. Particulars of extension staff's time is available for the whole Agricultural Division from which they have to be compiled for the system.

Average quantity prescribed systemwise (per acre or per hectare)

This is available with the Assistant Director of Agriculture for each crop for fertilisers and seeds and not for pesticides.

Average quantity used system wise

This is not available and no such data is collected.

(6) Soil types

The Joint Director of Agriculture (Soil Survey) with his headquarters at Coimbatore is in charge of the soil surveys in this and a few other adjacent districts. The soil survey map for the two taluks covered by the tank irrigation system command has been prepared by him and is available. The survey is low intensive and at a macro

level. Detailed soil surveys will be undertaken by his organisation in due course.

Broad classification of soil series, morphology and textural classification have been made in the low intensity soil survey report. The percentage given under each soil type and degree of salinity/alkalinity are only approximate. Only detailed survey will furnish precise information on these soil characteristics.

Ground water

Records of observation wells maintained by the Ground Water Wing of the P.W.D. gives the annual water table fluctuations. There are a few observation wells in the system command and the detailed analysis of the fluctuations are available with the Chief Engineer, Ground Water. A copy of the format in which the water level data of wells is maintained in a typical well in Kaveripakkam is given in Appendix IX. No routine seepage or percolation observations are made either by the Ground Water Wing or the Irrigation Wing of the P.W.D. But these studies are undertaken by P.W.D. under special programmes whenever required.

(7) Cost Elements Structure

Cost of Operation and Maintenance

The source of all this information is the office of the Assistant Executive Engineer under whose jurisdiction this system lies. He has other works in the district including maintenance of the public buildings. About one fourth of his time can be taken as spent on this system.

Operation and maintenance both rest on the same personnel and are attended to by the Junior Engineer and his staff. Information can be compiled for the total system. Yearly data as far back as five years is available but may have to be compiled from the office records in respect of the following:

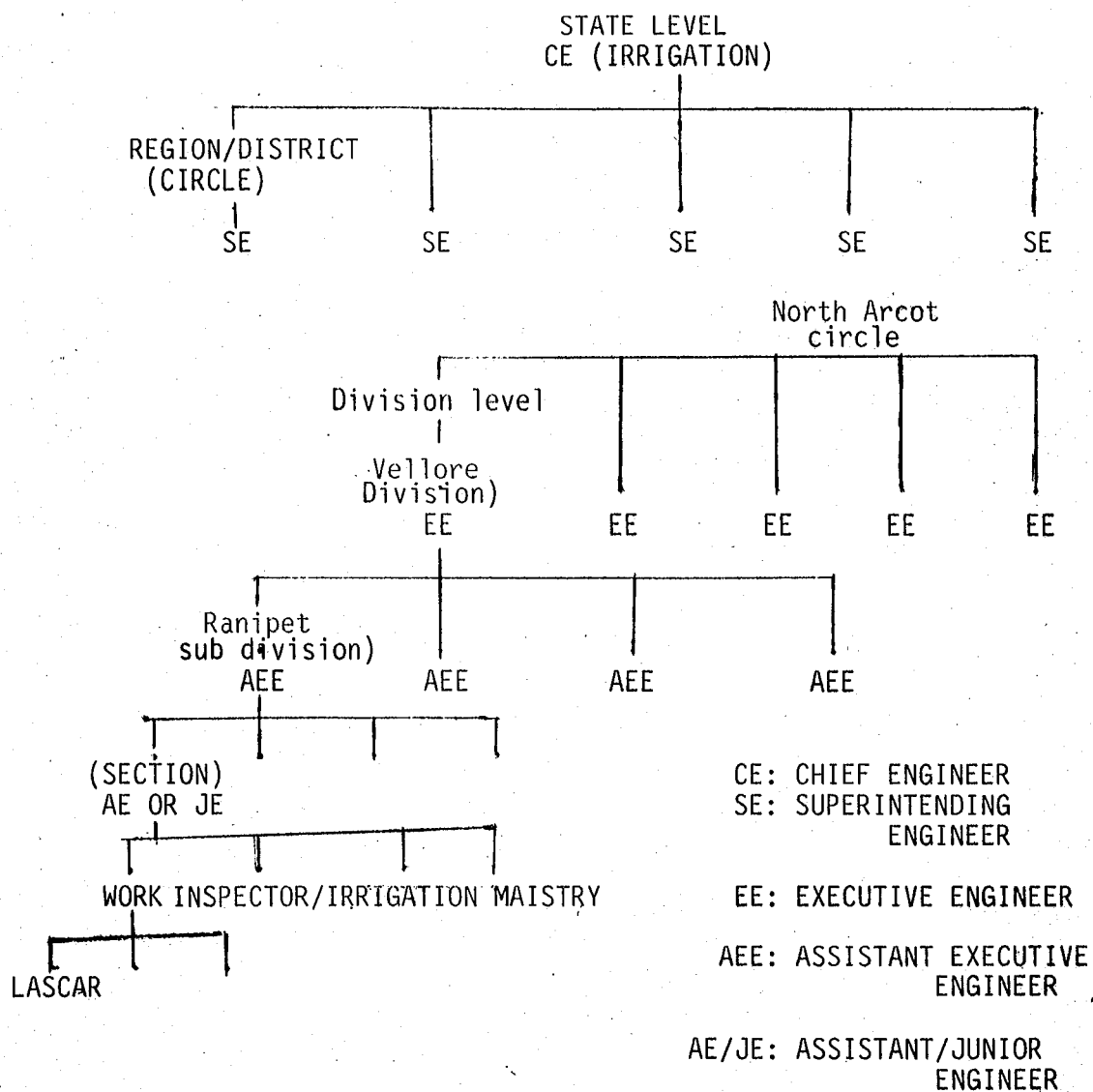
- Establishment cost
- Fuel cost
- Office overhead
- Cost of major repairs
- Cost of routine maintenance
- Labour cost
- Material cost
- Contract cost

Cost of rehabilitation

No rehabilitation has been done. But certain rehabilitation works were contemplated for enhancement of the capacity or the command area and for improving the existing physical system for increased water use efficiency and prevention of losses. But they have not been implemented so far.

Man power used

Data can be culled out from the Assistant Executive Engineer's office records for the past five years. Information is available for the whole section and can be apportioned to the system. Establishment chart of the current irrigation organisation is given below.



Note:1. Cross classification of the man power by type of organisations is possible only by contacting the officials of different organisations such as irrigation, Ground Water, Agriculture (T & V) & (Soil Survey), Revenue, Cooperation, Rural Development etc., by a time consuming process of ascertaining the time spent by their staff on matters relating to irrigated agriculture in the system command.

2. Collection of the same data by system is possible but it will be very approximate by sub system or canal wise. Since many organisations are involved, only approximate

apportionment of the time spent by each category of staff by job classification will be possible.

(8) Farming systems

The source of all information under this item is the office of the Assistant Director of Agriculture in each taluk.

Farm size

Distribution of farms by farm size

This information is not readily available for the tank irrigation system. It is available village wise. There are 14 villages in the tank command. Of these, only parts of some villages are in the command while the rest of the areas are outside the command. So compilation of the farm size distribution will be necessary from village data. For Kaveripakkam village, the farm size distribution is as follows

0-1 ha	1-2 ha	More than 2 ha	Total	Source
530 nos.	654 nos.	191 nos.	1375 nos	Agri.Dev. Officer, Kaveripakkam

When the Government introduces schemes for benefiting the marginal or small farmers by way of subsidies in the supply of inputs etc., or to provide agricultural loans, details of areas are gathered for the purpose and that too only village wise. Marginal farmer is one who owns less than 1.25 acres wet or 2.5 acres dry. A small farmer is one who owns between 1.25 to 2.50 acres wet or 2.5 to 5.00 acres of dry land.

Type of farming

Different crops during different seasons are seen but mixed crops are also seen in the same season. During 1989-90 the areas under various categories were as follows in Kaveripakkam village.

Mono crop-paddy	Different crops	Mixed crop	Total
250 ha	310 ha	31 ha	591 ha

Type of technology

Ploughing both by traditional method and by tractors is done in the command. No data is presently collected on the different types of technology adopted.

Seeds

The traditional seeds used in the command is very insignificant. Local improved and local new strains and also external strains which are derivatives of the I.R. variety are used. Data on the breakup in Kaveripakkam village as obtained from the Agricultural Development officer is as follows:

Seeds used in percentage

	Paddy	Banana	Sugarcane
1. Traditional	6	90	--
2. Local improved	32	10	90
3. Local new strains	32	--	--
4. External adopted	30	--	10
Total	100	100	100

Approximate quantities can be assessed for the system by conducting a survey of both the departmental godowns and the private sales depots. Such a survey can be conducted only with the help of the Assistant Director of Agriculture and his staff.

Seeding and Transplanting

In respect of paddy, transplanting is adopted extensively with direct seeding resorted to only in a very few places during drought years.

Traditional method is adopted for transplanting.

Harvesting

Only manual; no harvesting machine is used in the command.

Economic basis of farming

Essentially subsistence, with a few big farmers resorting to local commercial farming. There is no export oriented farming done.

Farm incomes

No systematically collected data is available. Now and then in small pockets, socio economic survey by oral enquiry is done for specific purposes by various organisations, the data for which are not readily available.

Land tenure

Both owner cultivation and tenancy are prevalent in the command but no data is available.

Ownership size

Please see farm size

to the farm but cannot be said to be satisfactory. The other source of information on farmers' organisation is the Farmers' Training Centre located at Navlock in the district. There is such a training centre in each district. It organises convenors' groups in the command for the purpose of transmitting farm messages and function in collaboration with the Assistant Director of Agriculture. In Kaveripakkam village, there is a Farmers' Committee comprising ten members and three of them are also delegates to the Tank Irrigation Council which manages the water distribution to the various segments of the system. Totally there are 24 delegates in the Council from the 14 villages. At present only 15 of them are actually participating in works relating to water distribution.

(10) National level information

Given in the Overall State Report.

APPENDIX I
PUBLIC WORKS DEPARTMENT, TAMILNADU
RAINFALL REGISTER

Location

For the month of

Recorded at 8.00 AM

Unit of measurement:mm

Date	1984	1985	1986	1987	1988	1989	Remarks
1.							
2.							
3.							
4.							
5.							
...							
...							
30							
31							
Total for the month (mm)							
Total from 1st Jan.							
Total from 1st April							
Particulars of heaviest rainfall							
A Date							
B Rainfall							
C Duration							

APPENDIX II
HORICULTURE DEPARTMENT
Large Scale Orchard cum Elite Banana Farm, Navlock
Register of Weather Data

Time : 8.00 AM

Date	Temperature				Rainfall	Signature of AAO	Signature of H.O.
	Minimum C°	Maximum C°	Dry F°	Wet F°			

Note: AAO : Assistant Agricultural Officer
 HO : Horticulture Officer

APPENDIX III
PUBLIC WORKS DEPARTMENT
DAILY WATER REPORT

PALAR ANICUT

NAME OF OFFTAKE

FREQUENCY OF MEASUREMENT :

Twice daily at 6.00 AM & 6.00 PM
or more often

Date	Time	Head Regulator		Number and height of vents opened	Discharge (cusecs)
		Front gauge (ft)	Rear gauge (ft)		
<hr/>					
<hr/>					

Work Inspector

Junior Engineer

APPENDIX IV
KAVERIPAKKAM TANK WATER READING REGISTER (Daily)

Date	Time	Gauge reading from low level sill (13.0 ft) ft.	Rainfall (mm)	Signature of Lascar	Countersignature of W.I., J.E/AEE/EE
	6.00 AM				
	6.00 PM				

Note : W.I. = Work Inspector
 JE/AE = Junior Engineer/Assistant Engineer
 AEE = Assistant Executive Engineer
 EE = Executive Engineer

APPENDIX V
VILLAGE ACCOUNT NO.2

Fasli Year	District	Taluk	Village
------------	----------	-------	---------

Annual field wise cultivation account

- | | | |
|--|--|--|
| 1. Survey field number | | |
| 2. Sub division no. of the field | | As per details seen in the land cess assessment register |
| 3. Extent | | |
| 4. Land cess (as fixed in the Land Survey Settlement) | | |
| 5. Eligible for one crop or two crops. | | |
| 6. Owner's name | | |
| 7. Cultivator's name/whether the whole field or part has been cultivated | | |
| 8. When did the cultivation start and when was the harvest made | | |
| 9. Name of the crop | | First season |
| 10. Extent cropped/harvested | | |
| 11. Irrigation source (Canal/Well/Tank) | | |
| 12. Percentage of yield assessed | | |
| 13. When did the cultivation start and when was the harvest made | | |
| 14. Name of crop | | Second season |
| 15. Extent cropped/harvested | | |
| 16. Irrigation source (Canal/Well/Tank) | | |
| 17. Percentage of yield assessed | | |
| 18. Village Administrative Officer's remarks | | |
| 19. Reasons in detail if a field is left fallow | | |
| 20. Comments of crop inspecting officer and Signature | | |

Note: 1. Translated from the original in local language.

2. The columns are to be spread horizontally and read.

APPENDIX VI

**YIELD PARTICULARS OF CROPS IN NORTH ARCOT DISTRICT
AND KAVERIPAKKAM AYACUT FOR 1987 - 88**

All yeilds are in kg/ha except for Sugarcane which is tonnes/ha

Sl.No.	Name of Crop	Irrigated North Arcot	Unirrigated District	Irrigated Kaveripakkam Ayacut Area
1.	Paddy	4300	---	5600
2.	Sorghum (Cholam)	2300	1480	--
3.	Bajra (Cumbu)	2210	740	--
4.	Ragi	2560	1460	--
5.	Sugarcane	78	--	80
6.	Chillies	1190	--	--
7.	Banana	14570	--	15000
8.	Cotton (in terms of lint)	450	190	--
9.	Groundnut: (unshelled)	1985	910	--
10.	Sunflower	880	400	--

APPENDIX VII-A

CONSUMPTION OF N.P.K. 1987-88 (Fertilisers) Tonnes

Sl.No.	District	N	P	K	Total	Distribution of Azospyrillum Packets
1.	North Arcot	25292	13987	14592	53871	53313

APPENDIX VII-B

CONSUMPTION 1987-88 DEPARTMENTAL DISTRIBUTION
PLANT PROTECTION CHEMICALS

(SEEDS (IN M.T.))

TABLE:

Sl.No.	District	Dust in M.T.	Liquids in litres	Paddy Certified seeds	Total Millet
1.	North Arcot	515	55704	1817.6	76.6

APPENDIX VIII-A

TABLE : Scheme : Cost of cultivation (Rs./Irrigated ha)

Sl.No.	District	Paddy	Cholam	Cumbu	Ragi	Pulses	Maize	Sugar cane	Cotton
1.	North Arcot Ambethkar	4336	1786	2355	1861	--	--	9415	--
2.	Tiruvannamalai Sambuvarayar								

APPENDIX VIII-B

Scheme : Cost of Cultivation (Rs./ha rainfed)

TABLE:

Sl.No.	District	Paddy	Cholam	Cumbu	Ragi	Maize	Pulses
1.	Coimbatore	--	3037	2244	1572	--	1946

APPENDIX IX

WATER LEVEL DATA IN CONTROL WELLS

District : NORTH ARCOT
 Taluk : Arakonam
 Block : Kaveripakkam
 Location : Kaveripakkam

Well No. U/23029
 M.S.L. of Measuring Point : 121.535m
 Ht. of M.P. above G.L. : 1.27m
 T.D. of the Well from M.P.:9.70m

Longitude : 79°30'50"
 Latitude : 12°53'27"
 River Basin : PALAR
 Nearest raingauge station:
 KAVERIPAKKAM

Sl.No.	Years	DEPTH OF WATER BELOW M.P. IN METRES(m)												Remarks
		JAN	FEB	MAR.	APR.	OCT.	NOV.	DEC.					
1.	1971	3.84	4.22	4.47	4.87		4.96	4.65		4.25				
2.	1972	4.56		5.00	5.52		6.98	6.20						
3.	1973	4.42	4.00	4.54	4.85		5.56	5.49		4.49				
4.	1974	4.13	4.20	4.39	4.94		5.40	4.11		3.98				
													
													
17.	1987	8.25	9.50	8.85	DRY		9.35	9.38		9.02				
18.	1988	6.67	6.76	7.20	7.72		8.55	7.00		6.20				
19.	1989	5.65	5.50	5.92	6.26		9.10	9.20		9.00				

Note: M.P. = Measuring Point

T.D. = Total Depth