

Globally Important Agricultural Heritage Systems (GIAHS) Initiative

Grand *Anicut*(*Kallanai*)and associated farming system in Cauvery Delta Zone of Tamil Nadu



Submitted by
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&
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Chennai - 600 113**

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Template for GIAHS proposal

Globally Important Agricultural Heritage Systems (GIAHS) Initiative

SUMMARY INFORMATION

Name /Title of the Agricultural Heritage System (local Name and Translation, if necessary) : **Grand Anicut (Kallanai) and associated farming system in Cauvery Delta Zone of Tamil Nadu.**

Requesting Agency / Organization: : 1. Tamil Nadu Agricultural University, Coimbatore 641 003.

Country / location / Site (please annex maps and geographical coordinates of the site) : 2. M.S.Swaminathan Research Foundation Chennai - 600 113 Tamil Nadu, India.

Annexure – I

Accessibility of the site to capital city or major cities: : The Grand Anicut is 47 km south east of the district capital Thanjavur.The nearest city Tiruchirapalli is 16 km away from the Grand Anicut which is well connected with the Tamil Nadu State Capital Chennai and the Country Capital New Delhi, by road, air and train.

Approximate Surface Area: : The Grand anicut is 328 metres (1,080 feet) long; 12.20 to18.30metres (40 to 60 feet) in width and 4.57 to5.49 metres (15 to18 feet) in height.The area irrigated by the ancient irrigation network of which the dam was the centrepiece was 28,000 hectares. By the early 20th century, the irrigated area has been increased to about 4.05 lakh hectares. At present the dam caters to irrigation needs of 4.86 lakh hectares.

Agro-Ecological Zone/s: : Cauvery Delta Zone (CDZ)
Lies in the eastern part of Tamil Nadu between 10.00-11.30 N latitude and between 78.15-79.45 E longitude. It is bounded by the Bay of Bengal on the East and the Palk straight on the South, Tiruchirapalli district on the west, Perambalur, Ariyalur

districts on the north west, Cuddalore district on the North and Puddukkottai district on the South West.

- Topographic features: : Longitude 78° 49' E & Latitude: 10° 50' N.
- Climate Type: : Tropical climate. The Cauvery region is a warm eco region. The climate is characterized by hot, dry summers from March to August, with intermittent rains from the southwest monsoon, and mild winters from September to February, with good rainfall from the northeast monsoon from October to December. Precipitation varies considerably across the basin. The western side of the catchment mainly experiences the southwest monsoon from June to September, and the northeast monsoon from October to December falls on the eastern side. The rainfall during the rest of the period is insignificant. About 20 per cent rain is received during the southwest monsoon, about 70 per cent in the northeast monsoon, roughly 10 per cent in the pre-monsoons and in the winter months. The total number of rainy days are more than 100 per year in the western part of the basin, and 40 to 50 elsewhere in the region. March is a dry month for the entire basin, while August is one of the wettest months in the year. The length of growing period extends from 90 to 150 days in a year. The Tamil Nadu part of the Cauvery basin receives an annual average rainfall of 956 mm. The rainfall in the deltaic region ranges from 1,000 to 1,140 mm, with the growing period varying from 120 to 200 days. The annual temperature ranges from 25°C to 40°C, though there is a considerable variation in the mean daily maximum and minimum temperatures across the catchment area. The mean daily maximum temperature ranges from 19.5°C to 33.7°C, whereas the mean daily minimum varies from 9.1°C to 25.2°C.
- Approximate Population : 11,098,617 (2011 census)
Density: 410/ km²
- Main source of Livelihoods : : Farming and allied enterprises
- Ethnicity / Indigenous population : : Tamil speaking Indians of multiple religious faiths, predominantly Hindus, Muslims and Christians.

Summary Information of the Agricultural Heritage System (about 200- 300 words)**About the dam- Grand Anicut (Kallanai)**

The Cauvery River rises from southwestern Karnataka and flows down into the Bay of Bengal with 55% of the drainage area falling in state of Tamil Nadu and 42% in the state of Karnataka. During monsoon it gets flooded, inundating large areas. *Anicut* are the diversion dam constructed with masterly engineering skill of the local people and the rulers of the day to control the flow of water saving region from the devastation of the furies of the floods and using it effectively and efficiently in irrigation as per demand of the situation. It has been constructed on the course of river, when it enters the delta region and where Cauvery bifurcates into Cauvery and its tributary Coleroon. It was constructed to restrict water spilling into Coleroon, and to raise the water level to gain command for its flow through delta.

The *Kallanai* is a dam made of stone (Tamil for stone), called as “Grand *Anicut*”, built by the Great Chola Emperor *Karikal Cholan* on river Cauvery in the 2nd Century AD. It is a marvelous piece of hydraulic structure built across a mighty river in its sandy bed when science had not developed enough to build structure on permeable foundations. It is perhaps the earliest irrigation marvel created to control a mighty river and is still functioning as efficiently as any modern hydraulic structure. It is 329 meters long, 18.3 meters wide and 5.49 meters tall, located 16 km east of Tiruchirapalli and 209 km below Mettur Dam. It has three head regulator and a surplus regulator, and collectively called *Kallanai* or Grand *Anicut*, controlling the furies of floods which should have been unimaginably devastating in the past. The delta with its extensive network of 36 branches of rivers, 1505 main channels and 28,376 branch channels is irrigating an area of over 535000ha (Command area). These network of rivers also feed about 650 system tanks in the delta which are the main source of water for the people and cattle during summer months besides irrigation. These developments made settled agriculture as the main occupation for nearly 60 per cent of the population.

Location

Kallanai is located, on the left bank of Cauvery 16 km east of Tiruchirapalli and 209 km below Mettur Dam and at 78°49'E longitude and 10°50'N latitude. The whole Grand *Anicut* complex consists of three head regulators (at the heads of Cauvery, Vennar and Grand *Anicut* canal) and a surplus regulator, on the Northern Bank of Cauvery discharging flood waters into Coleroon (Kollidam) which is actually known by the name Grand *Anicut* or *Kallanai*. The masterly engineering skill underlying Grand *Anicut* or *Kallanai* is amazing as it continues to efficiently work even after centuries as effective than any other modern dam. Also notable is that this structure has a very simple sloping apron on the downstream side as against the immaculately designed and well executed full fledged stepped apron provided to the modern structure.

Head Regulators in the complex

This is the location where the River Cauvery popularly known as “Akanda Cauvery” meaning “Broad Cauvery” divides itself into two branch rivers of equal capacity known as Cauvery and Vennar. In the year 1934, a man made canal by name “Grand *Anicut*” (GA)canal” was dug with its head besides the heads of these two branches. So the entire complex consists of

- ξ *Kallanai* or Grand *Anicut*
- ξ Head Regulator of Cauvery
- ξ Head Regulator of Vennar
- ξ Head Regulator of G.A. Canal
- ξ Surplus regulator of Coleroon.

Thus the Head works of Cauvery is collectively known by the name *Kallanai* or Grand *Anicut*. So *Kallanai* is the place where Cauvery Delta starts. The nearly flat fan shaped Cauvery delta slopes gently towards east over a length of 160 km where it ends meeting the coastal line of Bay of Bengal (**Annexure – II**).

About the River “Cauvery” and associated Cauvery Basin

The Cauvery is a large river and one among the 12 major rivers of India as classified by the Central Water Commission of India (CWC). The River Cauvery takes its origin at *Talai* Cauvery on the Brahmagiri ranges of the Western Ghats in the Coorg District of Karnataka at an elevation of 1,341 m above MSL. The river flows generally south and east through Karnataka and Tamil

Nadu and across the southern Deccan plateau through the south eastern lowlands, emptying into the Bay of Bengal through two principal mouths.

Before reaching the Bay of Bengal, the river flows to a distance of 802km excluding the tributaries and branch rivers. During this course, important tributaries viz., Harangi, Hemavathy, Laxmanthirtha, Kabini, Suvarnavathy, Arkavathi and numerous smaller tributaries join the river Cauvery in the Karnataka state. The river flowing through a gorge flows along the common boundary for a distance of 64 km between Karnataka and Tamil Nadu and enters into the Tamil Nadu at Hogenekkal falls. At Hogenakkal, its course towards south enters the well known Mettur reservoir and from there it enters the plains of Tamil Nadu where the tributaries such as Bhavani, Noyyal and Amaravathi join and reaches the Upper *Anicut*. Immediately after the Upper *Anicut*, the river splits into two branches namely the northern branch called Coleroon and the southern branch retaining its original name “Cauvery”. The Upper *Anicut* was constructed in the year 1886 to facilitate diversion of low supplies of the river into Cauvery delta and floods into the Coleroon. The two branches from the island of Srirangam before joining at lower *Anicut* Kollidam. The fertile Cauvery delta region begins from the Grand Anicut or Kallanai. The delta with its extensive network of 36 branches of rivers, 1505 main channels and 28,376 branch channels is irrigating an area of over 4,86,000 ha(Command area).These net work of rivers also feed about 650 system tanks in the delta which are the main source of water for the people and cattle during summer months besides irrigation.

The local communities and rulers of the region have displayed excellent engineering skills in establishing an extensive network of irrigation, particularly in the deltaic area. Cauvery’s northern and larger channel saved the old system from silting and extended irrigation to agriculture. These developments made settled agriculture as the main occupation for nearly 60 per cent of the population across the river basin.

The river passes through diverse topography, including arid , semi-arid tracts and ends in the coastal swamps. Thus it has resulted in the evolution of diverse and unique practices for eco friendly and sustainable management of livestock, fishing and agriculture. In this process of agricultural development, the region has evolved and conserved enormous genetic diversity particularly minor millets in the dry areas, rice in both rain fed and irrigated systems in deltaic

areas, which are supported either by monsoon rain as well as irrigation network. For these contributions, the region deserves to be proposed as another National Agricultural Biodiversity Heritage Site based on the indices described by Singh (2015). Cauvery region physically extend and spread along and around the flow of the Cauvery River. It is bounded on the north by the high Kollimalai, Pachaimalai, Shevaroy (Servaroyan), Kalrayan, Chitteri, Palamalai and Mettur hills separating it from the Krishna and Pennar basin, on the south and east by the low Sirumalai and Karanthamalai hills of the Eastern Ghats and Bay of Bengal respectively, and on the west by the Western Ghats. The river basin is estimated to be spread over 81,155 km² with many tributaries, including the Shimsha, the Hemavati, the Arkavathy, the Honnuhole, the LakshmanaTirtha, the Kabini, the Bhavani, the Lokapavani, the Noyyal and the Amaravati rivers. About 44,000 km² of the basin lies in Tamil Nadu, from 10.00°N to 11.30°N latitude and 78.15°E to 79.45°E longitude, and the rest in Karnataka. The Cauvery River rises from southwestern Karnataka and flows down into the Bay of Bengal. After it leaves the Kodagu hills, it flows onto the Deccan plateau and forms two islands, Srirangapatna and Shivanasamudra. At Shivanasamudra it drops more than 100 m, forming a fall. It enters Tamil Nadu through the Dharmapuri district leading into the lower flat plains. It drops into the Hogenakkal Falls just before it arrives in the town of Hogenakkal and then meanders through the districts of Erode, Namakkal and Karur, where it is joined by other rivers, and reaches Tiruchirappalli. It then branches off and again joins to form the Srirangam Island, which is a part of the city of Tiruchirappalli. The Cauvery divides into numerous branches and covers the whole of the delta with a vast network of irrigation channels in Nagapattinam and Tiruvarur districts, and gets merged into the wide expanse of paddy fields. The mighty Cauvery River here is reduced to an insignificant channel and enters the Bay of Bengal at the historical place of Poompuhar (Puhar), about 13 km north of Tharangampadi. Physically, 55 per cent of the drainage area of the river falls in state of Tamil Nadu, including the most fertile delta area, and 42 per cent in the state of Karnataka (Fig. 1). Administratively, the areas drained by the river cover the districts of Mandya, Mysore and Chamrajnagar of Karnataka, and Dharmapuri, Erode, Salem, Namakkal, Karur, Tiruchirappalli, Ariyalur, Perambalur, Thanjavur, Thiruvarur, Pudukkottai, Cuddalore and Dindugal of Tamil Nadu (Singh A.K 2015).

DESCRIPTION OF THE AGRICULTURE HERITAGE SYSTEM

I. Characteristics of the proposed GIAHS

Global or National Importance

1. Food and livelihood security

The 802 kilometres Cauvery has the basin area of 34,273 km² in Karnataka, 43,856 km² in Tamil Nadu, 2,866 km² in Kerala and 160 km² in Puducherry. Cauvery river water supports almost 12,00,000 ha (12,000 km²) of land in Tamil Nadu and provide food and livelihood security to the people living all along this river. Cauvery Delta Zone (CDZ) lies in the eastern part of Tamil Nadu between 10.00° -11.30° North latitude and between 78.15° -79.45° East longitude. It is bound by the Bay of Bengal on the East and the Palk straight on the South, Trichy district on the West, Perambalur, Ariyalur districts on the North West, Cuddalore district on the North and Pudukkottai district on the South West. CDZ encircles the entire revenue *taluks* of Thanjavur, Thiruvarur, Nagappatinam districts numbering 20, five revenue *taluks* of Trichy district, two of Cuddalore and one *taluk* of Pudukkottai district, thus the zone comprises of 28 revenue *taluks* of the eastern belt of the state, benefitted by the river Cauvery. The geographical area of CDZ is 14.47 lakh ha of which, 4.86 lakh ha of command area is irrigated thro the net work of rivers and canals down the Grand *Anicut* in the delta. Cauvery delta has the most extensive irrigation system in Tamil Nadu forming 48% of the area irrigated in the state by canals. The rural population to the total population in the delta accounts for 73 per cent, which shows that the CDZ continues to be highly rural based.

Contribution of *Kallanai* to Cauvery Delta and its people

The very existence of Cauvery Delta as a fertile, highly productive and well- protected land of cultivation should be attributed to *Kallanai*. It can, in all fairness, be said that “**Cauvery Delta is the gift of *Kallanai***” just as “**Egypt is the gift of Nile**”. The significance and correctness of this statement can very well be understood and appreciated only by comparing the Cauvery delta with the delta of Godavari located in the near by state of Andhra Pradesh, India.

The uniqueness of *Kallanai* and Cauvery Delta

Comparison of Cauvery and Godavari Delta

Godavari is the largest River of Peninsular India with a mean annual flow of 105,000 Mcm water. Godavari's water resources are five times that of Cauvery whose mean annual flow is only 20,950 Mcm. But, it is only Cauvery delta which is acclaimed as the Granary of the South India and not the delta of Godavari. It is because water resources were very well managed in Cauvery delta from ancient-times as against Godavari delta where water management was totally absent. *Sangam* literature(300 BC to 400 AD) speaks, vociferously, on the abundant flow of water in *Cholanadu* and the masonry structures regulating the flow into various agriculture activities, the connected cultural festivities that has become the way of life with the Tamil people and so on. As a result, the people of *Cholanadu* led a very pleasant and prosperous life. Hunger was not known to them, which gave rise to the saying “*Cholavalanadu Sorudaithu*” meaning the kingdom of Cholas has food surplus.

Godavari, however, presented a totally different picture with the area around the river depending on rain fed cultivation until 1891. **Sir Arthur Cotton** an eminent British engineer built a dam across this river adopting the Grand *Anicut* model and changed the prospects of this delta.

It took 1700 long years to have an *Anicut* constructed (in the 19th century) across Godavari (at Dowlaishvaram) to bring prosperity to the Godavari delta while such an *Anicut* was constructed in Cauvery in 2nd century AD, itself. Had *Kallanai* not been constructed by Karikal Cholan in 2nd century AD itself, Cauvery delta would have remained as a land of poverty. And flood-caused disasters. So, *Kallanai*(Grand *Anicut*) has made all the difference between the famine stricken Godavari delta and the prosperous Cauvery delta; the poverty of Godavari and the plenty of Cauvery. It is therefore no exaggeration to call Cauvery delta as the “**Gift of *Kallanai*”**. This is, perhaps, the most important contribution of *Kallanai* to Cauvery delta and its' associated farming and livelihood system.

2. Biodiversity and ecosystem functioning

The Grand *Anicut* has contributed immensely for the existence of bio-diversity of the Cauvery Delta. The entire farm holdings depend on Cauvery water for rice farming and related farm activities which was nurtured by the Grand *Anicut*, called as *Kallanai*, whereas the urban population across the state depends heavily on Cauvery for drinking water. The Cauvery is the

lifeline for drinking water in many important cities, viz., Mysore, Bangalore, Coimbatore, Salem, Tirupur, Erode, Tiruchirapalli and Chennai. The Cauvery and its tributaries is the living net work feeding not only the farmers but also nurtures innumerable plant and animal creatures of the delta. This chain of Cauvery canals in the delta forms a life line thread like vein carrying blood in any living human / animal system. Urban population often visits the deltaic region during the cropping season mainly to enjoy the natural Cauvery water ways / water bodies, rice crop and its bio-diversity. The crop-animal farming system is the predominant way of life for the rural population in the delta because of Cauvery water nurtured by Grand Anicut in the entire Cauvery Delta.

Rice based eco system is the major way of farming as the water required for rice farming is assured by the river Cauvery with the support of Grand Anicut. Rice is the Principal crop of the delta whereas the successive cropping depends on the availability of water. In most of the deltaic areas, three crops of rice during kharif(June-Sept), rabi(Oct-Jan) and summer(Feb-May) were raised which could be possible with the perennial water supply thro' Cauvery facilitated by Grand Anicut. The first crop of rice raised during kharif used to be harvested coinciding with heavy monsoon. Because of the canal water supply and with plentiful rainfall during NE monsoon, there cannot be any other crop but rice from September to January. The uniqueness of delta is its potential for rice fallow pulses viz., blackgram and greengram. The farmers grow first rice crop and use the income for celebrating the Diwali festival and they grow the second season rice either thaladi crop i.e after the harvest of the first rice crop in the same fields or grow medium or longer duration rice crop in separate fields during Samba season(Sep-Jan) which will come to harvest by Jan 2nd week during which the Tamil people celebrate the Pongal, as a thanksgiving festival to Land, Water and Cattle. The pulse crops viz., black gram or green gram used to be sown one week prior to harvest when the soil is in waxy mire condition. When the harvesting is done by manual labour, the pulse seeds sown will be falling on the soil and trampled by their feet while harvesting. That is why the rice fallow pulses sown under such conditions are known as “ Midhi Ulundu” means pulses grown thro' pressing by feet. No cost is involved in this kind of pulse cultivation, no irrigation is adopted and the growth is accomplished with the residual soil moisture and dew fall. There are the other important crops such as cotton grown in the rice fallows throughout the delta region from January onwards under ‘zero’ tillage condition. The crops like sesame and irrigated blackgram are also grown during summer months

in the delta and the sowing of these crops commence from February onwards. Vegetables, viz., brinjal, chillies, ladies finger, pumpkins, yams, different guards and greens are grown in the *Padugai* lands (the land area between two close flowing rivers) and also in the well drained fertile lands depending upon the underground water source. In light clay loamy soils under garden land condition; crops viz., groundnut, maize, sesame and irrigated pulses are grown. Banana and sugarcane are the two important cash crops cultivated on the river banks and also in specific locations of the delta where ever drainage facilities are assured. The flower crops like jasmine, rose, chrysanthemum, crossandra and neerium are the annuals occupying the land for more than one year for the successive returns. Coconut gardens and the wood lots of teak, bamboo, casuarinas and eucalyptus are the wood lots scattered in the delta in different densities. Mango, Jack, citrus, guava, pomegranate, custard apple, etc., are the more prevalent fruit trees in addition to cashew in specific locations. Apart from crops, the Cauvery delta nurtures rice based farming practices including cattle, fish rearing and other agriculture related enterprises (Annexure – III).

In addition to agriculture associated ecosystem in the Cauvery river basin, numerous living creatures and plant species also enjoys the nourishment by mother Cauvery. The canals, lakes and tanks all fed by the river Cauvery in the delta supports the reptiles, crustaceans, fishes, ducks, water crows, cranes, eagles and migratory pelicans from far reaches of the world. The pigeons, peacocks, parrots, cuckoos, sparrows, crows, woodpeckers, vulchers and thousands of such birds are seen in the land side. Apart from animal species thousands of herbs, shrubs, creepers, bushes, small and big trees are from green covers of the delta. The river Cauvery also stands for the very existence of the biodiversity in the mangroves of Chidambaram, the Kodiakarai reserve forest, and the lagoons of Muthupet.

Aquatic Diversity : Fishing is a common agricultural activity both under the river system and marine system in the coastal region using traditional methods. The river provides a significant level of species and genetic diversity in fishes, including ornamental fishes. Jayaram et al. (1982) published a survey of the entire River Cauvery system with a major account on fish fauna. The river system is very rich in fish biodiversity (Jayaram et al., 1982; Balasundaram et al., 1999)

In the coastal areas of the region, fishing is a major agricultural activity. The coastal fishing communities in Sirkali taluk have used the Catamaran for the last 2000 years. It is a sustainable

eco-friendly traditional fishing system crucial for preserving and promoting sustainable fishing in coastal areas. The Catamaran is a type of multi hulled boat or ship consisting of two hulls or vakas, joined by some structure, the most basic being a frame, formed of akas. It has evolved into a light watercraft called Kattumaram in the Tamil language. The word kattu means ‘tie’, and maram is the ‘wood tree’, thus, Kattumaram simply means ‘tying two trees together’ .It was invented by the Paravas, an aristocratic fishing community of southern Tamil Nadu. Recently, this system has also been considered by the FAO as one of the Globally Important Agriculture Heritage Systems under other potential systems and sites (FAO, 2008a, 2008b) needing protection, promotion and use in other parts of the world with similar conditions for sustainable/conservation fishing.

3. Knowledge systems and adapted technologies

The Grand Anicut built by Raja Karikal Chola is being maintained well, this could serve as an example for its engineering structure across the world. This unique structure built just with large boulders brought over and sunk in the Cauvery sand, a task arising of a desperate need for irrigating fertile fields below when the floods breached the left bank and rushed down north to join back its counterpart the Coleroon, leaving its delta high and dry. Also this was the lone solution available centuries before the reputed Punjab engineer Dr.A. N. Khosla, I.S.E. came up with an engineering design for structures to be built on permeable foundations according to data available with the Public Works Department. Floods to an extent of about 5260 cumecs (1,86,000 cusecs) have been discharged through this anicut with minimum or no damage. It is possible that higher floods could have flown over in the past when there were no other structures in the river. The *Anicut* is 328 metres (1,080 feet) long; 12.20 to 18.30 metres (40 to 60 feet) in width and 4.57 to 5.49 metres (15 to 18 feet) in height. The main function of this anicut was to retain the supply in the Cauvery and its branches and pass on the surplus into Coleroon through the Ullar river. The skill of engineers in temporary storage and diversion of water at the point of Grand *Anicut* to flow thro’ Cauvery delta is the living legend to illustrate the knowledge system which irrigate 600,000 hectares of rice crop. During the rest of the years exclusive water and crop management techniques are developed for the benefit of Cauvery Delta farmers by the Tamil Nadu Agricultural University and it is taken to the farmers for adoption through the Government departments viz., Department of Agriculture and Public Works Department and Water Users Association at farm level.

4. Cultures, value systems and social organisations (Agri-Culture)

Any agricultural system thrives on the local weather, soil, slope, people and other resources available in the region. The Cauvery water originated from western hills of India is made to run along the Cauvery delta region with a net work of irrigation and drainage channels with the help of the massive diversion structure called Grand *Anicut* at the western top. This Grand *Anicut* system is having the unique social and cultural heritage as the farmers and people of Cauvery Delta celebrate the receipt of water every year during the Tamil month of “*Adi*” (July – August) as “*Adipperukku*” meaning everyone will raise and flourish. *Kallanai* is considered one of the oldest water-diversion or water-regulating structures in the world, which is still intact and functional. The architectural beauty of *Kallanai* tells the early history of the Cholas and the Dravidian culture. In Sangam literature, a number of references are found on irrigation. Silappathikaram while describing *Chola Nadu* makes extensive references to the various activities of cultivation. The story narrated in the ancient literary work took place in Poompuhar, which was near the mouth of Cauvery i.e., in the confluence point of Cauvery into the Bay of Bengal. When the hero and his wife of the story proceeded to Madurai they followed the pathway on the left Bank of Cauvery.

5. Remarkable landscapes, land and water resources management features

The Cauvery watershed covers nearly 535,000 hectares, of which about 150,000 to 200,000 hectares come under double cropped rice area and about 335,000 hectares covered under single crop area. It is believed that large cyclopean stones used in construction of *Kallanai* would have been brought and continuously dumped across the running water in the river and in the beginning these boulders could have sank in the sandy bed and then the structure rose above to raise the water level. It is not of a solid masonry wall as believed from its name, but consists of layer of rough stones or boulder sandwiching layers of sand or clay or both in between. No cementing materials were used in rock-fill layers which was sustained only by interlocking between stones. It is of 329 m (1,079 ft) long, 20 m (66 ft) wide and 5.4 m (18 ft) high. Generally Cauvery Delta is susceptible to flash flood as it receives copious rainfall during northeast monsoon season (October to December) every year. This *Anicut* was built on the left bank of the river Cauvery in such a way that it maintains higher flow levels in Cauvery and spill the surplus into Coleroon. Hence, it acts as the best heritage diversion structure in the world, still in use to control the water discharges. Thus, *Kallanai* is a successfully living proof to the skill, vision and innovation of the

ancient Tamils. The entire Cauvery river basin is the best of its kind in the world owing to its water diversion structures, sluices, shutters and thereby giving a landscape accommodating thousands of hectares of rice and associated crops. Apart from this massive *Kallanai*, the Big Temple of Thanjavur(Bragadeeswar Temple) and thousands of such temples all along the river banks of the delta are the standing monuments to illustrate the engineering skills of the ancient Chola Kingdom, which are the long enduring of the southern peninsular India.

II. Other *social* and *cultural* characteristics pertinent to the management of the agricultural systems (optional)

III . Historic relevance

Kallanai of Cauvery confines to the structure of *Kallanai*, the materials used for alignment. It is generally believed that *Kallanai* is the oldest water regulating structure in the world constructed in the 2nd century A.D by the Chola King *Karikal Cholan*. As per the literature survey it is given to understand the following:

Construction of *Kallanai* was the earliest known work on development of water resources in South India during 2nd century.. In the 11th Century AD, Gangaikondan Tank, in the present Tirunelveli District, with a 26 km long embankment was constructed by King Rajendra Chola who also constructed a very big tank by name Ponneri, also called as Chologangam near Thanjavur with 28 km long embankment and 60 to 80 sq.km storage area receiving water from Coleroon. Kaveripakkam Tank and Maduranthakam tank are among the innumerable tanks all over Kancheepuram and Vellore and neighboring Districts constructed by the Pallava Kings who were the pioneers in tank construction. Vaigai river irrigation is one of the best systems feeding the cultivated area through tanks. Pandiya Kings constructed the tanks in Madurai and Southern Tamil Nadu.

As per the literature, Colonel Baird Smith writes ‘.... very soon after Tanjore(Thanjavur) came into our (British) possession, I find it noted in the records, that in 1804, Captain Caldwell, of the Engineers, had arrived at the conclusion that....if nothing is done Cauvery irrigation would be annihilated all going to the Coleroon’(Baird Smith, 1856: p. 10).The above quotations indicated

the engineering skills of the British Engineers who came in the later part for making necessary arrangements for storing the water for Cauvery delta irrigation.

Measures were taken to raise the crest level of the anicut and to counter the differential longitudinal bed slopes of the Coleroon which proved unsuccessful. Captain Caldwell introduced 1.22 m wide sluices through the body of Grand Anicut. While doing so, he revealed that the composition of the original dam was of boulders laid in clay fill and that no mortar had been employed in the structure. Five years later, Colonel Arthur Cotton introduced a further 10 sluices under the Grand Anicut and in the same year a bridge, 30 spans each of 9.88m was built along the anicut to allow easier operation of the structure.

A new intake for the new Grand Anicut Canal to supply an additional area of 1,04,000 ha south of the delta was added to the complex in 1934 after the Mettur reservoir was constructed. The discharge recorded was 477m³ per second with 45% flowing in the Coleroon and 55% in the Cauvery. The irrigable area served by the Coleroon and Cauvery at that time was 2,78,750 ha, split 25% and 17% respectively. After the construction of new structures viz, upper Coleroon anicut and lower Coleroon anicut, the cultivable area increased by 38%(3,83,333ha) and two crops were grown in 10% of the area. Development of the field canals and farm irrigation was left to the zamindars (land owners) and ryots(peasant cultivators) whose traditional methods prevailed.

Sangam literature makes stray references to *Kallanai*, which help to confirm the period of its construction, to understand the abundance of water in *Chola nadu*(Chola kingdom), and prevalence of efficient agricultural practices. These in turn led to the consequent confluence in flood and giving rise to the saying “*Chola valanadu Sorudaithu*” meaning abundance of food in the fertile Chola Kingdom.

Literature Reference in Copper inscriptions:

1. Melapallam Copper plates of Panyakumara, a RenanduChola King of 7th or 8th century AD states that KarikalaCholanstopped the overflow of Cauvery over its banks.

2. Karanthai Copper plates refers to KarikalaCholanraising and strengthening the flood banks of Cauvery.
3. Velancheri Copper plates of Paranthaka Chola-I refers to strengthening of flood banks of Cauvery by KarikalaCholan

Literature Reference :

1. The earliest literatures (Year 200-848) *Kalingathuparani* of Jeyankondar, *Kulothungan Pillai Tamil* and *Moovarula* of Ottakuthar make references to the achievements of KarikalaCholan
2. The medieval literatures (Year 848-1070) such as *Irangesavenpa*, *Thondaimandalachataka* and *Cholavamsa Charitra*all speak about the KarikalaCholan'swork on strengthening of Cauvery at *Kallanai*.
3. Ula literatures viz.,VikramacholanUla and Kulothunga Cholan Ula state that KarikalaCholanbuilt *Kallanai* by *deploying* the menfrom defeated kingdoms.
4. Nava Chola Charitham, a Telugu literature states that the idea of forming diversion banks to Cauvery struck Karikala Cholan when he was resting after day's of hunting on the banks of Cauvery at *Kallanai*.

It is therefore a settled part of history, that Karikal Cholan (2nd Century AD) raised *Kallanai* and strengthened the banks of Cauvery.

Development during14th to 18th Century

This is a period when the political situation was fluid in the region constituting the present day Tamil Nadu. The Moghul Empire, which extended over the entire North and Central India and Deccan, did not have its command over this region. With the three great Tamil dynasties of Chera, Chola and Pandiyas having completely faded into thin air, the region was ruled by chieftains and small kings, as representatives of Naiks, Marathas and Nawabs. Among these rulers were both Hindus and Mohammedians. They spent large sums of money for the upkeep of the efficiency of irrigation works. Even during the disturbed times that preceded the British rule, the irrigation works were not entirely omitted. There were 50,000 tanks in Madras Presidency with 30,000 miles (48278.08 km) of embankments. The whole of this gigantic machinery of

irrigation was purely Indian origin. The Veeranam Tank with 9 miles (14.48 km) long embankment on the west of Chidambaram was dug by the King Paranthaka Cholan. This is the second biggest tank in Tamil Nadu. Similarly Ramanathapuram Big tank and Rajasingamangalam Tank in South Tamil Nadu speak of the contribution of Pandiya Kings in harnessing water.

Development during 19th and 20th Century

The British Contribution to development of irrigation in Tamil Nadu is immense. In 1837 **Sir Arthur Cotton** constructed two big regulators across Coleroon, one at the head of Coleroon called Upper *Anicut* which diverted lean flow to the Delta by preventing it from spilling into Coleroon, and the other, known as Lower *Anicut* near '*Anaikkarai*'. The Lower *Anicut* is the terminal usage point, from where water was taken to Veeranam Tank. The construction of these two *Anicuts* saved the Delta from deterioration. In 1830 Sir Arthur Cotton cut open the 21centuries old Grand *Anicut* and provided scour sluices. The scour sluices improved clearing the silt deposits of the area.

IV. Contemporary relevance

Agriculture is the main source of livelihood for most of the people of Cauvery Delta. Cultivation has been the major occupation of the local inhabitants since the soil is most ideally suited to rice crop and other crops like; pulses, sugar cane and banana. Hence, it is commonly called as the "Rice Bowl of South India". The Grand *Anicut* constructed in the 2nd Century AD still feeds millions of people in the delta and neighbouring states of India and Cauvery Delta. It is the main stake for achieving the rice production of the state and food security of the state revolves around the Cauvery river basin.

V. Threats and challenges

The biodiversity of the region is being threatened by a number of factors, including expanding agriculture, and needs attention with suitable strategies for protection and conservation. Though the Cauvery river basin, with its network of canals and aqueducts, is the granary of Tamil Nadu,

it has seen decreasing rainfall in the last few decades. Appropriate rain harvesting and augmentation of irrigation facilities can help overcome the shortage of water and bring more marginal lands under intense cultivation. High-value, quality vegetable, flower and fruit production under normal and technologically managed greenhouse conditions can provide value additions to the products and greater income to the farmers. Korangadu pasture land needs to be protected and promoted, as it can provide financial security to resource-poor farmers and help conservation of local livestock breeds and plant diversity of forage value. Awareness needs to be generated at the local, regional, national and international levels for possible initiation or replication of such systems. But before that, the traditional knowledge of grassland management practices, livestock management and ethno-veterinary practices needs to be experimentally analyzed to justify the gains, for preservation. The recent study regarding the local communities in the different areas of the region has discovered the evolution and conservation of several breeds.

In the coastal areas of the region, fishing is a major agricultural activity. The coastal fishing communities in Sirkali taluk have used the Catamaran for the last 2000 years. Same may apply to the Kattumaram boat for promotion of conservation fishing without damaging the fish biodiversity, and many other practices followed in the region for river and water management. It is difficult to economize the water for irrigation in an irrigation network consisting of channels, which would lose their regime in due course. So the most important component of the project should be to keep the channels maintain its regime, as given below.

1. Lining the channels, not for arresting seepage loss as normally believed but for maintaining the trapezoidal section of the channels and their bed slope thereby keeping the channels under regime condition.
2. The banks of the rivers should be widened and strengthened with inspection track (Jeep track) on the top of the bank, well maintained.
3. All the irrigation structures should be thoroughly checked and repaired and those, which are beyond repairs, should be demolished and reconstructed.
4. The system should be maintained in a trim condition such that the dictum of supplying a prefixed quantum of water at prefixed point at prefixed time is enforceable. This can be

achieved by providing sufficient annual maintenance fund and by improving the staff strength both in magnitude and expertise and skill.

Drainage Problem

While ensuring irrigation supply is a problem on one hand, draining away the surplus water received through unexpected heavy rains and floods received from the uplands are a problem on the other hand. The terrain slope is very mild in the delta near the sea. With a very mild slope the velocity is very low and it takes much longer time for the water to drain. This leads to longer period of submersion of crop in water, causing heavy damage to the crops.

De silting of drainage rivers being taken up in the delta, should be carried out more scientifically by identifying the worst affected area calculating the flood intensity in the area and flood carrying capacity of drainage rivers and courses by giving priority. The smaller streams carrying surface over-flows to the drainage rivers should also be cleared off weeds and led to the ‘in fall’ points.

Aquaculture farms are found all along the coast of the delta. The aquaculture farms are in the form of tanks with raised bunds on all four sides and are located in a chain with a small gap in between the adjacent farms. This chain of tanks (farms) acts like a fort wall preventing floodwater from approaching the sea fast. Only low floods will be carried by drainage lines to the sea. But heavy floods, even a fraction of which cannot be discharged in a river, has to find its way only as surface run off covering the entire terrain like a sheet of moving water – the reason why the land near the coast is called flood plains. But the presence of fort like aqua farms obstruct the flow, and it takes much longer time for water to move through the small gaps in between farms. This increases the stagnation time of crops spoiling their prospects and sometimes leads to total damage of crops affecting the economy of the Delta and its people.

VI. Practical considerations

The, food grain basket of Tamil Nadu and South India as a whole need to be sustained in order to harness its benefits for the future generations. Efforts are being taken to protect the “Grand Anicut” which feeds several branches of Cauvery river in the delta. The Union Government of

India and the State Government in Tamil Nadu have initiated steps to renovate the structures, viz., check dams, sluices, shutters and de-silt the rivers and channels with the financial support of international organizations. The entire Cauvery delta formed by the Grand *Anicut* covers 37 per cent of total rice area of Tamil Nadu producing annually about 5.7 million tons of paddy. In addition to feeding people of South India, the Grand *Anicut* and its net work of Cauvery tributaries and associated rice based cropping system offer employment to millions of people and sustain the of farmers and agricultural labourers. Had the Great King Karikal Cholan did not think of constructed this massive water storage and diversion structure at the head reaches of river Cauvery, the centuries old rice cultivation and associated farming activities would not have flourished in the delta. There is no need to explain how the entire flat terrain of Cauvery Delta would have turned out, had the Grand *Anicut* is not constructed across the river Cauvery. The rice culture and rich bio diversity would not have evolved. Today it is difficult to visualize the delta without rich rice harvest and support to the associated living system.

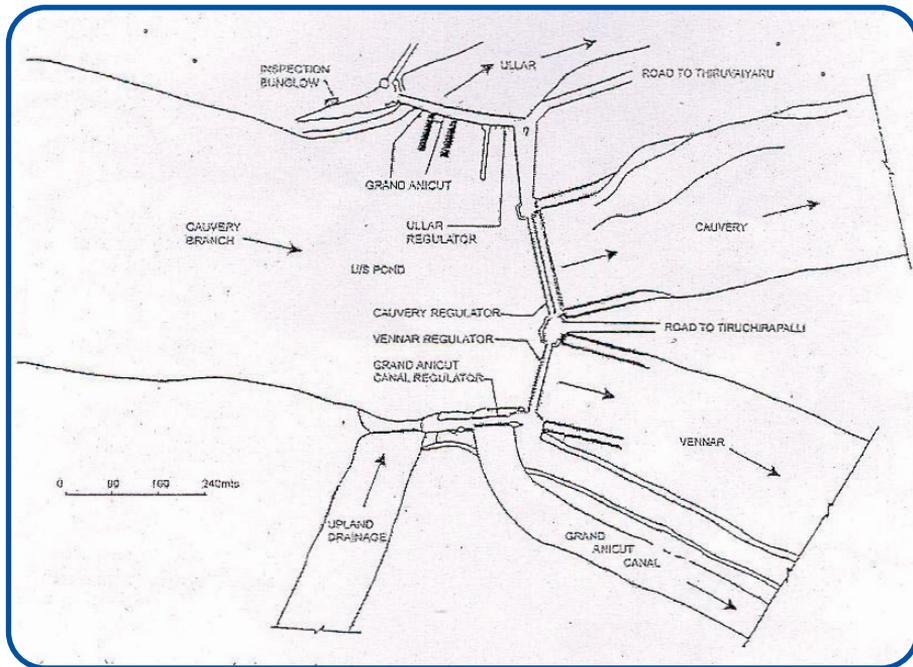
Hence, it is important to protect the Grand *Anicut* and and strengthen this complex historic heritage on water regulating structures in order to ensure food security of the future generations and to safe guard the bio diversity wealth of the Cauvery Delta. In many respects the Grand *Anicut* merits recognition as one of the Globally Important Agriculture Heritage Systems for its continued preservation and strengthening of its role in regional food security and biodiversity conservation.

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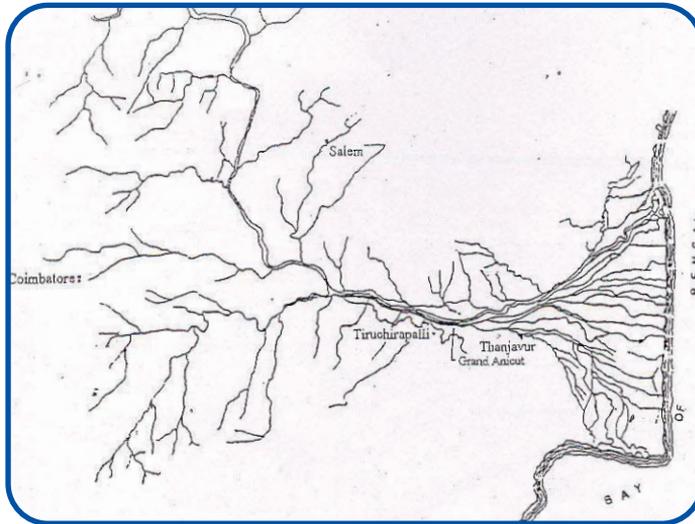
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ANNEXURE – I
CAUVERY RIVER DELTA MAPS

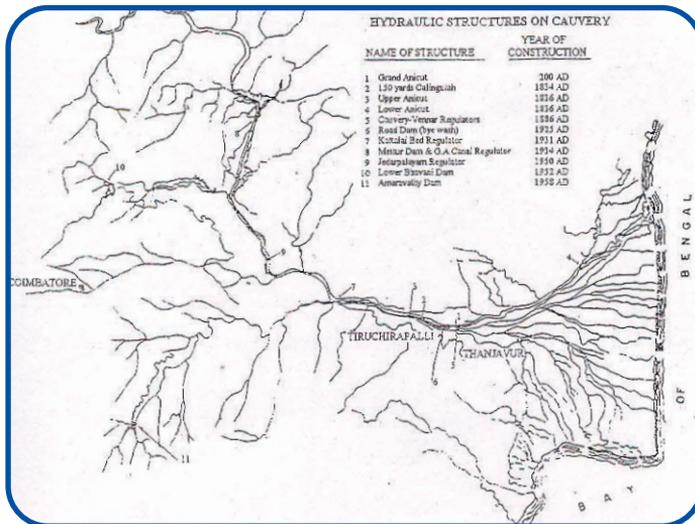


The Grand Anicut Complex at present (Source : Mohanakrishnan, 1990)

Fig -1

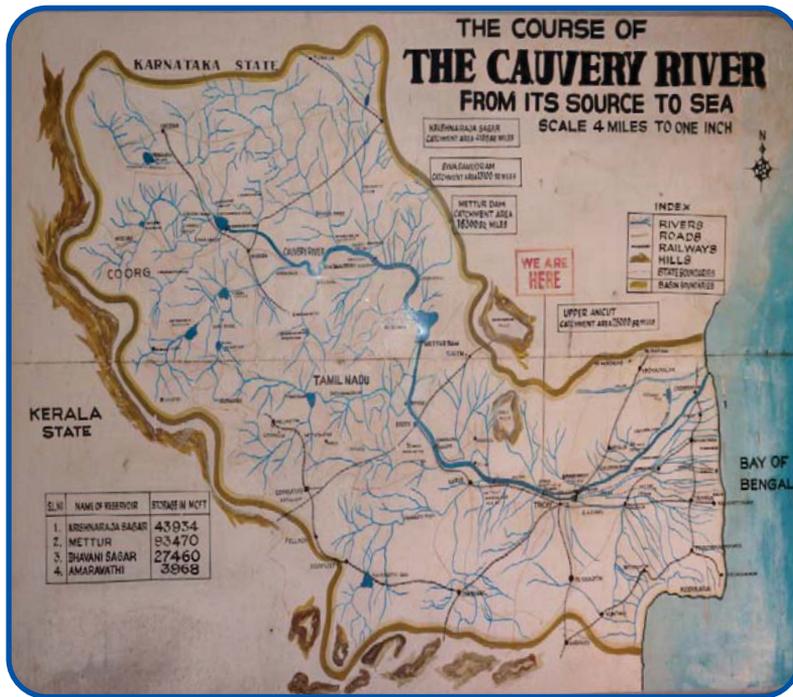


Map of the Cauvery in 1800 A.D. (Note the triangular delta downstream of the Grand Anicut (Kallanai))

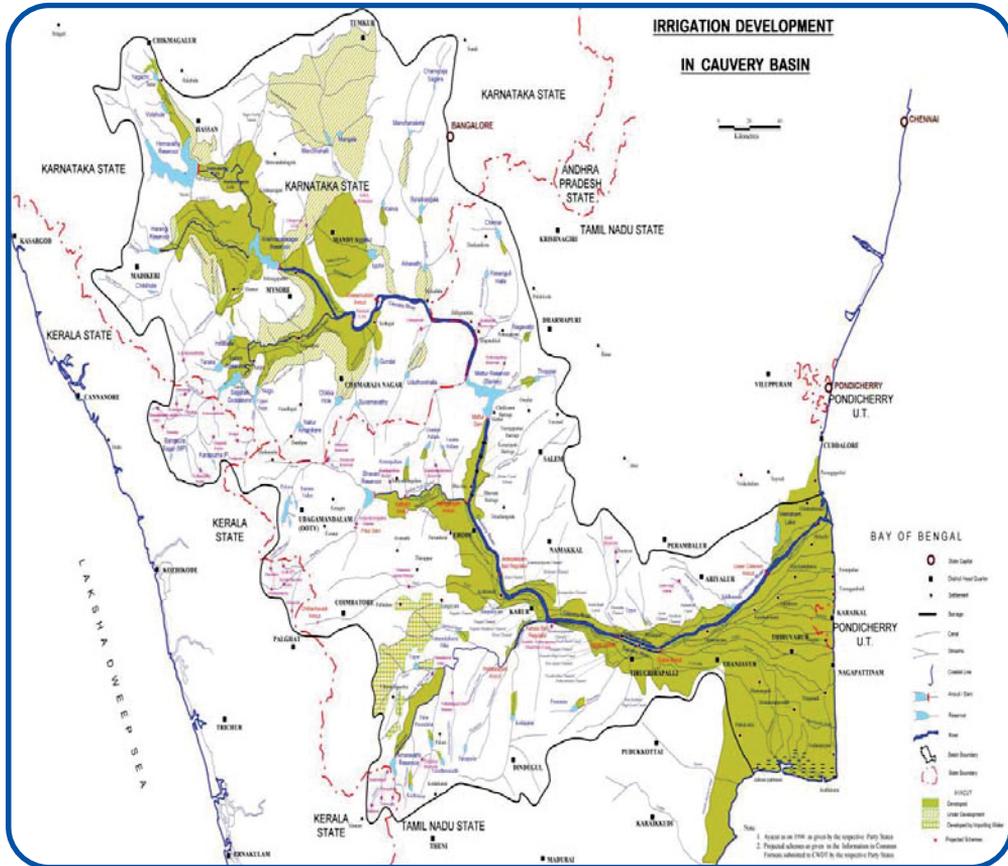


Map of the Cauvery in 2000 A.D.
Note the numerous hydraulic structures built from 1834 onwards
Map of the part of the Cauvery river that falls in Tamil Nadu state,
(Adapted from Mohanakrishana, 1990)

2. Maps showing Cauvery delta and hydraulic structures across Cauvery river

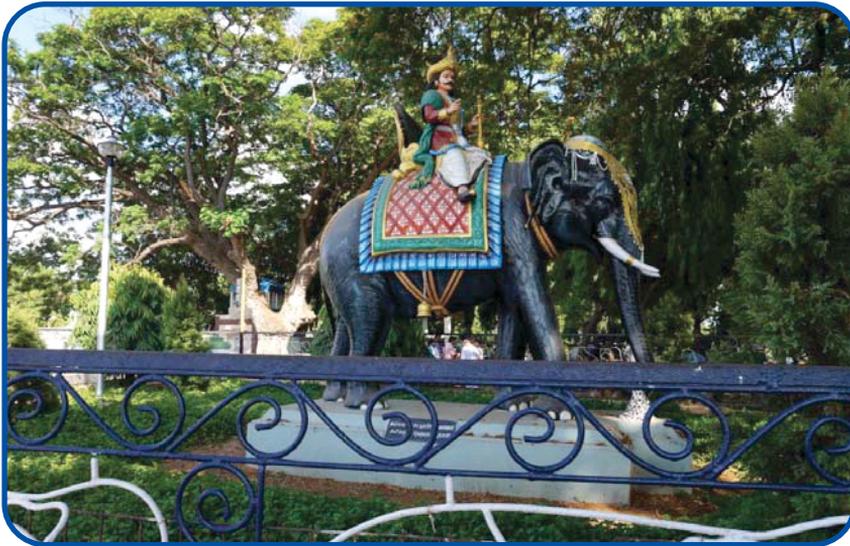


3 & 4. Maps showing the Cauvery River and Delta



5. Catchment and Command Area of Cauvery River

ANNEXURE – II
GRAND ANICUT COMPLEX



1. The Majestic King Karikal Cholan who built the *Kallanai* dam



2. King Karikal Cholan Memorial Building recently built by Govt. of Tamil Nadu



3 & 4.GRAND ANICUT COMPLEX



5 & 6. Cauvery river at the dam site (*Kallanai*) and Thirukkattupalli(Thanjavur Dt)

ANNEXURE – III

Crops and Biodiversity of Cauvery Delta



Main crop Paddy spread across the Cauvery Delta



Blackgram at Govindapuram village(Thanjavur Dt)



Greengram at Vannakudi village(Thanjavur Dt)



Sesame at Thirukkattupalli village(Thanjavur Dt.)



Cotton at Thirumangalakudi village(Thanjavur Dt.)



Groundnut crop at Naduvur village(Thanjavur dt.)



Maize crop at Orathanad(Thanjavur Dt.)



Banana in Wetland eco system



Mango groves at Devasthanam(Trichy dt)



Jack Fruit trees at Marungulam(Thanjavur dt.)



Tapioca in rainfed lands



Cashew gardens at Vallthirakottai(Thanjavur dt.)



Flower cultivation in the delta



Gourds at Poiyundarkottai(Thanjavur dt.)



Tobacco cultivation at Vedaranyam(Nagapattinam)



Betel vine cultivation in wetlands



Amla cultivation in the delta

1. Diversified crops in the Cauvery delta – Main crop Paddy and associated crops



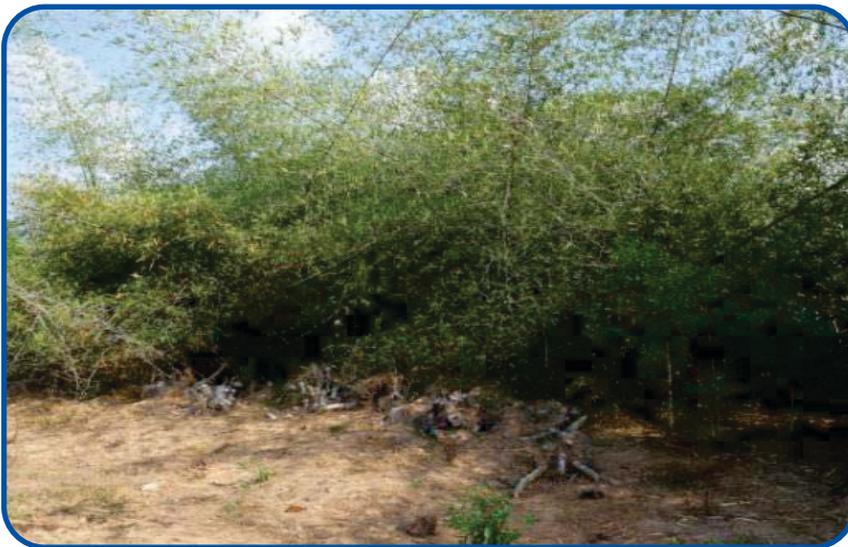
2. Palms of the Cauvery Delta - Coconut and oil Palm at Pulavankadu and Swamimalai(Thanjavur Dt.)



3. Palm trees seen on field bunds and river banks in the delta at Nagachi village(Nagapattinam dt.)



4. Rain tree and Banyan - the Avenue trees of delta at Aduthurai and Koviladi villages in Thanjavur dt. adjoining the river banks and field bunds



5. Teak and Bamboo woodlots of Delta



6. Sheep and Goats are the poor men's assets in the Cauvery Delta



7. Cattle and Buffaloes - Widespread Animals in Cauvery River Delta



8. Sugarcane and its wild species at Poondi village(Thanjavur dt.)



Cocoa as intercrop in Coconut

Areca as intercrop in Coconut



Green manure crop Sunnhemp in Coconut

9. Vegetable cultivation and intercropping in the delta



10. The main canal and a village pond at Thirumangalakudi village(Thanjavur dt.)



11. The river supports waters birds - Cranes and black nose pelicans at dam site and Vaduvur lake(Tiruvarur dt.)



12. Kodiakarai reserve(Nagapattinam dt.), Chidambaram Mangrooves and Muthuppet Lagoon(Nagapattinam dt.) situated at Northern and Southern drains of Cauvery at Bay of Bengal

CROP DIVERSITY – Horticulture crops in the Delta



Oilpalm at bearing in Naduvur(Thanjavur dt.)

DIVERSITY OF FORESTRY CROPS



Casurina junghuniana – improved species at Panikkampatty(Trichy dt.)



Eucalyptus spp. at Marungulam(Thanjavur dt.)



Casurina equisetifolia – conventional species at Poiyundarkottai (Thanjavur dt.)

PREPARATORY CULTIVATION FOR RICE IN THE DELTA



Ponding of water for puddling operation



Manual leveling after puddling



Rice transplanting by womenfolk

FISHING ACTIVITIES IN THE DELTA



**Farm pond for aquaculture at
Sethurayankudikadu(Thanjavur dt.)**



**Farm pond for aquaculture at
Sethurayankudikadu(Thanjavur dt.)**



**Farm pond for aquaculture at
Ezhutthanivayal(Nagapattinam dt.)**



**Farm pond for aquaculture at
Orathanadu(Thanjavur dt.)**

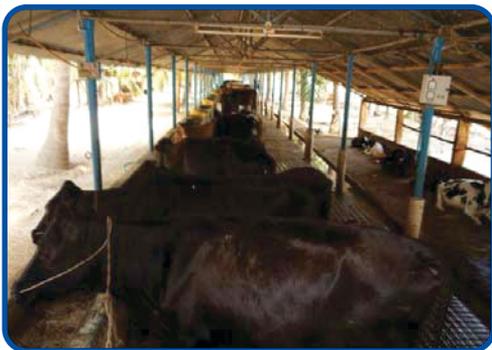


**Freshwater prawn culture at
Mallipattinam(Nagapattinam dt.)**



**Fish marketing at
Mallipattinam(Nagapattinam dt.)**

LIVESTOCK AND POULTRY ACTIVITIES



Cattle farm at Orathandu(Thanjavur dt.)



Black cattle bathing in rivers in the delta



Jersey cow in cattle farm



Tellicherry breed Goat rearing



Sheep farming at Orathanadu(Thanjavur dt.)



**Rearing of broilers at
Krishnapuram(Thanjavur dt.)**