



GOVERNMENT OF TAMILNADU

PUBLIC WORKS DEPARTMENT

WATER RESOURCES ORGANISATION

ARJUNANADHI SUB BASIN

VAIPPAR BASIN

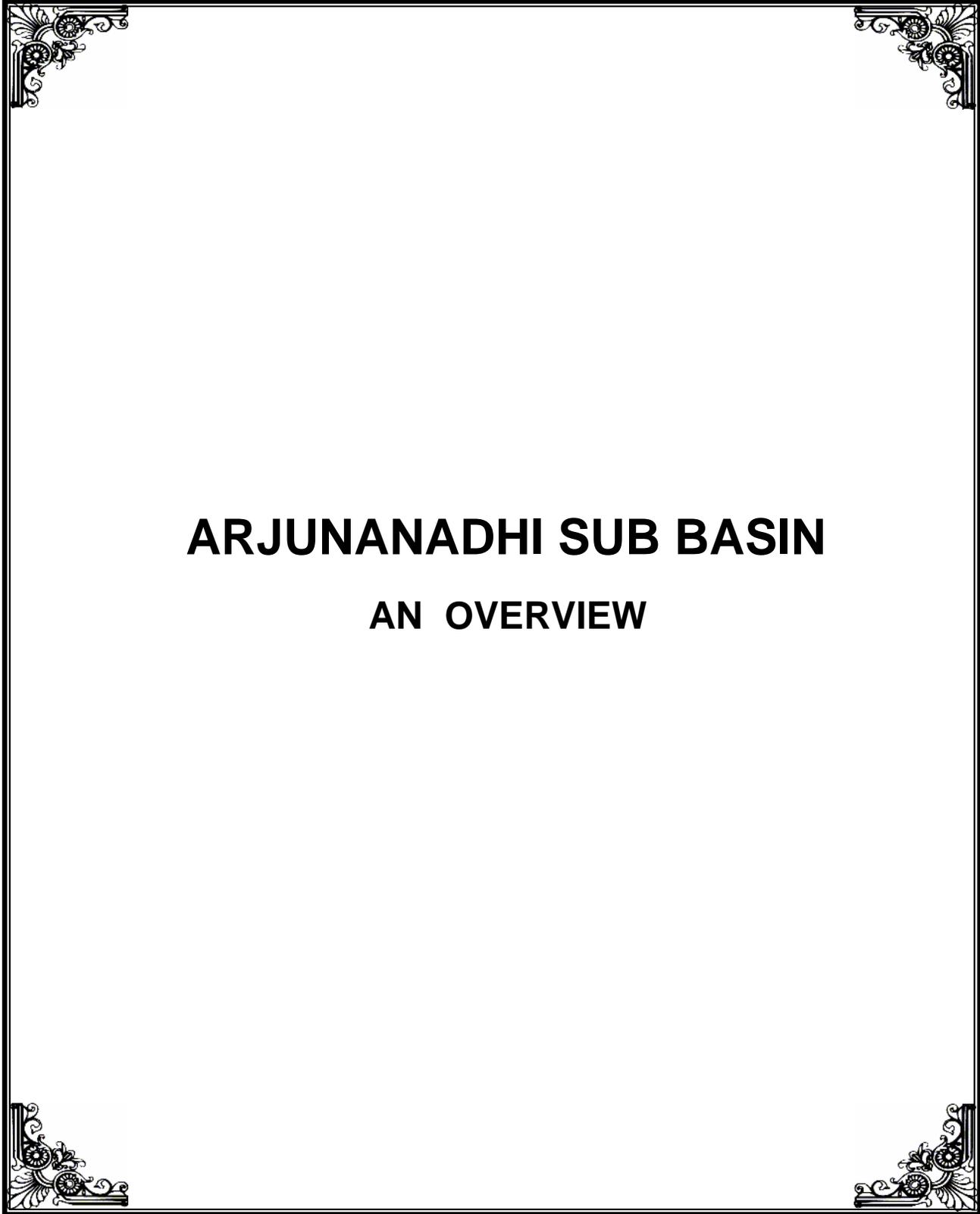
MADURAI REGION

TN IAM WARM PROJECT

DETAILED PROJECT REPORT

**TN IAM WARM PROJECT
ARJUNANADHI SUB BASIN
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ARJUNANADHI SUB BASIN

AN OVERVIEW

Arjunanadhi Sub basin – An Over view

1. Introduction

The river Vaippar originates at an altitude of 1644 m in Vasudevanallur Reserve forest on the eastern slopes of Western Ghats in Tirunelveli District and runs eastward for a distance of 112 km and finally empties into Gulf of Mannar near Vembar village, i.e., 18 km from Vilathikulam town of Thoothukudi District. The Vaippar river basin is located between latitude 8⁰ 59' N to 9⁰ 49' N and longitude 77⁰ 15' E to 78⁰ 23' E having an area of 5423 Sq.Km and is surrounded by Tambara parani Basin on the South Western Ghats and Vaigai Basin on the west, Gundar Basin on the north and Gulf of Mannar / Bay of Bengal on the east.

The Vaippar Basin has been divided into 13 sub basins and Arjunanadhi is one of the sub basins. The surplus course of Watrap Periyakulam is the origin of Arjunanadhi. It had two reservoirs Periyar and Kovilar prior to 1989. During 1989, two more reservoirs namely Anaikuttam reservoir and Golwarpatti reservoir were constructed across the Arjunanadhi.

Arjunanadhi Sub basin area is 1096 Sq. Km with a hilly area of 195 Sq. Km. The taluks covered in the sub basin are Srivilliputhur, Sivakasi, Sattur and Virudhunagar of Virudhunagar District and Peraiyur of Madurai District. It receives an annual average rainfall of 895 mm, with its major share during North -East Monsoon.

2. Details of Ayacut

The details of ayacut area is classified as Direct Ayacut and Indirect Ayacut which are furnished below.

(a) Direct Ayacut :

Sl. No.	Name of the Reservoir	Ayacut Area in Ha.
1	Periyar Reservoir	390.54.5
2	Kovilar Reservoir	140.55.0
3	Anaikuttam Reservoir	1214.00.0
4	Golwarpatti Reservoir	1821.00.0

(b) Indirect Ayacut:

Nos. Ayacut Area

Sl. No.	Description	No. of tanks	Ayacut Area in Ha
1	System Tanks	45	3138.11.0
2	Non system Tanks	65	4481.57.5
3	Panchayat Tanks	59	1765.00.0

The total ayacut area under the sub-basin: 12950.78.0 ha

The total ayacut area under the maintenance of PWD: 11185.78.0 ha or 11186 ha.

Though the total registered ayacut under PWD control is 11186 Ha., average cultivation is only in 5627 ha leaving a gap of 5559 ha which is approximately 50% of designed irrigation extent.

3. Soil Type and Crops Grown

The soil types found in this Sub Basin are combination of Inceptisol, Alfisol and Vertisol.

Crops grown in this sub basin area are Coconut, Sugarcane, Banana, Sapota, Amla, Guava, Mango as annual crops, besides Paddy, Cotton, Vegetables, Pulses, Fodder Chulam, Cumbu, Maize are grown during first season and Paddy, Cotton, Vegetables, Pulses etc. as second season crops.

4. Water Potential

Surface water potential	139.76 Mcum
Ground water potential	269.79 Mcum
Total Water Potential	409.55 Mcum

4.1. Present Water Demand

Domestic	19.08 Mcum
Live stock	4.56 Mcum
Industrial	10.92 Mcum
Irrigation PWD/ WRO	135.64 Mcum
Panchayat Union	48.03 Mcum
Ground Water fed (Wells)	55.31 Mcum
Total	273.54 Mcum

There is thus 136.01 Mcum (409.55 - 273.54) in excess of current demand.

In spite of the surplus scenario, the reasons for substantial gap in area coverage are,

- (i) This system is a very old system existing for more than 100 Years; it therefore requires wide spread rehabilitation.
- (ii) Lack of adequate control of regulating structures like Anicuts, Head Sluices, Sand vents etc.,
- (iii) Heavy Accumulation of silt due to surrounding hilly region and contour nature of canal system.
- (iv) Thick vegetation growth in the canals obstructing free flow of water.
- (v) Encroachment on canal banks, and consequently water spreads through man made damages to prevent inundation in the upper reaches, (i.e.) the canal sections need redesigning.
- (vi) The cross masonry works need repairs.
- (vii) Micro irrigation needs to be propagated in the application of water to the fields.
- (viii) Most of the lands are in fragmented condition, consequently there is a lot of water loss in field to field irrigation.
- (ix) Farmers are not aware of modern techniques of irrigation and hybrid varieties of crops.
- (x) Lack of efficient farm management.

5. Water Users Association (WUA)

At present, there are 3 Water Users Associations covering an area of 2038 Ha. . 64 new WUAs covering an area of 9148 Ha are proposed to be formed.

5.1. Stakeholders Consultations

In order to improve the system efficiency and productivity of irrigated agriculture, a multi disciplinary approach involving the following departments is envisaged.

- i. Water Resources Organisation (WRO)
- ii. Agriculture
- iii. Agriculture Engineering (AED)
- iv. Horticulture and plantation crops
- v. Agricultural Marketing and Agribusiness
- vi. Tamil Nadu Agricultural University (TNAU)
- vii. Fisheries
- viii. Animal Husbandry and Veterinary Services.

WRO officials with the officials of the above line departments have conducted meetings with the stakeholders in the sub basin and also had “**Joint Walkthrough Surveys**” and the following table shows the constraints and countermeasure s which emerged during these consultations.

5. 2. Overview

Components	Constraints	Counter Measures
WRO	(i) Survey and design of headwork, distribution systems are needed	(i) Proposed to have topographic survey. ii). Redesigning of the system to be done
	(ii) Insufficient water ways damaged bunds requiring revetment and lining etc.	(i) Redesigning to be done and wherever necessary protection work, river / canal lining works are proposed.
	Problems like leakage through shutter and sluices regulating arrangements	Damaged shutters are proposed to be replaced (ii)WUA are newly proposed to be formed wherever there is no formal WUA iii) Proposed to work with WUA to create awareness & training to maintain the system by themselves so that wasteful irrigation is minimised.
	The Tank feeder canals and tanks are silted up and it is required to be desilted and distribution system is to be rehabilitated	(i) A holistic approach to be adopted to include all the PWD and P.U. Tanks in the sub basin and improve their bunds & desilting to the minimum extent required to harvest rainwater. (ii) WUAs are to be formed and further maintenance would be with their involvement. (iii)Surplus weirs, tank sluice, are to be improved etc. (iv) The rehabilitation of distribution system network is also proposed.
	Post irrigation management, over drawal by upper reaches, no water to lower reaches.	Proposed WUA shall take care of this with members from lower reaches in the WUA and regulatory systems shall be developed as bye laws of the WUA.
Agriculture	Traditional old practice being adopted.	(i)Productivity linked Demonstration by TNAU and by Agriculture Department is proposed. (ii) Capacity Building of farmers and officials is proposed. (iii) Extension of new Agricultural

		<p>technology on application of optimum fertilizers, IPM measures are proposed through Agriculture, Horticulture Departments and TNAU Departments.</p> <p>(iv) Supply of quality seeds to be ensured.</p>
<p>Agriculture Marketing, Horticulture, Agricultural Engineering</p>	<p>(i) Farmers failed to adopt new technologies, and diversification mainly due to absence of correct market information.</p> <p>(ii) For diversification of crops no proper extension advice is available.</p> <p>(iii) Modern technologies like micro irrigation, to save water, are costly and require lot of frequent training etc.</p> <p>(iv) The value addition technologies observed are absent.</p>	<p>(i) Agri. Marketing Department and TNAU to assess the market trend and advise the WUA through Agribusiness Cell, Kiosks & Discussion meetings.</p> <p>(ii) For value addition to products, grading arrangements, threshing floor, cold storages etc are proposed.</p> <p>(iii) The possibility of making WUA as entrepreneurs of Agri-processing units are explored and suggestions are made.</p> <p>iv) Depending on the marketability and Agro-climatic suitability, appropriate Horticulture crops are proposed and the extent of development is also proposed in consultation with the WUA.</p> <p>(v) Depending on the Horticulture crops proposed, AED proposes to link installation of micro irrigation system network and wherever required pilot cases for buried pipe conveyance is also proposed.</p>
<p>Animal Husbandry and Fisheries</p>	<p>(i) Livestock population need health improvement schemes</p> <p>ii) Quality Fodder is needed.</p> <p>iii) Infrastructure development in existing veterinary sub centres is needed.</p> <p>iv) In service training to veterinarians are needed.</p> <p>v) Good fish fingerlings are required to promote inland fishery through farm ponds in the farmers' lands.</p>	<p>(i) A.I centres with improved infrastructure in existing veterinary sub centres have been proposed.</p> <p>(ii) Sufficient fodder area is proposed to be cultivated with good quality fodder seeds supply</p> <p>(iii) Adequate trainings are proposed.</p> <p>(iv) Fisheries Department in consultation with the AED, and WUA propose inland fishing with the farm ponds etc with provision for Kiosks for improved marketability.</p>

6. Details of Activities of Line Departments

6.1. Water Resources Organisation (WRO)

6.1.1. Approach: To rehabilitate the irrigation system and service delivery:

- a. Thematic Maps on land use, soils, crops, water bodies, and other agricultural and demographic attributes are prepared by IWS.
- b. The crop water requirements for the crops during without and with Project situation are prepared by IWS. The crops proposed by Agriculture and Horticulture Departments will be tailored in consultation with Agricultural Marketing Department and the Water Users Association.
- c. The adequacy & status of the canal system, feeder channels to tanks, distribution system etc, have been assessed by the WRO (both regional and Plan Formulation wing) as follows:
 - Training the River by removing the Shoals accumulated in the U/s and D/s of the Anicuts & evicting the encroachments by earthwork excavation using machineries
 - Conversion of Mud korambu into Masonry Anicut
 - Reconstruction of Collapsed Anicuts
 - Repairs to the damaged Anicuts
 - Providing Head Sluice to some of the supply channels to avoid breaches during Floods and for better water management
 - Providing Scour vent in anicuts
 - Desilting the supply channels & Surplus courses by earthwork excavation using machineries
 - Providing revetments and retaining walls in selective area of the supply channels
 - Providing Model sections to maintain the bed level and inner slopes of the supply channels
 - Providing steps in the supply channels for easy approach to the fields by the farmers wherever necessary
 - Reconstruction of damaged lining in Reservoir Canals
 - Rehabilitation of Jeep Track of Reservoir Canals

- Reconstruction of damaged cross masonries in Reservoir canals
- Strengthening the tank bund by desilting the tank using machineries
- Spreading gravel on top of bund for conveying manures and fertilizers to the field by vehicles
- Reconstruction of Collapsed weirs
- Repairs to the damaged weirs
- Reconstruction of Collapsed Sluices
- Repairs to the damaged Sluices
- Providing revetments and Retaining walls in selective area of the tanks
- Providing S.G. Shutter / Plug arrangements to Sluices, Head sluices, Scour vents etc.,
- Providing Wooden planks to Anicut / Weir Dam stones
- Removing, Repairing and refixing in position of the existing S.G. shuttering arrangements and providing locking arrangements etc.,

Accordingly the following packages are proposed

i.	Rehabilitation of Periyar and Kovilar Reservoir Canals, Anicuts, Supply Channels and Tanks system upto Watrap - Viragasamudram Tanks in Arjunanadhi Sub basin	Rs. 850.67 Lakhs
ii.	Rehabilitation of Anicuts, supply Channels and Tanks below Watrap - Viragasamudram Tanks upto Nathampatti Anicut in Arjunanadhi Sub basin in Watrap, Srivilliputhur, and Sivakasi Blocks	Rs. 1090.33 Lakhs.
iii.	Rehabilitation of Non system Tanks, its Anicuts, and supply Channels in Watrap Block	Est. Rs. 549.70 Lakhs
iv.	Rehabilitation of Non system Tanks, its Anicuts, supply etc., channels in Srivilliputhur Block	Est. Rs. 845.00 Lakhs
v.	Rehabilitation of Anaikuttam and Golwarpatti reservoir system and non system Tanks, Anicuts, Channels in Peraiyur, Sivakasi, Sattur and Virudhunagar Taluks	Est. Rs. 1221.40 Lakhs
Total		Rs. 4557.10 Lakhs

Selective lining is proposed wherever necessary with extension of micro-irrigation in the command. There will be substantial improvement in storage capacity which facilitates raising of high value and less water intensive crops as second crop in a considerable area.

6.1.2. Outcome Indicators

The indicators for evaluating the performance of WRO are as follows:

- The conveyance efficiency is expected to be improved from the present 40% to 65%
- The present gap area of 5559 Ha will be bridged totally in the project
- Rehabilitation/ Reconstruction of Irrigation Infrastructure

Besides this, the WRO is actively engaged in formation of WUAs as per TNFMIS Act 2000 and Rules by preparing the relevant documents such as maps showing the hydraulic boundary of WUA, land owners voters list etc. To help in the above collection of data involving social and field activities, it is proposed to enlist the services of NGOs, Agricultural Extension Officers, SHGs etc. It is estimated that about 64 WUA shall have to be formed in this sub basin.

6.1.3. Tank Components

The practice of tank irrigation has been prevalent for time immemorial. Tanks help to store water for lean season and have played a significant role in the irrigation sector. They not only provide a source for irrigation but also help in recharging ground water under suitable conditions. There are **45 system tanks** commanding an ayacut of **3138.11 Ha**, **65 Non-system tanks** with an ayacut of **4481.58 ha**, and 59 P.U. Tanks with a command area of 1765 ha (each PU tank having ayacut between 20 to 40 ha). These tanks are quite old and are in urgent need of repairs & rehabilitation. The irrigation potential of these tanks has declined with siltation, poor maintenance of sluices, bund erosion and failure of the distribution system.

Under the IAMWARM project, the following investments are proposed to rehabilitate the PWD tanks .

For improving the supply channels, desilting to restore capacity, improvements to bund, weirs and sluices in 110 PWD tanks, a sum of Rs. 46.711 Crores has been proposed.

SLUICE RECONSTRUCTION

EXISTING



AFTER IMPLEMENTATION



ANICUT RECONSTRUCTION

EXISTING



AFTER IMPLEMENTATION



6.2. Agriculture Department

The approach to enhance Agriculture production will be as follows.

6.2.1. Approaches

- Diversification of low profit high water requirement crops(paddy) to high profit, low water requirement crops, especially to commercial crops.
- Gap area coverage with suitable irrigated crops.
- Transfer of latest production technologies to increase the productivity through
 - Demonstrations and crop coverage.
 - Distribution of critical inputs in time.
 - Extension and Frequent field visits.
 - Distribution of farm implements and enhanced farm mechanisation.
 - Training to farmers and field staff.
 - Strengthening information and publicity activities.
 - Exposure visits.
 - Agri Clinic services.
 - Constant follow up and feedback.
 - Documentation of reports on achievements made.

6.2.2. Cropping Pattern

The existing cropping pattern and the proposed cropping pattern with the project are shown in the table below .

ARJUNANADHI SUB BASIN								
CROPPING PATTERN - Area in Hectare								
Crops	WOP				WP			
	FI	PI	RF	TOTAL	FI	PI	RF	TOTAL
Annual Crop (Jan-Dec)								
Coconut	439			439	480			480
Sugarcane	436			436	500			500
Banana	78			78	300			300
Sapota					25			25
Amla					25			25
Guava					50			50
Mango					25			25
Fodder					250			250
I Crop (Sep-Jan)								
Paddy	3803	596		4399	4400			4400
Cotton	185			185	1431			1431
Vegetables	41			41	80			80
Chillies	20			20	180			180
Pulses	29			29	1200			1200

Gingelly			1000	1000		500		500
Cholam (Fodder)			300	300				
Cumbu			300	300				
Maize			900	900	1700			1700
Coriander					40			40
	5031	596	2500	8127	10686	500		11186
II Crop (Feb-May)								
Paddy	872			872	875			875
Cotton	445			445	980			980
Vegetables	11			11	125			125
Pulses	202			202	1530			1530
Periwinkle					40			40
Marigold					60			60
Maize						1300		1300
Celosia					10			10
Senna					40			40
Total Crop Area (Ha)				9657				16146
Total Regd. Ayacut (Ha)				11186				11186
Cropping Intensity (%)				86				144
Fully Irrigated (Ha)				5031				10686
Partially Irrigated (Ha)				596				500
Gap (Ha)				5559				0
Crop Area under Irrigation (Ha)				7158				16146
Irrigation Intensity (%)				64				144

WOP-Without project WP - With project

It can be seen from the above table, that the gross cropped area of 9657 Ha, with the cropping intensity of 86% during without project situation is aimed to be increased to gross cropped area of 16146 ha with cropping intensity of 144%. This is due to improvements in infrastructure by WRO, against the Registered ayacut of 11186 ha and other improved components from other line departments.

The expected outcome & through the project is summarised below.

6.2.3. Outcome Indicators

10 %-20 % shift from paddy to other commercial crops.

30-40% adoption of INM and IPM practices.

10% to 20 % increase in productivity.

10 % to 20 % increase in farm income.

To achieve the above indicators, the proposed components of activities by the Agriculture Department is furnished as below.

Sl. No	Name of the Component	Full cost (Rs. Lakhs)	Subsidy cost (Rs. Lakhs)	Farmers contribution (Rs. Lakhs)	Area to be covered in ha. / Nos.
1	Integrated Nutrition Management –	96.110	72.760	23.350	1000
2	Improvement of Pulses production	4.850	4.285	0.565	500
3	Integrated Nutrition Management – Cotton	21.300	10.650	10.650	1000
4	Supply of Plant Protection Equipments [in numbers]	7.200	3.600	3.60	450
Total		129.460	91.295	38.165	

The estimated cost is **Rs. 129.46 Lakhs**

PIT METHOD OF PLANTING IN SUGARCANE



6.3 Department of Horticulture and Plantation Crops

The Horticulture department works with an objective of increasing the area under horticulture crops substantially with varietal upgradation such as tissue culture and hybrid crops. The above are proposed carefully with reference to market linkages especially for perishables.

6.3.1 Approaches

- Improving the knowledge of the farmer in better cultivation techniques through training etc.,
- Encouraging micro irrigation for water use efficiency.
- Introduction of hybrid varieties of horticultural crops to achieve varietal diversification.
- Promoting area expansion under horticulture crops .
- The following table shows the horticulture activities proposed in the sub -basins with cost details.

Sl. No.	Components	Increase d Area (in Ha.)	Total (in lakhs	Component details	
I	AREA EXPANSION			A.E.P includes the following components	
A.	Fruits Plants			Seeds, Plants, Manures, Fertilizers and P.P chemicals.	
1	Mango	25	7.50		
2	Guava	50	15.0		
3	Sapota	25	7.50		
4	Amla	25	7.50		
5	TC Banana	222	111.00		
B.	Vegetables crops				
1	Hybrid tomato	53	15.90		
2	Hybrid Bhendi	100	30.00		
C.	Spices				
1	Chillies	160	24.00		
2	Coriander	40	6.00		
D.	Medicinal plants				
1	Senna	40	6.00		
2	Periwinkle	40	6.00		
E.	Flowers				
1	Marigold	60	14.40		
2	Celosia	10	2.40		
	Total	850	253.20		

II - 1	Extension support @ Rs. 8000/- per month. (144 man months for 5 years)		11.52	
2	Advertisement		1.20	
3	Hiring computers		2.50	
	Total		15.22	
III	ORGANIC FARMING			Amount already included in A.E.P.
IV	INM / IPM		5.00	
V	MICRO IRRIGATION			Implemented by A.E.D.
	Overall Total		273.42	

The total estimated cost of investment is Rs. 273.42

6.3.2 Outcome Indicators

- 30-40% increase in area coverage.
- 20-30% increase in productivity.
- Around 40-50% percent increase in varietal diversification
- Increased Private sector participation.

FRUIT CROP – MANGO



6.4 Agriculture Engineering Department

The main objectives are to bring water directly to the root zone of the crop, improve application and conveyance efficiency, thereby reduce the wastage of water due to flood irrigation. The following are the approaches to achieve these objectives.

6.4.1 Approach:

- Promoting latest water saving technologies like Drip & Sprinkler systems and Precision Farming to improve water application efficiency.
- Improving the conveyance efficiency through buried pipe laying with conjunctive use of surface and ground water.
- Promoting improved labour saving implements and machineries for farm operation.
- Harnessing the excess runoff in the ayacut areas through Farm Ponds and utilising the same as life saving irrigation.
- Encouraging fish culture in Farm Ponds for additional income generation in the farm.

The project component shall be as below.

Sl. No.	Components Proposed	Unit	Unit cost (Rs.)	Physical (Ha.)	Fin. (Rs. in Lakhs)
I	MICRO IRRIGATION				
a)	Drip Irrigation with Fertigation				
1	Banana (2m x 2m)	Ha.	52800	200	105.60
2	Guava (6m x 6m)	Ha.	33200	50	16.60
3	Fruit crops (10m x 10m)	Ha.	21000	60	12.60
4	Sugarcane (1.5m x 1.5m)	Ha.	58000	300	174.00
5	Coconut (8m x 8m)	Ha.	22900	300	68.70
6	Cotton (1MX1M)	Ha.	58000	250	145.00
	Total	Ha.		1160	522.50
b)	Sprinkler Irrigation System				
1	Chillies	Ha.	15000	110	16.50
2	Medicinal Plants	Ha.	15000	25	3.75
3	Flowers	Ha.	15000	40	6.00
4	Vegetables (II Crop)	Ha.	15000	125	18.75
	Total	Ha.		300	45.00
II	PRECISION FARMING				
	Vegetables (I Crop)	Ha.	75000	80	60
III	COMMUNITY BORE WELLS ALONG WITH THE BURIED PVC PIPE LINES FOR CONVEYANCE AND MICRO IRRIGATION SYSTEM(MIS)				
1	Cost of Pipe laying for Enjar Naduvapatti M.I.Tank as demo	M	15000	102	15.30

	model				
2	Construction of sump	Nos.	90000	1	0.90
3	Bore Wells with energisation	Nos.	200000	15	30.00
	Total				46.20
IV	FARM MECHANISATION WITH ADVANCED USER FRIENDLY IMPLEMENTS				
1	Rotovators		90000	3	2.70
2	Power Weeder		75000	11	8.25
3	Seed drill for Maize		35000	8	2.80
4	Post Hole Digger		90000	3	2.70
5.	Lumpsum provision				15.00
	Total	Nos.		25	31.45
V	WATER HARVESTING STRUCTURES				
	Farm Ponds	No	40000	50	20.00
VI	IEC & Capacity Building				20.00
	Grand Total (Rs. in Lakhs)				745.15

Thus a sum of Rs 745.15 Lakhs is proposed to be invested by this Department in this sub-basin, to help Water Users Association to effect substantial saving in water and to help them go in for mechanisation in their farms. 50 numbers of farm ponds are proposed and 15 numbers of community bore-wells are also proposed to augment water resources through rain water harvesting and good recharging of ground water.

6.4.2 Out Come Indicators

- Sustained cultivation in gap area because of 30% savings of water over the existing system.
- Improved Conveyance efficiency up to 25% by way of buried pipe laying.
- Labour savings up to 50% in preparatory operations and post harvest operations.
- 100% assured crop yield through life saving irrigation.
- Additional income up to Rs. 10,000/- through fish culture per annum.

DRIP IRRIGATION WITH FERTIGATION



FARM IMPLEMENTS

HARVESTING OF CHOLAM – REAPER IN ACTION



6.5 Tamil Nadu Agricultural University (TNAU)

6.5.1 Objectives

- ❖ To promote water saving technologies like SRI in Rice, Drip Fertigation in agriculture and horticulture crops for large scale adoption
- ❖ To enhance the crop and water productivity
- ❖ To increase the cropped area by crop diversification
- ❖ To converge with WRO and other line departments for an overall improvement in total farm income

6.5.2 Emerging Issues

- ❖ Non adoption of SRI Practices in Rice
- ❖ Non adoption of micro irrigation system in commercial crops like banana, coconut and sugarcane
- ❖ Lack of crop diversification in the sub basin
- ❖ Low productivity and quality of cotton are the principal issues.

The activities of TNAU will be carried out both under project mode and mission mode. **Project Mode** activities are transfer of technologies in major crops, demonstration of labour saving implements, high yielding varieties and recommendation and adoption of harvest and post harvest technologies etc., under **Mission Mode** approach, large scale implementation of specific technologies like SRI in 500 ha, hybrid cotton in 400 ha will be adopted

6.5.3 Approaches

The productivity of water could be increased in field level either by reducing the water requirement without detrimental effect on yield of crops or by increasing the production per unit of water by controlling loss of water through conveyance, distribution, application, seepage, percolation etc.,

6.5.3.1 Micro Irrigation Techniques like Drip Irrigation

Drip irrigation in commercial crops like sugarcane, banana, coconut and other orchard crops improves the Water Use Efficiency. In this respect, 84 ha have been brought under drip irrigation. Among this, Drip Fertigation under sugarcane, banana and coconut occupy an area of 24 ha, 10 ha and 50 ha respectively.

6.5.3.2 Improved Production Technologies in Maize

Under the head of crop diversification, maize is going to be attempted in an extent of 150 ha to increase the maize productivity. The technologies proposed are seed drill sowing, improved varieties / hybrids, balanced nutrition application and scientific water management

6.5.3.3 Improving the Productivity and Quality of Cotton

To improve the productivity and quality improvement in cotton, an area of 400 ha is aimed at. Under this head, the principal practices like introduction of hybrid cotton with superior quality, sowing of cotton using seed drill for proper sowing, adoption of IPM practices for protecting the quality of cotton and adoption of improved production technology in cotton are aimed at.

6.5.3.4 System of Rice Intensification (SRI)

SRI is one of the scientific management tool for rice cultivation. SRI requires skillful management of the factors of production and at least initially, additional labour input accounting for 25 to 50 per cent for careful transplanting and for weeding. Square planting ensures rotary weeder operation in either direction. Rotary weeder operation incorporates the weed biomass and aerates the soil for better root activity and tillering and permits saving of seed, water and increases productivity to an extent of 30 per cent.

6.5.3.5 Improved Technology in Pulses Production

Pulse crop will be raised in sequence after the harvest of first season rice during September to October. Fifty per cent of SRI demo area will be covered with this program. The amount allotted under SRI will be utilized for purchase of seed and it will be broadcasted into standing rice crop (10 days prior to harvest). The advantages associated with the practices are increasing cropping intensity, maintaining soil fertility, additional income and reduction of pest and disease. The pulses area will be increased both in SRI and Non SRI areas.

6.5.3.6 Outcome Indicators

- ❖ By the end of fourth year of the project, nearly 80 per cent of sugarcane and banana and 50 per cent of coconut area will be under drip Fertigation with 15 to 20 per cent increased productivity and 20 per cent of water saving.
- ❖ Out of 3000 ha maize area, at least 1700 ha will be under full technology package with 30 per cent increase in productivity.
- ❖ Cotton productivity could be enhanced by 20 per cent with improved quality of hybrids.
- ❖ Around 50 per cent of rice area will be under SRI in the post project period. 20 per cent water saving and 20 to 30 per cent increase in the productivity.

TOTAL BUDGET FOR ARJUN ANADHI

Sl.No	Particulars	Physical	Financial (in lakhs)
I	Activities		
1	Drip fertigation in Sugarcane	24 Ha	15.36
2	Drip fertigation in Banana	10 Ha	6.98
3	Drip Fertigation in coconut by AED	50 Ha	2.75
4	Improved Production technologies Maize	150 Ha	9.00
	a. Organizing field day	3 Nos	0.30
	b. Maize Sheller	1 No	0.50
5	Quality seed production	100 Ha	0.66
6	Demonstration of organic farming / Integrated Farming System in Model villages	1 No	1.00
7	SRI	500 Ha	50.00
8	Productivity and quality of cotton	400 Ha	37.50
9	Production technology for pulses	300 Ha	-
10	On farm demos and skill development	-	5.60
		Sub Total	129.65
II	Outsourcing for Technical Assistance		
1	Outsourcing charges (9000 Salary +1000 FTA per Month)	12 nos for 3 years; 4 nos for 4 th and 5 th year	52.80
	Sub Total		52.80
III	Contingencies		
	a. Vehicle hire charge for Scientists @ Rs.60000/yr		3.00
	b. Demonstration, stationeries, exhibits and Reports		2.50
	d. Miscellaneous		1.00
		Sub Total	6.50

6.6 Department of Agriculture Marketing and Agribusiness

In the background of stakeholders demand for identifying markets for new and diversified crops, improving existing markets for utilization, improving access to market by providing better collective transport, specialised storages as per crop needs, are prime concern and hence the following approaches / components are proposed.

6.6.1 Approaches

- Strengthening infrastructural facilities – Storage godowns, Drying yards
- IT based market information network – Expanding TNAU based Agribusiness and Farm Advisory Cell
- Contract farming / MOU arrangements – Maize produce with poultry feed manufactures
- Collective bargaining through FIG, Farmers Commodity Groups
- Capacity building / IEC – Centralised programme.
- Private – Public Participation- Interface Workshop of cultivators / producers/ traders by C I I.

6.6.2 Existing Market Analysis

Regulated markets are available at Virudhunagar, Rajapalayam and Srivilliputhur for notified crops of groundnut, paddy and cotton. There are no storage godowns and threshing floors to cater to the full needs of this sub basin.

There is a big market for chillies and is dominated by VPSA & Sons which trades 40000 MT of chillies per year, in which 32,000 MT is procured outside the State. Coriander polishing and gingelly oil extraction are other important trades. More than 100 dhal mills are functioning in Virudunagar and the turnover is around 400 MT of grams per day. The vegetables grown in the Sub basin are transacted in the 4 Farmers' Markets (i.e. Uzhavar Sandhai) and the banana is being sent to adjoining Kerala markets. Virudunagar, Rajapalayam and Srivilliputhur have a good network of private markets and commission agents for millets. Sugarcane grown in this area goes to M/S Tharani sugars Ltd., besides being used for edible purposes. There are more than 100 cotton mills for this area in which 85% of the requirements are imported from other states especially Maharashtra.

No scientific grading or other quality control measures are being followed. No IT based market information system is being utilised. No adoption of pre and post harvest practices. Similarly there is no collective action for crop planning and marketing activities. The above scenario stresses the need to create adequate marketing infrastructure, strengthen the grading and market information system besides market -led diversification of crops.

Sl. No	Details	Nos.	Project Cost
1.	Providing Storage Godown 6 Centres	6	Rs.30.00 lakhs
2.	Drying yard in 10 Villages	10	Rs.22.00 lakhs
3	Provision of collection centre at Krishnankovil	1	Rs. 5.00 lakhs
4	Providing mini autos to transport goods from farm to collection centre	2	Rs. 4.00 lakhs
5	Providing one mini lorry for transporting goods from collection centre to market centre at Madurai	1	Rs. 5.00 lakhs
6	Agri. Business centre	1	Rs. 11.00 lakhs
	Total cost of the project		Rs.77.00 lakhs

Thus the investment of Rs. 77 Lakhs, will propel agricultural growth from production front to the marketing front thus making the agriculture sector more profitable and vibrant to face competition both at national and international scene.

6.6.3 Outcome Indicators

- Percentage increase in farm gate sale price.
i.e. > 10% increase over 2006-07 level]
- Extent of use of marketing Kiosk.
i.e. 10-15% of stakeholders per year.
- Percentage of output taken for agro processing.
i.e. 5% increase over 2006-07 level.
- Percentage of diversified crops marketed.
i.e. 33% of the produce during 1st year.

STORAGE GODOWN



6.7 Department of Animal Husbandry & Veterinary Services

Improved delivery of Veterinary services, Fodder cultivation in an area of 250 ha, capacity building of farmers on Veterinary health care camps, Artificial insemination techniques, and Human resources developments by way of training to farmers and in-service officials etc, are the main areas of concentration of Animal Husbandry Development in the sub basin.

6.7.1 Approach

- Productivity enhancement by improving delivery of Veterinary services in the project area of the Government and private level (WUA.).
- Increasing the availability of green fodder for sustainable growth of livestock.
- Improving the infrastructure and diagnostic facilities in the project area.
- Improving the knowledge level of the farmers about the livestock activities through various outreaches programmes, training etc.

6.7.2 Budget Estimate

The following table shows the components and their cost.

Sl. No	Components	Physical	Financial (In Lakhs)
1	Productivity enhancement by improving delivery of veterinary services		
a	Establishment of Sub basin Veterinary Units (SBVU) @ Rs.783700/- per unit	3	23.51
b	Improving the essential infrastructure in the Government institutions (graduate institutions) @ Rs.33,000/-unit	14	4.62
c	Improving the essential infrastructure in the Government institution (sub centres) @ Rs.20,000/-unit.	15	3.00
d	Strengthening the diagnostic facilities in the sub basin by providing special diagnostic tools to sub basin referral institutions @ Rs.3,00,000/- per unit.	1	3.00
e	Strengthening storage, input facilities for breeding in Sub-basin @ Rs. 40000 per 2 jumbo containers and 2500 lit. of LN ² per year @ Rs. 26 per lit.	1	3.65
2	Increasing availability of green fodder in private lands (Ha.)	250	15.00

3	Out reach programmes.		
a	Infertility cum Total Veterinary Health Care camp @ Rs.6,000 per camp per month for each SBVU	180	10.80
b	Distribution of mineral mixture @ Rs. 1,82,500 per SBVU	3	5.48
c	Information, education and communications campaigns (IEC)	17	9.35
4	Enhancing the knowledge level of human resource		
a	Training of Farmers	2000	8.00
b	Entrepreneurship training of 31 unemployed veterinary graduates to be placed as Sub basin Veterinary Extension Officer @ Rs.50,000/- per person	4	2.00
c	Orientation Training for Sub basin Veterinary Extension Officers @ Rs. 1,350/- trainee	3	0.04
	In-service Training for Veterinarians @ Rs.2,000/- per person	14	0.28
	Total		88.73

The total cost works out to Rs. 88.73 Lakhs.

Animal Husbandry can nurture a better quality of life for the rural farmer by not only providing sustainable employment of their location but can also act as assets or rural currencies.

6.7.3 Outcome Indicators

- Breed improvements in the project area.
- Improvement in health care and productivity status of livestock in the project area.
- Around 150% increase in Milk production over the existing situation and there by increase in the socio - economic status of the farmers.
- Around 250% increase in the Green Fodder Area to meet the requirements of the lactating animals.

JERCY COW WITH A.I. CALF



6.8 Fisheries Department

The sub basin has 110 tanks with a water spread area of about 5000 ha. Potential WSA for the purpose of fisheries development is taken at 50% of the WSA, which is 2500 ha. Out of this 1080 ha covering about 50 tanks are identified for focusing on sustainable aquaculture. However about 100 tanks will be covered under the project for one time demo and out of this atleast 50 tanks are expected to be under sustainable aquaculture activity after the project period.

6.8.1 Approaches

- Timely availability of quality carp seeds when the tank receives water by providing rearing and storing space for fish seeds.
- Additional income to agriculture farmers through aquaculture in farm ponds.
- Increase in over all fish production and water spread area under aquaculture.
- Facilitate Hygienic fish marketing.
- Increased fishing efficiency, (CPU) by providing effective craft and gear.

6.8.1.1 Renovation of Government Pilavakkal Fish Seed Farm

To support 50 tanks or 1080 ha of effective WSA 108 lakh advanced fingerlings are required. Strengthening / Renovation of existing govt fish seed farm shall produce the required fish fingerlings for 780 ha of WSA (30tanks). Existing two breeder ponds (remaining unused) will be converted to 28 rearing ponds with 2800 Sq.m. of WSA which shall produce 7.7 lakhs of fingerlings required for 30 tanks targeted in the project. The investment required is furnished below.

Fish Farm renovation	=	Rs. 39.00 lakhs
Recurring cost per year	=	Rs. 2.80 lakhs.

6.8.1.2 Fish Seed Bank

One new fish seed bank is proposed with an output of 3 lakh fingerlings per year in three cycles. This will cater to the need of a nother 300 ha of WUA. (about 13 tanks). The seed bank will be owned and operated by a progressive WUA and will have a WSA of 600m². On the 1st year of operation the fish seed output will support aquaculture in 300 ha of WSA. From second year of operation the WUA shall sell the seeds and make profit as well support the sub basin seed demand.

Fixed investment cost	=	14.50 lakhs.
Annual recurring cost for 2 year	=	1.16 lakh.

6.8.1.3 Aquaculture in Farm Ponds

Agricultural Engineering Department has proposed to excavate 50 farm ponds. Out of this 30 farm ponds shall be identified for aquaculture which are likely to retain water for more than 4 months. Expected fish production is 600 kg /0.1ha. /pond. A net revenue of about Rs.10000 per crop is envisaged.

Aquaculture input for one crop	=	Rs. 16,500/-
30 farm ponds	=	Rs. 4.95 lakhs.
Net Return 30x10,000	=	Rs.3 lakh / crop.

As a supporting activity fishing implements (Gear and craft) will be provided to Fishermen Co-operative societies to facilitate increased catching efficiency.

6.8.2 Outcome Indicators

- Timely availability of quality carp seeds leading to about three fold increase in unit production of fish.
- Fish seed demand of the sub basin to be met locally.
- Additional income of about Rs. 10,000/-per farm pond (0.1ha-WSA)
- Increase in Price of fresh water fish through hygienic marketing.
- Increased fish catch per unit effort.

6.8.3 Budget Estimate

Sl. No.	Details of activities	Budget Estimate (Rs. In Lakhs)
1	Renovation of Government fish seed farm	39.00
2	Operational cost for 4 years	13.00
3	Aquaculture seed bank 1 No.	4.95
4	Fish seed bank	14.50
5	Operational cost	1.16
6	Supply of fishing implements	2.40
7	Vehicle hire charges (5 years)	2.00
8	Documentation	0.50
	Total	77.51

GOVERNMENT FISH FARM



7 BRIEF NARRATION OF LINE DEPARTMENT ACTIVITIES

7.1 WATER RESOURCES ORGANISATION

- Restoring the capacity of the Irrigation Storage Structures (like tanks)
- Restoring the carrying capacity of the Channels/Rivers
- Harnessing the Ground Water Quality/Potential in deficit areas
- Forming Water User Associations for Participatory Irrigation Management (PIM)
- Prevention of Industrial Pollution from Match and Fire Works, Printing Industries, solid waste disposal through awareness programmes, collection and testing of water and soil samples, segregation, recycle of dry waste with user agency

7.2 AGRICULTURE DEPARTMENT

- Integrated Nutrition Management – Paddy
- Improvements of Pulses production
- Supply of plant protection equipments, hand operated sprayers

7.3 DEPARTMENT OF HORTICULTURE AND PLANTATION CROPS

- Hybrid Variety seeds & Crop variety Diversification –
Watrap, Srivilliputhur, Sivakasi, Virudhunagar, Sattur
- TC Banana, Vegetables & Chillies - Area expansion.
Watrap, Srivilliputhur, Sivakasi, Sattur
- Mango, Guava, Sapotta & Amla - Area expansion.
Watrap, Srivilliputhur, Sivakasi, Virudhunagar, Sattur

7.4 AGRICULTURAL ENGINEERING DEPARTMENT

- Micro irrigation – Kovilar, Periyar main canals & Anaikuttam
- Community Bore wells coupled with buried pipe laying – Watrap, Maharajapuram, & Sundarapandiam
- Labour saving improved implements and machineries to WUA
- Farm Ponds and Water Harvesting Structures

7.5 TAMIL NADU AGRICULTURAL UNIVERSITY

- System of Rice Intensification (SRI) techniques
- Precision Farming Techniques Demonstration plots – Anaikuttam, Srivilliputhur, Golwarpatti canals, Watrap, Maharajapuram
- Improved Production technologies for cotton.
- Transfer of technology in Integrated Nutrient and Pest Management, Fertigation Srivilliputhur & Athikulam
- Market intelligence information through Agribusiness Cell.

7.6 DEPARTMENT OF AGRICULTURAL MARKETING AND AGRIBUSINESS

Hardware Components

- Providing Drying yard, Storage Godown, Collection Centre

Software Components

- Market linkages
 - Cotton - Cotton Corporation of India, local mills
 - Pulses - Avitta
 - Mango, Guava - Local traders through collective marketing, Processing Centres
 - Medicinal plants - Ayurvedic Centres in Kerala, Tampcol,IMCOPS
- Contract Farming, MOU arrangements
- Market Information System
- Pre and Post Harvest Technologies
- Adoption of quality standards, Krishnankoil

7.7 DEPARTMENT OF ANIMAL HUSBANDRY AND VETERINARY SERVICES

- Mobile veterinary Units – Nathampatti, T.Managaseri, Vellore village, Mathyasenai
- Fodder crops like agathi, kothari grass,etc
- Supply of birds (hens and cock)
- Providing Quality Veterinary Services

7.8 FISHERIES DEPARTMENT

- Upgradation of breeder ponds into Rearing Ponds at Pilavukkal to meet the demand of Fish seeds
- Aquaculture in Farm Ponds through Intensive Management
- Providing Coracle & fishing implements (floats, mono filaments nets) to fishermen

EXAMPLE FOR CONVERGENCE ACTIVITIES

Tissue Culture Banana

▪ Discussion with farmers	Agriculture, Horticulture & WRO
▪ TC Banana plantlets	Ag,Horticulture, TNAU
▪ Demonstration Plot, INM,IPM techniques	TNAU, Agriculture,Horticulture
▪ Water	WRO, AED
▪ Micro Irrigation with Fertigation	AED / TNAU
▪ Marketing linkages with nearby traders	Agri. Marketing, TNAU

Economic Analysis

The overall sub basin plan outlay works out to Rs. 63.25 crores. The focus of the project is improving water resources management and service delivery to maximize productivity in an area of 11186 ha through IAM WARM Project. Only 50% of the area currently gets irrigated in an year. Economic Rate of Return (ERR) varied from 13 per cent to 30.2 per cent with the overall ERR for the nine sub basins under IAM WARM Project working out to 22.1 per cent. Whereas, the Economic Rate of Return for Arjunanadhi sub basin alone works out to 23.2 per cent which is much above the opportunity cost of 12 per cent. This will yield a Net Present Value of Rs 266 million during the project cycle of 25 years at 2006 prices. The incremental benefit in the project area is derived from increased irrigation coverage and efficiency, crop diversification and improved technology adoption in agriculture, horticulture, livestock, fisheries etc. besides sustainable environmental benefits.

Project Benefits and Poverty Alleviation Improvement:

Area Expansion Shifts:

The project shall help maximizing water productivity in its entire 11186 ha. Nearly 90% of the farmers of marginal and small categories shall be fully benefited with increased food production and farm income. The present irrigation intensity of 64% shall increase to 130%.

Enhanced irrigation coverage and service delivery with productivity improvements in the scheme is expected to increase the production of major crop such as Maize from 900 ha to 3000 ha, Pulses from 230 ha to 2730 ha, Cotton from 630 ha to 2410 ha. The existing cropping intensity of 86% shall improve to 144%.

Diversification Impact:

Diversification of low profit high water crops to high profit low water commercial crops like maize, Groundnut etc will result in increased farm income, besides increased area under irrigation.

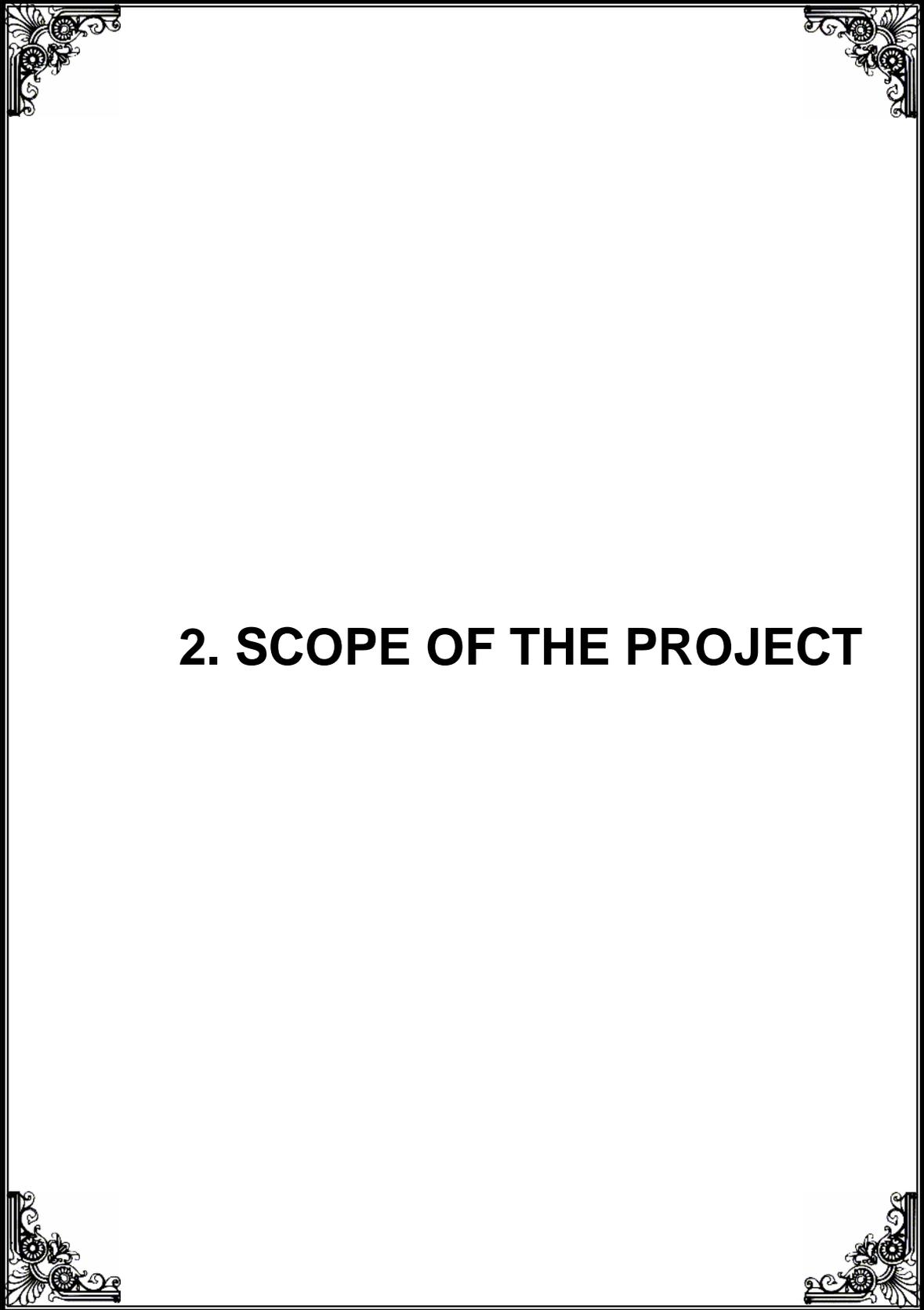
Technological Impacts

For Paddy, SRI technologies and micro irrigation for Horticulture crops, and Sugarcane are proposed. These not only increase water saving, but also increase productivity of crops.

This intervention represents an 80% increase in farm employment over the existing level of labour strength as most of the increased demand would be made from hired labourers. Impact on employment and income would be more than the above estimate in view of increased off farm employment opportunity in marketing and agro processing through diversified farm activities as envisaged in the project. Implementation of the project involving civil works shall further add temporary employment opportunities during project implementation.

Conclusion:

The IAMWARM Project will definitely increase the percapita income and the social status of the farmers of the sub basin through its well designed component of activities in the stakeholders departments.



2. SCOPE OF THE PROJECT

PRESENT STATUS OF THE SYSTEM

2.1 GENERAL

The deficiencies in the structure and functions of Irrigation network causes the inefficient functioning of the Arjunanadhi Sub-basin and creates hardship to the farming community.

2.2 SYSTEM DEFICIENCY

In most of the command areas of the channels, tanks, irrigation channels etc. distribution are taken upto a certain limit only,beyond this the water is left to be conveyed by the farmers themselves to the fields for irrigation. No technical attention is paid on the application of water to the fields. The farmers with out the proper awareness of irrigation leave most of the fields with zigzag boundaries and the field bunds are abnormal in size which reduces the cultivatable area considerably.

In this sub basin there are some controlled structures in the system area and Un controlled structures in the non system area. Some of the controll structures are in damaged condition. Tanks are also to be desilted, since for a long period these tanks have not been desilted

The other major problems being experienced in the Arjunanadhi sub basin are as follows.

- Lack of efficient on farm water management.
- Poor infra structure facilities.
- Non-adoption of modern micro irrigation methods and new agricultural practices.
- Inadequate farm mechanization.
- Inadequate coordination among rural agencies, Government departments and other financial institution etc.
- Lower crop yield.
- Low field application efficiency
- Traditional method of farming.
- Excess use of chemical fertilizers and pesticides.
- Inadequate post harvest management facilities.

2.3 SCOPE OF THE PROJECT

The Water Resources Organisation in coordination with the following line departments have proposed to improve the irrigation service delivery and productivity of irrigated agriculture with effective integrated water resources management in this sub basin. The line departments are

1. Agriculture Department
2. Department of Horticulture and Plantation Crops.
3. Agriculture Engineering Department.
4. Tamil Nadu Agricultural University.
5. Department of Agricultural Marketing and Agribusiness services
6. Animal Husbandry and Veterinary services.
7. Fisheries Department.
8. Environmental cell of Water Resources Organization.

2.4 Water Resources Organisation

In order to improve the conveyance and operational efficiency, it is now proposed to improve and modernize the structural components in Arjunanadhi Sub -basin.

- Training the River by removing the Shoals accumulated in the U/s and D/s of the Anicuts & evicting the encroachments by earthwork excavation using Machineries
- Conversion of Pethankulam Mud korambu into Masonry Anicut
- Reconstruction of Collapsed Anicuts
- Repairs to the damaged Anicuts
- Providing Head Sluice to Sivaneri and Pethankulam tanks to avoid breaches during Floods and for better water Management
- Providing Scour vent in Vannaparai Anicut
- Desilting the supply channels & Surplus courses by earthwork excavation using Machineries
- Providing revetments and Retaining walls in selective area of the supply channels
- Providing Model sections to maintain the bed level and inner slopes of the supply channels
- Providing steps in the supply channels for easy approach to the fields by the farmers wherever necessary
- Reconstruction of damaged lining in Periyar & Kovilar Canals
- Rehabilitation of Jeep Track of Periyar & Kovilar Canals
- Reconstruction of damaged cross masonries in Periyar & Kovilar Canals

- Strengthening the tank bund by desilting the tank using Machineries
- Spreading gravel on top of bund for conveying manures and fertilizers to the field by vehicles
- Reconstruction of Collapsed weirs
- Repairs to the damaged weirs
- Reconstruction of Collapsed Sluices
- Repairs to the damaged Sluices
- Providing revetments and Retaining walls in selective area of the tanks
- Providing S.G. Shutter / Plug arrangements to Sluices, Head sluices, Scour vents etc.,
- Providing Wooden blanks to Anicut / Weir Dam stones
- Removing, Repairing and refixing in position of the existing S.G. shuttering arrangements and providing locking arrangements etc.,

Recharging the ground water through rain water harvesting by providing

1. Check dams
2. Recharge pits

2.5 Agriculture Department

1. Integrated Nutrition Management for Paddy
2. Improvement of Pulses production
3. Integrated Nutrition Management for Cotton
4. Supply of Plant Protection Equipments - Hand operated sprayers

2.6 Department of Horticulture and Plantation Crops

1. Varietal Diversification, micro irrigation, INM in fruits.
2. Varietal Diversification, micro irrigation, IPM in Vegetables
3. Varietal Diversification, micro irrigation, Organic farming in Spices
4. Varietal Diversification, micro irrigation, Organic farming in Medicinal Plants
5. Varietal Diversification, micro irrigation in Flowers

2.7 Agriculture Engineering Department .

1. Drip Irrigation with fertigation arrangements
2. Sprinkler Irrigation System
3. Precision Farming
4. Community Bore Wells along with the buried PVC Pipe lines
5. Farm Mechanizations with advanced user Friendly Implements
6. Water Harvesting Structures such as farm ponds

2.8 Tamil Nadu Agricultural University

1. Drip fertigation in Sugarcane
2. Drip fertigation in Banana
3. Drip fertigation in Coconut
4. Improved Production technologies in Maize
5. Quality seed production
6. Demonstration of organic farming and IFS model in Model villages
7. SRI Practices in Rice
8. Productivity and quality of cotton
9. Production technology for pulses
10. On farm demos and skill development

2.9 Department of Agricultural Marketing and Agribusiness

1. Thrashing floor / (Drying Yard)
2. Storage godown
3. Collection Centre
4. Mini lorry
5. Goods Auto
6. Agribusiness Centre

2.10 Animal Husbandry and Veterinary Services

1. Productivity enhancement by improving delivery of veterinary services
2. Increasing availability of green fodder in private lands (in hectares)
3. Out reach programmes
4. Enhancing the knowledge level of human resource

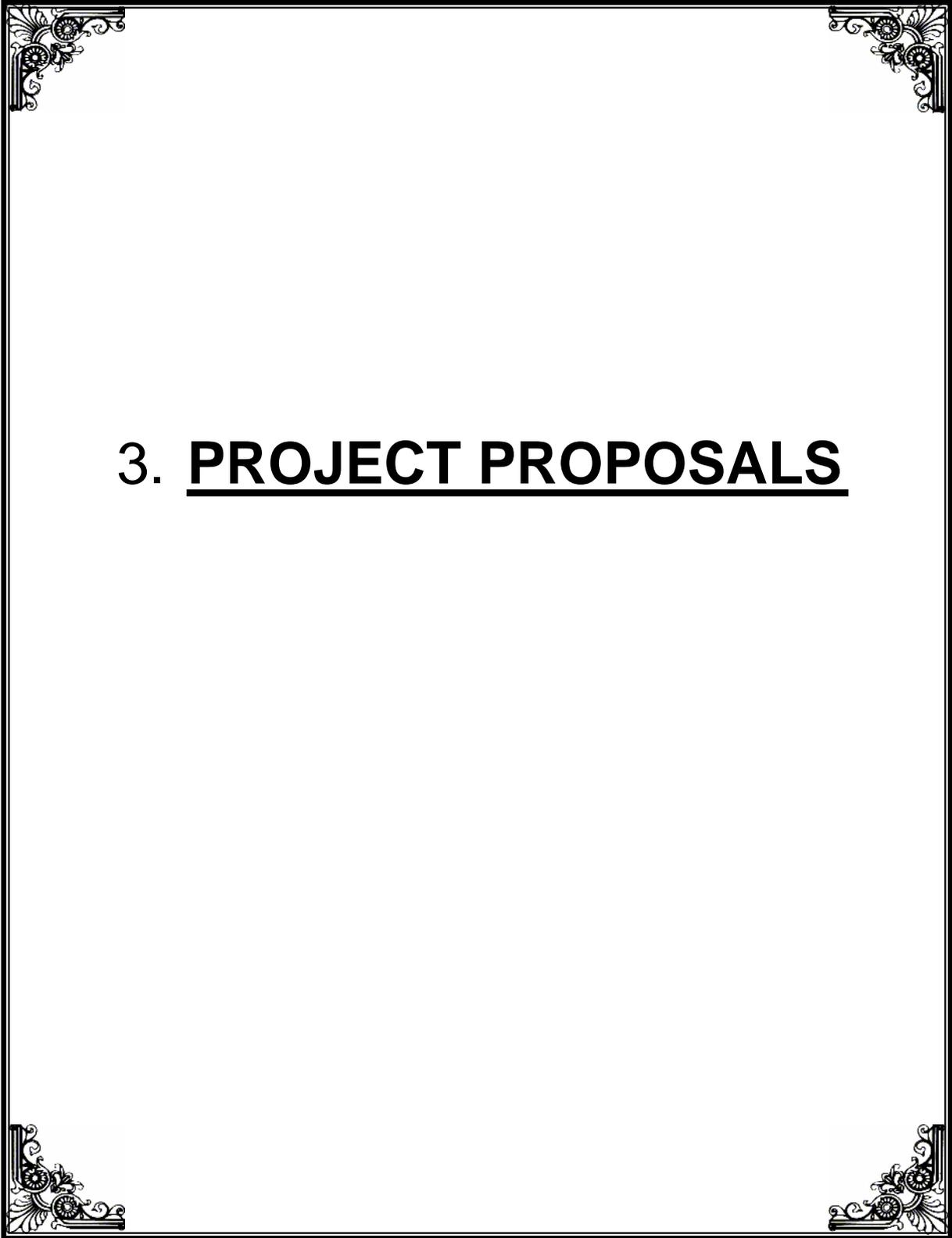
2.11 Fisheries Department

1. Upgradation of Government fish seed farm at Pilavukkal.
2. Aquaculture in farm ponds
3. Supply of fishing implements
4. Establishment of Fish Seed bank to meet the demand for fish seeds.

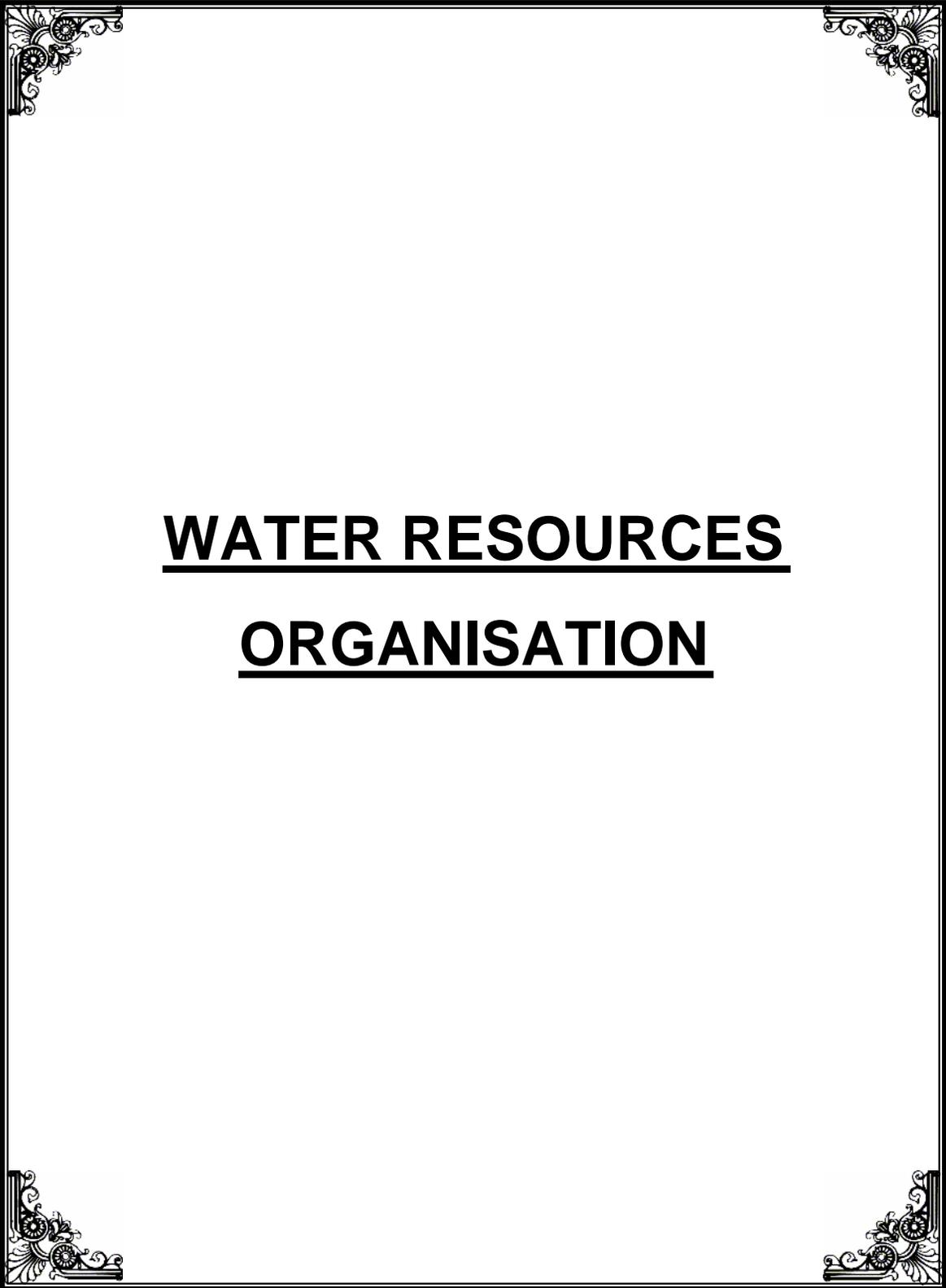
2.12 Environmental Cell of WRO

1. Environmental and social monitoring of the River Basin including periodical water and soil quality testing and documentation
2. Environmental , Social knowledge base, Analysis and Development reporting

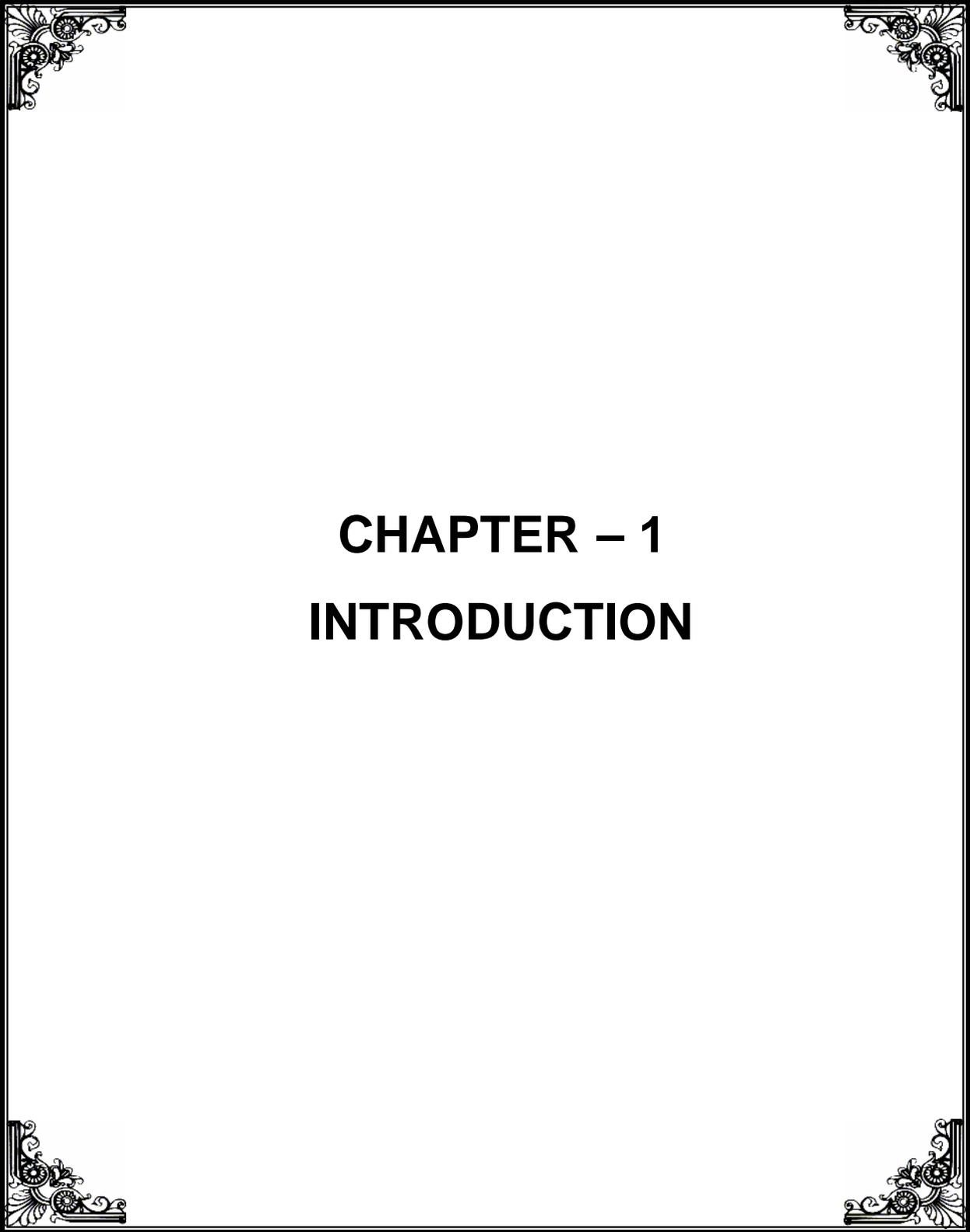
3. Transfer of technical know how for solid waste management system including source segregation, recycle of dry waste and linkage with user agencies.
4. Conducting Environmental and social Awareness meeting, programme, demonstration and Exhibitions on various environmental and social related issues including capacity building.



3. PROJECT PROPOSALS



WATER RESOURCES
ORGANISATION



CHAPTER – 1

INTRODUCTION

INTRODUCTION

1.1 GENERAL

Agriculture is the dominant sector in the Indian economy. Tamil Nadu, depends largely on the surface water irrigation as well as ground water irrigation. The state has used the surface and ground water potentials to the maximum limit and hence the future development and expansion depends only on the efficient and economical use of water potential and resources.

To achieve higher water use efficiency, it is necessary to improve and upgrade the existing conveyance system and also to introduce modern irrigation methods.

With the above objective, a comprehensive programme has been proposed with a Multi Disciplinary Approach.

1.2 DESCRIPTION OF THE VAIPPAR BASIN

The River Vaippar originates at an altitude of 1644m in Vasudevanallur reserve forest on the eastern slopes of Western Ghats in Tirunelveli District and run eastward for a distance of 112 km and finally debouches into Gulf of Mannar near Vembar village, 18 km from Vilathikulam town of Thoothukudi district. The Vaippar river basin is located between latitude 8°59'N to 9°49' N and longitude 77°15'E to 78°23'E, having an area of 5423 Sqkm and is surrounded by Thamirabarani basin on the South, Western ghats and Vaigai basin on the West, Gundar basin on the North and Bay of Bengal on the East. This basin has been divided into 13 sub-basins namely as follows;

1. Nichabanadhi
2. Kalingalar
3. Deviar
4. Nagariyar
5. Sevalperiyar
6. Kayalkudiar
7. Vallampatti Odai/Uppodai
8. Sindapalli Uppodai
9. Arjunanadhi
10. Kousiganadhi
11. Uppathurar
12. Sinkottaiyar
13. Vaippar

1.3 DESCRIPTION OF THE ARJUNANADHI SUB-BASIN

Of the various hill streams that emerge out of the eastern slope of the Western Ghats, the Periyar, Kovilar, Chittar, Kallanaiyar, Kavariyar, Thalamalaiyar, Anaithalaiyar and Peyanar are worth mentioning tributaries of Arjuna River.

Periyar takes its origin in the Western Ghats at an altitude of about 1644 meters (5388 feet), runs from south to North up to Thavalaiperumal Parai, then takes a turn towards east.

Kovilar, the other important stream takes its origin from the Panchanthatangi malai at an altitude of about 1165 metres (3821 feet) and runs from North to South and at about ½ mile above Thungankadavu kovil, it takes a turn, towards east, and joins the Periyar river just half a mile below the Thungankadavukoil.

During 1976, two reservoirs were constructed, namely Periyar Dam and Kovilar Dam across Periyar and Kovilar respectively under Pilavukkal Project. The combined course called Periyar runs for a distance of 7.90 KM and enters into Viragasamudram and Watrap Periyakulam after supplying a few tanks enroute.

Chittar River, taking its origin in an adjacent valley also enters into Viragasamudram and Watrap Periyakulam after supplying a few tanks enroute. The surplus course of Watrap Periyakulam is the origin of **Arjunanadhi**.

The Kallanaiyar originates in the Eastern Slopes of Western Ghats near Thaniparai and runs for a length of 7 Kms and finally joins Arjunanadhi up stream of Nathampatti Anicut near Nathampatti Village after supplying a few tanks enroute. The Kavariyar, a tributary of Kallanaiyar originates in the Eastern slopes of Western Ghats near Thaniparai and runs for a distance of 2 km and finally joins Kallanaiyar river down stream of Ayakulam anicut.

Anaithalaiyar river originates in the Eastern slopes of Western ghats in Srivilliputhur taluk and runs for a distance of 10 km and finally ends with Valaikulam tank in Srivilliputhur Taluk. Valaikulam tank surplus goes to Srivilliputhur big tank.

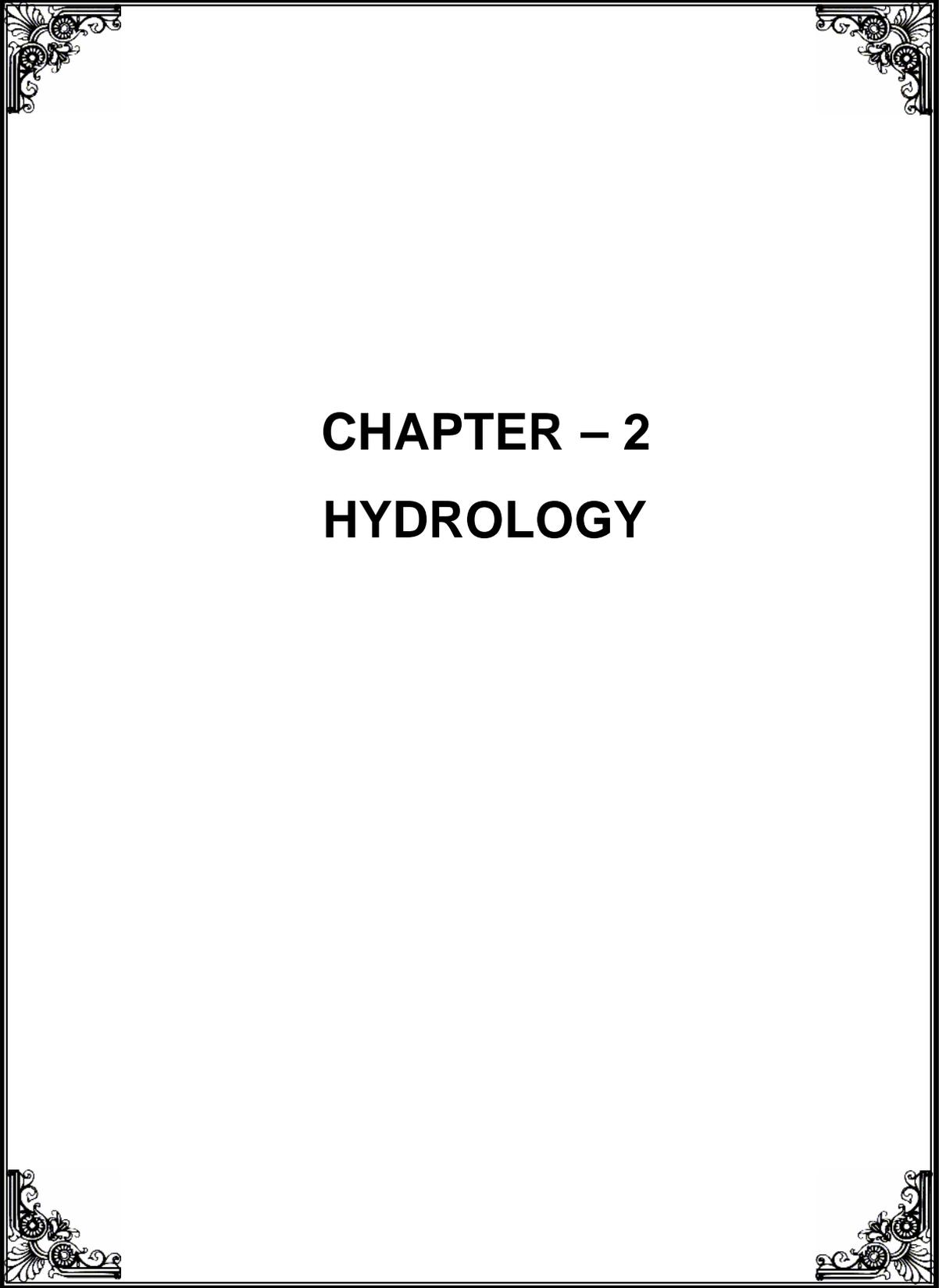
Peyanar river originates in the Eastern slopes of Western ghats near Shenbagathope area in Srivilliputhur taluk and runs for a distance of 10 km and finally ends with Srivilliputhur big tank after feeding a few tanks enroute.

The surplus course of Srivilliputhur big tank finally joins Arjuna river in the U/s of Golwarpatti anicut in Sattur taluk.

During 1989 two reservoirs namely Anaikuttam reservoir and Golwarpatti reservoir were constructed across the Arjunanadhi.

Finally, Arjunanadhi joins Vaippar river U/s of Irukkankudi Reservoir in Sattur Taluk of Virudhunagar District.

Arjuna Sub Basin area is **1096 Sqkm** including a hilly area of 195 Sqkm. The taluks covered in this sub basin are Srivilliputhur, Sivakasi, Sattur, Virudhunagar of Virudhunagar district and Peraiyur of Madurai district.



CHAPTER – 2

HYDROLOGY

2.1 GENERAL

Arjunanadhi is a major tributary of river Vaippar.

Periyar, Kovilar, Chittar, Kallanaiyar, Kavariyar, Thalamalaiyar, Anaithalaiyar and Peyanar are worth mentioning tributaries of Arjuna River

The combined course finally enters into Viragasamudram and Watrap Periyakulam after supplying a few tanks enroute. The surplus course of Watrap Periyakulam is the origin of **Arjunanadhi**.

The surplus course of Srivilliputhur big tank finally joins Arjuna river in the U/S of Golwarpatti anicut in Sattur taluk.

During 1989 two reservoirs namely Anaikuttam reservoir and Golwarpatti reservoir were constructed across the Arjunanadhi.

Finally, Arjunanadhi joins Vaippar river near Nenmeni village of Sattur Taluk, below the Nenmeni Anicut.

2.2 LOCATION

Arjuna Sub Basin area is **1096 Sqkm** including a hilly area of 195 Sqkm. The taluks covered in this sub basin are Srivilliputhur, Sivakasi, Sattur, Virudhunagar of Virudhunagar district and Peraiyur of Madurai district

Periyar takes its origin in the Western Ghats at an altitude of about 1644 meters (5388 feet), runs from south to North up to Thavalaiperumal Parai, then takes a turn towards east.

Kovilar, the other important stream takes its origin from the Panchanthatangi malai at an altitude of about 1165 metres (3821 feet) and runs from North to South and at about ½ mile above Thungankadavu kovil, it takes a turn, towards east, and joins the Periyar river just half a mile below the Thungankadavukoil.

During 1976, two reservoirs were constructed, namely Periyar Dam and Kovilar Dam across Periyar and Kovilar respectively under Pilavukkal Project. The combined course called Periyar runs for a distance of 7.90 KM and enters into Viragasamudram and Watrap Periyakulam after supplying a few tanks enroute.

Chittar River, taking its origin in an adjacent valley also enters into Viragasamudram and Watrap Periyakulam after supplying a few tanks enroute. The surplus course of Watrap Periyakulam is the origin of **Arjunanadhi**.

During 1989 two reservoirs namely Anaikuttam reservoir and Golwarpatti reservoir were constructed across the Arjunanadhi.

Finally, Arjunanadhi joins Vaippar river near Nenmeni village of Sattur Taluk, below the Nenmeni Anicut.

2.3 CATCHMENT AREA OF ARJUNANADHI SUB -BASIN

The Arjunanadhi Sub Basin has a typical climate, owing to the marginal catchments area in the Western Ghats and extensive major catchments area in plains. Arjunanadhi enjoys the benefits of mostly North East monsoon and slightly in summer season.

2.4 HYDRO METEOROLOGY

The Hydro Meteorology parameters include rainfall, temperature, humidity, wind velocity, evaporation and duration of sun shine which determine the climate of the basin.

2.5 RAIN FALL

Average annual rainfall of gauging stations influencing this sub basin is as follows

<u>Sl No</u>	<u>Name of Rain gauge Station</u>	<u>North East Monsoon</u>	<u>Summer</u>	<u>South west monsoon</u>	<u>Annual</u>
<u>1.</u>	<u>Watrap</u>	<u>682.5</u>	<u>221.6</u>	<u>82.1</u>	<u>986.2</u>
<u>2.</u>	<u>Srivilliputhur</u>	<u>604.8</u>	<u>215.6</u>	<u>71.6</u>	<u>892.0</u>
<u>3.</u>	<u>Sivakasi</u>	<u>486.6</u>	<u>170.3</u>	<u>69.8</u>	<u>726.7</u>
<u>4</u>	<u>Sattur</u>	<u>459.1</u>	<u>158.6</u>	<u>71.6</u>	<u>689.3</u>
<u>5</u>	<u>Virudhunagar</u>	<u>506.6</u>	<u>170.4</u>	<u>127.6</u>	<u>804.6</u>
<u>6</u>	<u>Peraiyur</u>	<u>682.5</u>	<u>221.6</u>	<u>82.1</u>	<u>986.2</u>

2.6 CLIMATE

The Vaippar basin lies in a low rainfall belt having an annual average rainfall of 722 mm. Southwest monsoon contribute 148 mm (20%), while NE monsoon contributes 414 mm (53%). This basin receives a major share of its rainfall during NE monsoon. This monsoon helps to build up storage in the reservoirs and tanks both system and Non system. This basin has Western Ghats on Western sides. Southwest monsoon rainfall, though lesser that the NE monsoon rainfall, still contribute some runoff helping to buildup storage in Pilavukkal res ervoirs namely Periyar and Kovilar reservoirs. For the measurement of Hydro meteorological parameters in the

basin area, there is one weather station at Kavalur near Virudhunagar; its data is taken for the study.

2.7 SOIL CLASSIFICATION

In this sub basin, due to different stages, Weathering & parent material, the soil types are met with in combination of Inceptisol, Alfisol and Vertisol. More prominent type is Inceptisol.

<u>Inceptisol</u>	<u>Red or brown or grey soil with surface horizon more developed than sub surface. They are developing soils, moderately deep, coarse loamy to loam moderately drained to well drained</u>	<u>Suited for commonly grown crops with exceptions</u>
<u>Alfisol</u>	<u>The red or brown soils having accumulation of alleviated clay in sub surface horizon it well drained, poor water and nutrient holding capacity.</u>	<u>Annual crops with shallow roots systems cum up wells</u>
<u>Vertisols</u>	<u>Black soil</u>	<u>Suitable for cotton, Pulses etc</u>

2.8 LAND HOLDINGS

The details of farm holdings and size classes prevalent in Arjunanadhi S ub basin are given below:

<u>Category</u>	<u>Size of holdings</u>	<u>Numbers</u>	<u>Percentage</u>
<u>Marginal</u>	<u>Below 1.00 Ha</u>	<u>52303</u>	<u>63.20 %</u>
<u>Small</u>	<u>1.00 – 2.00 Ha</u>	<u>23336</u>	<u>28.20 %</u>
<u>Medium</u>	<u>2.00 – 5.00 Ha</u>	<u>5933</u>	<u>7.20 %</u>
<u>Big</u>	<u>5.0 ha & above</u>	<u>1183</u>	<u>1.40 %</u>
<u>Total</u>		<u>82755</u>	<u>100 %</u>

Above table revealed that the marginal farmers alone accounted for 63 percent in the sub basin followed by small farmers. Developmental initiatives will be establishment in marginal and small farmers.

2.9 DEMOGRAPHY

Name of Sub Basin	Total No. of Blocks	Total No. of Villages	Population		
			2004	2010	2025
Arjunanadhi Sub basin	6	62	569553	645744	900323

2.10 WATER POTENTIAL

Surface water potential : 139.76 Mcum.

Ground water yield	:	269.79 Mcum
Total	:	<u>409.55 Mcum</u>

2.11 WATER DEMAND WITHOUT PROJECT

i) Domestic	19.08
ii) Live stock	4.56
iii) Industrial	10.92
iv) Irrigation - WRO	135.64
- PU	48.03
- GW fed	55.31
Total	273.54 Mcum

2.12 WATER BALANCE WITHOUT PROJECT

Surplus – 136.01 Mcum

2.13 CROPPING PATTERN OF ARJUNANADHI SUB BASIN

CROPPING PATTERN - Area in Hectare								
SEASON	WOP				WP			
	FI	PI	RF	TOTAL	FI	PI	RF	TOTAL
Annual Crop (Jan-Dec)								
Coconut	439			439	480			480
Sugarcane	436			436	500			500
Banana	78			78	300			300
Sapota					25			25
Amla					25			25
Guava					50			50

Mango					25			25
Fodder					250			250
I Crop (Sep-Jan)								
Paddy	3803	596		4399	4400			4400
Cotton	185			185	1431			1431
Vegetables	41			41	80			80
Chillies	20			20	180			180
Pulses	29			29	1200			1200
Gingelly			1000	1000		500		500
Cholam (Fodder)			300	300				
Cumbu			300	300				
Maize			900	900	1700			1700
Coriander					40			40
II Crop (Feb-May)								
Paddy	872			872	875			875
Cotton	445			445	980			980
Vegetables	11			11	125			125
Pulses	202			202	1530			1530
Periwinkle					40			40
Marigold					60			60
Maize						1300		1300
Celosia					10			10
Senna					40			40

	9657	16146
Total Regd. Ayacut	11186	11186
Cropping Intensity (%)	86	144
Fully Irrigated	5031	
Partially Irrigated	596	
Gap	5559	

2.14 LIVE STOCK - POPULATION

Name of Sub basin	Battle	Buffalo	Sheep	Goats	Pigs	Dogs	Others	Poultry
ARJUNANADHI BASIN	38721	30457	83513	71991	5880	362	4378	176200
Monthly requirement	0.38 Mcum							

2.15 INDUSTRIES & MONTHLY WATER DEMAND in Mcum

Name of Sub basin	Medium Industries			Small Industries			Water Requirement		
	2004	2010	2025	2004	2010	2025	2004	2010	2025
ARJUNANADHI SUB BASIN	40	54	90	4107	5600	9033	0.91	1.25	2.08

2.16 CROP WATER REQUIREMENT (WITHOUT PROJECT)

Name of Crop		Area in Ha	Crop water requirement in mm	Crop water requirement in Mcum/Ha	Irrigation requirement in Mcum/Ha @ 40% efficiency	Total Irrigation requirement in Mcum
I CROP	Coconut	439.450	866	0.008660	0.0217	9.54
	Sugarcane	435.975	1119	0.011190	0.0280	12.21
	Banana	77.800	769	0.007690	0.0192	1.49
	Paddy	4398.925	820	0.008200	0.0205	90.18
	Cotton	184.970	442	0.004420	0.0111	2.05
	Pulses	28.710	300	0.003000	0.0075	0.22
	Vegetables	40.520	294	0.002940	0.0074	0.30
II CROP	Chillies	20.265	344	0.003440	0.0086	0.17
	Paddy	871.665	597	0.005970	0.0149	12.99
	Cotton	444.985	437	0.004370	0.0109	4.85
	Vegetables	11.370	438	0.004380	0.0110	0.13
	Pulses	202.440	300	0.003000	0.0075	1.52
TOTAL		7157.075				135.64

2.17 CROP WATER REQUIREMENT (WITH PROJECT)

Name of Crop		Area in Ha	Crop water requirement in mm	Crop water requirement in Mcum/ Ha	Irrigation requirement in Mcum/ Ha @ 60 % efficiency	Total Irrigation requirement in Mcum
Annual	Coconut	480.00	866	0.00866	0.0144	6.91
	Sugarcane	500.00	1119	0.01119	0.0187	9.35
	Banana	300.00	769	0.00769	0.0128	3.84
	Sapota	25.00	526	0.00526	0.0088	0.22
	Amla	25.00	460	0.00460	0.0077	0.19
	Guava	50.00	657	0.00657	0.0110	0.55
	Mango	25.00	591	0.00591	0.0099	0.25
	Fodder	250.00	438	0.00438	0.0073	1.83
I CROP	Paddy	4400.00	820	0.00820	0.0137	60.28
	Cotton	1430.78	442	0.00442	0.0074	10.59
	Vegetables	80.00	294	0.00294	0.0049	0.39
	Chillies	180.00	344	0.00344	0.0057	1.03
	Pulses	1200.00	300	0.00300	0.0050	6.00
	Gingelly	500.00	300	0.00300	0.0050	2.50
	Maize	1700.00	550	0.00550	0.0092	15.64
	Coriander	40.00	438	0.00438	0.0073	0.29
II CROP	Paddy	875.00	597	0.00597	0.0100	8.75
	Cotton	980.00	437	0.00437	0.0073	7.15
	Vegetables	125.00	438	0.00438	0.0073	0.91
	Pulses	1530.00	300	0.00300	0.0050	7.65
	Periwinkle	40.00	438	0.00438	0.0073	0.29
	Marigold	60.00	438	0.00438	0.0073	0.44
	Maize	1300.00	550	0.00550	0.0092	11.96

	Celosia	10.00	438	0.00438	0.0073	0.07
	Senna	40.00	438	0.00438	0.0073	0.29
TOTAL		16145.78				157.38

2.18 WATER DEMAND WITH PROJECT

i) Domestic	:	32.88
ii) Live stock	:	4.56
iii) Industrial	:	24.96
iv) Irrigation - WRO	:	157.38
- PU	:	48.03
- GW fed	:	53.11
Total	:	320.92 Mcum

2.19 WATER BALANCE WITH PROJECT

Surplus – 88.63 Mcum



CHAPTER - 3
HYDRAULICS OF THE
COMPONENTS

3.1 Reservoirs / Anicuts / Dividing Dams / Bed Dams / Off Takes

Reservoir Details :

	Periyar	Kovilar	Anaikuttam	Golwarpatti
River	Periyar	Kovilar	Arjunanadhi	Arjunanadhi
Catchment Area	45.3.Sq.km	24.77Sq.km	40.83 Sq.km	13.8 Sq.km
Capacity	5.44Mcum	3.77 Mcum	3.56Mcum	5.04 Mcum
Depth	14.5 M	13 M	7.5 M	5.5 M
Flood Discharge	283 cum	221 cum	2166 cum	2848.53cum
Direct Ayacut	391.52.0ha	140.66.0 ha	1214.00.0 ha	1821.00.0 ha

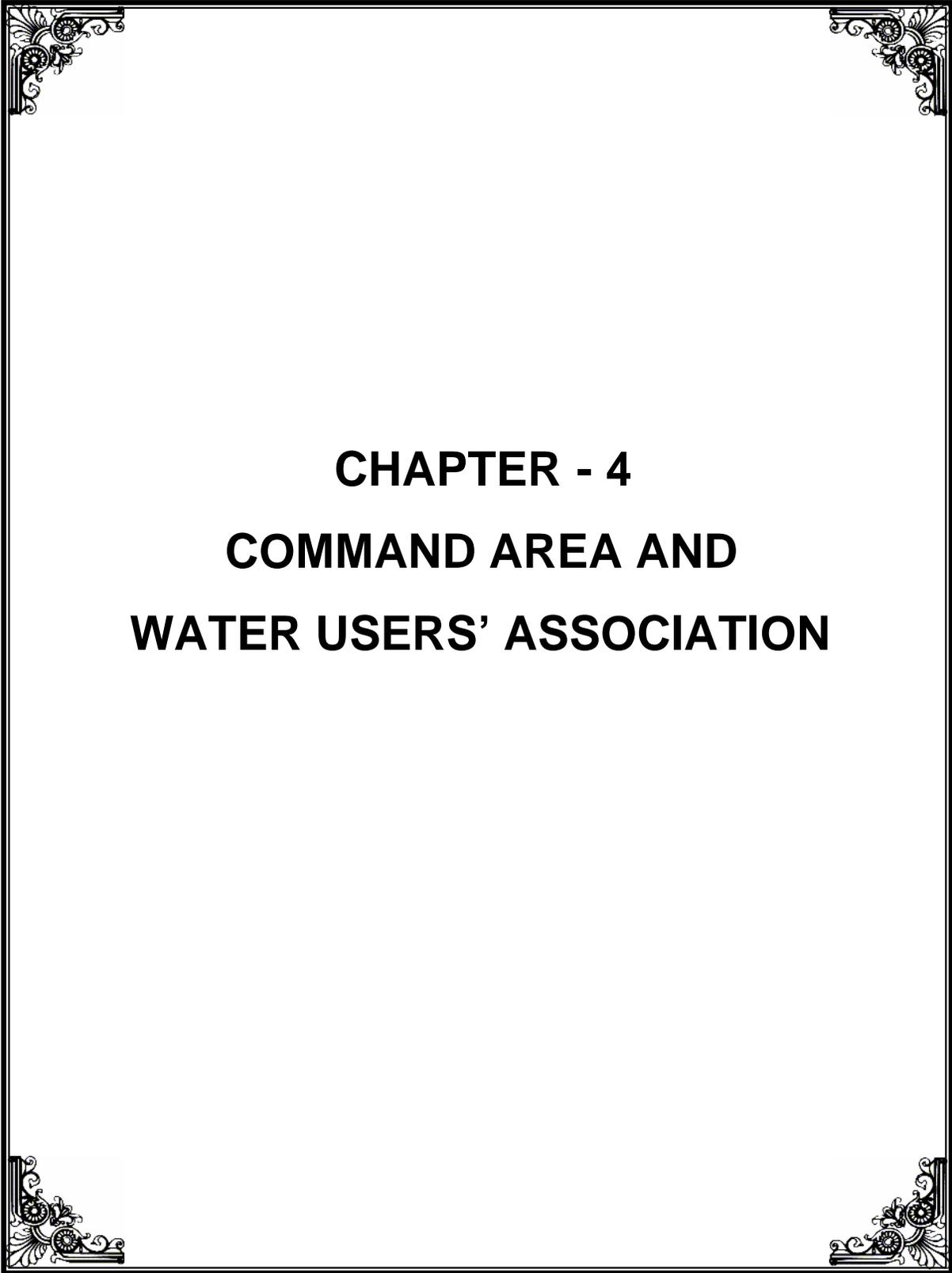
Reservoirs / Anicuts / Dividing Dams / Bed Dams / Off Takes		Tanks / Canal		Ayacut in Ha	Capacity in Mcft	Name of Village
A	Pilavukkal Periyar Dam	a	Periyar Main canal	249.470	192.00	Khansapuram
		b	Periyar Branch canal	141.075		S.Kodikulam
B	Pilavukkal Kovilar Dam	c	Kovilar Main canal	140.550	133.00	S.Kodikulam
I	Kuppankulam Anicut	1	Kuppankulam	58.280	8.30	Khansapuram
II	Thamaraikulam Anicut	2	Thamaraikulam	33.170	2.89	Khansapuram
III	Padarankulam Anicut	3	Padarankulam	97.130	8.47	Khansapuram
IV	Sivaneri Anicut	4	Sivaneri	204.830	39.90	Khansapuram
V	Vannaparai Anicut	5	Puri Paraikulam	131.050	13.52	Khansapuram
VI	Gunavanthaneri Anicut	6	Gunavanthaneri kulam	155.300	35.10	S.Kodikulam
VII	Kodikulam Anicut	7	Kodikulam	68.420	14.09	S.Kodikulam
VIII	Pethankulam Off take	8	Pethankulam	31.095	2.50	S.Kodikulam
IX	Pungankulam Off take	9	Pungankulam	35.900	5.29	S.Kodikulam
X	Viragasamudram tank & Watrap big tank	10	Viragasamudram tank	174.080	24.00	Watrap
		11	Watrap Periakulam	367.210	81.00	Watrap
		12	Koonikulam	33.840	4.40	Watrap
		13	Sathampadi	40.210	1.20	Watrap
		14	Kosavankulam	26.790	2.17	Watrap
XI	Thiruthakal Anicut					
XII	Ayakulam Anicut	15	Ayakulam	66.900	9.07	Watrap
XIII	Mathur Anicut	16	Mathurkulam	102.790	23.80	Mathur
XIV	Alankulam Tank	17	Alankulam	128.260	18.90	Maharajapuram
		18	Medankulam	59.735	5.60	Maharajapuram
		19	Pannikulam	42.810	3.77	Maharajapuram
		20	Sundarapandiam Periyakulam	117.000	35.80	Sundarapandiam
XV	Vannankulam Anicut	21	Vannankulam	38.290	15.77	Maharajapuram
		22	Alaganerikulam	42.790	33.72	Maharajapuram

		23	Tambipattikulam	43.120	9.70	Thambipatti
XVI	Thirumalaikulam Tank	24	Thirumalaikulam Tank	107.650	26.30	Kottaiyur
XVII	Settikuruchikulam	25	Settikuruchikulam	97.130	11.40	Kottaiyur
XVIII	ILandaikulam Tank	26	ILandaikulam (Sirukulam) Tank	61.160	17.60	llandaikulam
XIX	Thirumagalkulam	27	Thirumagalkulam	69.690	28.70	Thulukkappatti
XX	Ayartharmam Tank	28	Ayartharmam (Sirukulam) Tank	45.730	18.20	Ayartharmam
XXI	Madhavarayankulam Anicut	29	Madhavarayankulam	31.450	6.48	W.Pudupatti
		30	Panikkankulam	38.340	7.89	W.Pudupatti
XXII	Anuppankulam Anicut	31	Anuppankulam	152.000	24.83	W.Pudupatti
XXIII	Vilvarayankulam Anicut	32	Vilvarayankulam	99.040	20.35	W.Pudupatti
XXIV	Unjankulam Bed Dam	33	Unjankulam	46.380	13.60	Sundarapandiam
XXV	Veppankulam Anicut	34	Veppankulam Tank	4.560	1.50	Veppankulam
XXVI	Senkulam Anicut	35	Senkulam	88.055	16.00	Sundarapandiam
XXVII	Vennikondan Anicut	36	Vennikondan kulam	32.780	14.56	Kunnur
		37	Senkulam	32.380	7.25	Kunnur
		38	Nangurkulam	12.550	5.00	Kunnur
XXVIII	Kovaneri Anicut	39	Kovaneri kulam	121.200	26.91	Sundarapandiam
XXIX	Nathampatti Anicut	40	Nathampatti Periya kulam	159.195	85.00	Nathampatti
		41	Thondamankulam	36.550	17.70	Pattakulam Sallipatti
		42	Kondhavarayankulam	14.420	5.40	Pattakulam Sallipatti
		43	Thiralankulam	26.870	5.53	Semmandi karisalkulam
		44	Panankulam	29.510	6.07	Viluppanur
		45	Kalliputhur kulam	24.900	14.39	Pattakulam Sallipatti
		46	Thatchakudi Periya kulam	55.650	16.18	Thatchakudi
		47	Thatchakudi Pudhukulam	12.700	2.61	Thatchakudi
		48	Krishnaperi kulam	30.560	11.30	Krishnaperi
		49	Semmandi Karisalkulam	12.060	2.49	Semmandi karisalkulam
		50	Karisalpatti Pudhukulam	24.280	5.00	Semmandi karisalkulam

		51	Sathaneri kulam	45.880	9.34	Moovaraivendran
		52	Mangalam Periyakulam	73.740	58.00	Sivakasi
		53	Nedunkulam	71.230	24.74	Nedunkulam
XXX	Thathankulam Anicut	54	Thathankulam Tank	35.260	14.52	Moovaraivendran
XXXI	Anaithalaiyar Dividing Dam	55	Valaikulam Tank	228.650	50.60	Valaikulam
XXXII	Velankulam Open Off Take	56	Velankulam	50.060	15.84	Padikkasuvaithanpatti
XXXIII	Athithondu Open Off Take					
XXXIV	Veppankulam & Rengappanaikarkulam Anicut	57	Rengappanaikarkulam	51.490	9.53	Sivanthipatti
		58	Veppankulam	75.500	12.95	Sivanthipatti
XXXV	Amuthakulam Open Off Take	59	Amuthakulam	46.830	3.80	Sivanthipatti
XXXVI	Maravankulam Dividing Dam	60	Maravankulam	58.680	8.51	Inam Nachiyar kovil
		61	Kosavankulam	13.265	4.03	Ponnanganni
		62	Ponnanganni kulam	50.960	8.86	Ponnanganni
XXXVII	M.Valankulam Open Off Take	63	M.Valankulam Tank	45.580	6.32	Sivanthipatti
XXXVIII	Srivilliputhur Periyakulam	64	Srivilliputhur Periyakulam	401.860	50.00	Srivilliputhur
		65	Vellakulam	45.370	3.09	Padikkasuvaithanpatti
XXXIX	Athikulam-Sengulam Anicut	66	Rajakularamaperi kulam	51.490	8.86	Srivilliputhur
XL	Thiruvannamalai Anicut					
XLI	Rengatheertha Odai Dividing Dam					
XLII	Pottakulam Kurukkalkulam Tank	67	Pottakulam Kurukkalkulam Tank	41.950	3.55	Kurukkalkulam
XLIII	Vadamalaikuruchikulam	68	Vadamalaikuruchikulam	149.330	26.19	North Srivilliputhur
XLIV	Athikulam Senkulam	69	Athikulam Senkulam	50.300	6.32	Athikulam Senkulam
XLV	Nakkamangalam kulam	70	Nakkamangalam kulam	44.890	6.90	Malli
		71	Thailakulam	42.600	11.60	Inam Nachiyar kovil
		72	Malli Periyakulam	80.940	32.70	Malli

		73	Mulli kulam	86.600	12.86	Mulli kulam
		74	Thadangannikulam	54.450	14.88	T.Managaseri
XLVI	Sholankulam Anicut	75	Sholankulam	118.580	18.87	Srivilliputhur
		76	Deivendri kulam	50.510	6.31	Deivendri
		77	Nochikulam	67.000	16.76	Ayan Nachiyar kovil
XLVII	Managaserikulam	78	Managaserikulam	57.160	11.86	T.Managaseri
XLVIII	Pattakulam	79	Pattakulam	50.180	17.37	Pattakulam
		80	Viluppanur Periyakulam	69.200	10.37	Viluppanur
XLIX	Pudhukottai Anicut	81	Pudhukottai Periyakulam	129.320	36.60	Pudhukottai
		82	Kandaneri kulam	24.690	6.17	Sevalur
		83	Nalliyankulam	29.150	7.28	Sevalur
		84	Kothaneri kulam	21.460	5.37	Kothaneri
L	Modhagam Tank	85	Modhagam tank	48.160	10.50	Modhagam
LI	Muruganeri Tank	86	Muruganeri kanmoi	40.470	6.78	Gunnathur
		87	Senkulam	49.970	10.29	M. Senkulam
LII	Koovalapuram kulam	88	Koovalapuram kulam	62.980	28.38	Koovalapuram kulam
LIII	Sittilotti Tank	89	Sittilotti kanmoi	43.440	18.60	Sittilotti
LIV	Thathaperumalkulam	90	Thathaperumalkulam	43.560	25.93	Vellur
		91	Servaikaranpatti Tank	36.420	7.50	Servaikaranpatti
LV	Kalaiyarkurichi Anicut	92	Periyakulam Tank of Kalaiyarkurichi	70.700	13.55	Kalaiyarkurichi
LVI	Thiruthangal Anicut					
LVII	Enjar sengulam Tank	93	Enjar sengulam Tank	45.770	19.38	Enjar
LVIII	Enjar Naduvapatti Tank	94	Enjar Naduvapatti Tank	102.470	11.32	Enjar
LIX	Thiruthangal Periyakulam	95	Thiruthangal Periyakulam	52.610	66.00	Thiruthangal
		96	Urinjikulam	29.000	7.03	Keela Thiruthangal
		97	Alamarathupatti kulam	14.780	2.46	Keela Thiruthangal
		98	Rengasamudram tank	30.990	7.74	V.Muthulingapuram
		99	Vadi kulam	79.870	33.55	Vadi
		100	Kanniseri kulam	71.920	21.77	Chinna Vadi

C	Anaikuttam Reservoir	d	Anaikuttam Main canal	1214.000	125.75	Keela Thiruthangal
LX	Mathyasenai	101	Mathyasenai	80.940	18.02	Mathyasenai
		102	Nattarmangalam Tank	55.440	11.52	Nattarmangalam
LXI	Ondipulinaikanur Periakulam	103	Ondipulinaikanur Periakulam	42.060	10.00	Ondipulinaikanur
LXII	Veppilaipatti Tank	104	Veppilaipatti Tank	48.120	35.20	Veppilaipatti
LXIII	Golwarpatti Anicut	105	Golwarpatti kulam	273.380	174.62	Golwarpatti
D	Golwarpatti Reservoir	e	Golwarpatti Main canal	1821.000	178.00	Sirukulam
		106	Onaipattikulam	8.370	1.10	N.Mettupatti
		107	Melamadai Periyakulam	164.750	59.65	Nathathupatti
		108	Sirukulam	33.310	12.70	Sirukulam
		109	Sevalkulam	6.910	0.34	Nathathupatti
		110	Vannankulam	3.350	1.15	Sirukulam
				11185.780	2601.98	



CHAPTER - 4
COMMAND AREA AND
WATER USERS' ASSOCIATION

Participatory Irrigation Management (PIM) Under IAMWARM Project

1. One of the “Emerging Issues” identified during the Project preparation stage was “Institutional weaknesses” which will continue to constrain optimum management and development of water resources in the state, and which needs to be urgently addressed. The approach to operation and maintenance needs to be improved through adequate budget allocation, improved collection, better asset management systems and strengthening of Water Users Associations to take on increasing maintenance responsibility. Participatory Irrigation Management (PIM) has therefore to be strengthened and rolled out state-wide to improve farmer involvement in irrigated agriculture decision-making and serve as an organizing principle for extension, marketing and dialogue. Better mainstreaming of social and environmental issues in irrigation service delivery and water resource management is required. IAMWARM Project implementation will ensure improvement in the critical areas identified above, primarily through targeted investments and technical assistance.
2. The project provides for necessary funding to assist in the formation and capacity building of about 2500 WUAs and cluster WUAs (about 10 WUAs clustered on a hydraulic basis to serve as a focus for extension and information technology efforts) in the 63 sub-basins under the project.
3. Participation and ownership of farmers and their organizations is critical for sustainable irrigation and agricultural intensification and diversification. Number of opportunities have been created under this project for the involvement of project beneficiaries, more precisely the WUAs, in monitoring and reporting activities at the local level. Necessary analytical tools are also proposed to be introduced under this project to deliver efficient, environmentally and socially sustainable cost effective irrigation services to farmers through the Water Users

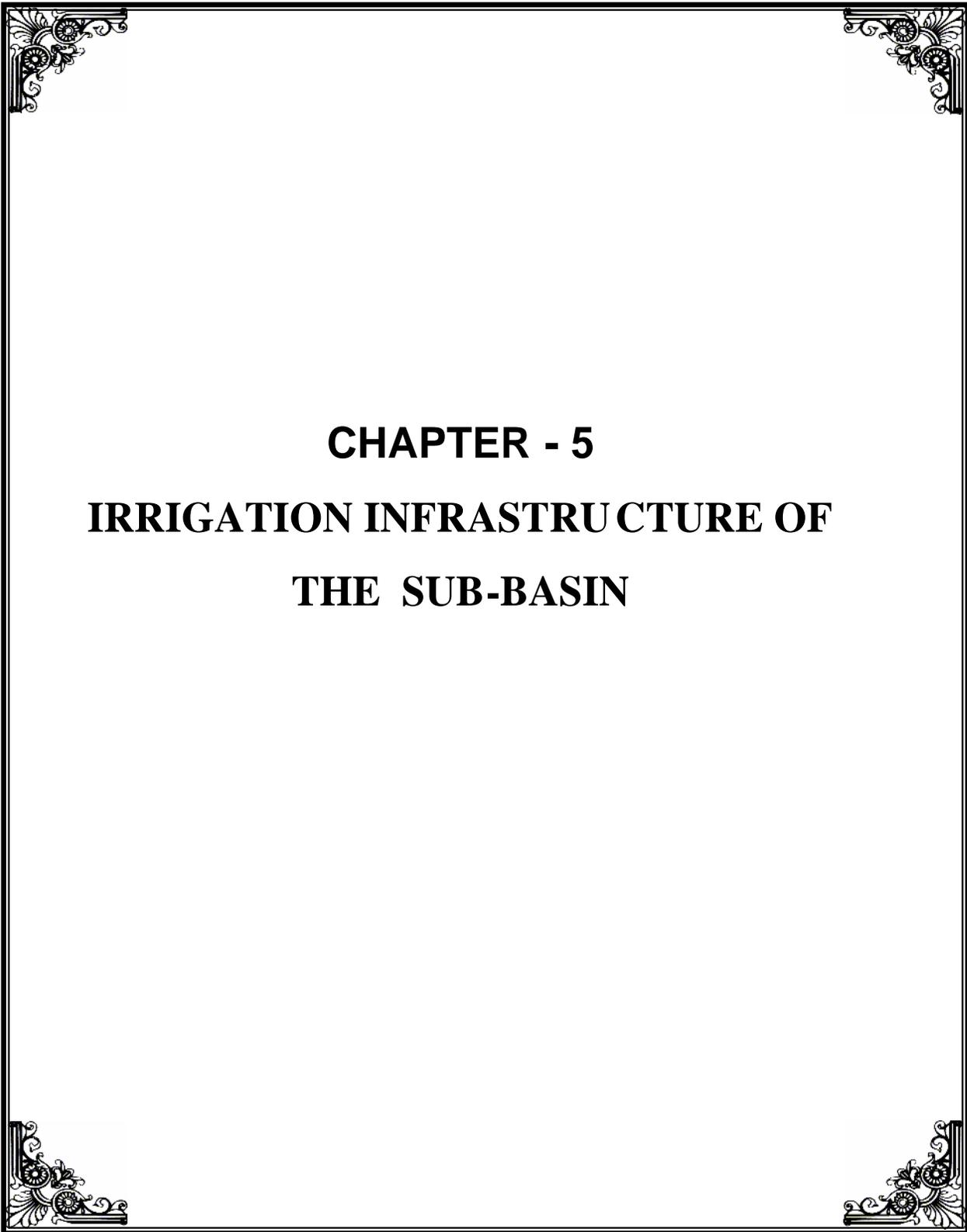
Associations. Necessary funds have also been provided to assist in the formation and capacity building of WUAs in all the 63 sub-basins covered under this project.

4. The project has been designed to work with WUAs, to be formed during the project implementation. The WUAs will have a role in the project in terms of planning and supervision of construction at appropriate levels. To achieve the project development objective of “increase in irrigated agriculture productivity” there is a need to take into consideration all the above aspects and ensure the effective involvement of all the beneficiary farmers functioning in all the 63 sub-basin commands.
5. Considering all the above aspects related to participatory irrigation management under IAMWARM Project, WUA s are to be formed in all the 63 sub-basins. “Arjunanadhi” sub-basin, being one of 63 selected sub-basins all the required activities are proposed to be taken up in forming the WUAs. Totally 64 new WUAs have been delineated and the formation process has just commenced. Besides the 64 new WUAs, there exist 3 WUAs already formed and functioning.
6. These new associations are to be formed as per the provisions in the TNFMIS ACT and Rules. The operation and maintenance responsibilities of the irrigation systems are the tasks of the managing committee of the WUA. This managing committee comprises of one president and 4-10 Territorial Constituency members. The delineated area of the WUA will be further demarcated into a minimum of four and a maximum of ten, territorial constituencies. Adopting the TNFMIS – Election Rules, one president and designated number of territorial constituency members will be elected through secret ballot to constitute the managing committee of the WUAs. Soon after the declaration of the election results, the members of the managing committee will assume office and start functioning.

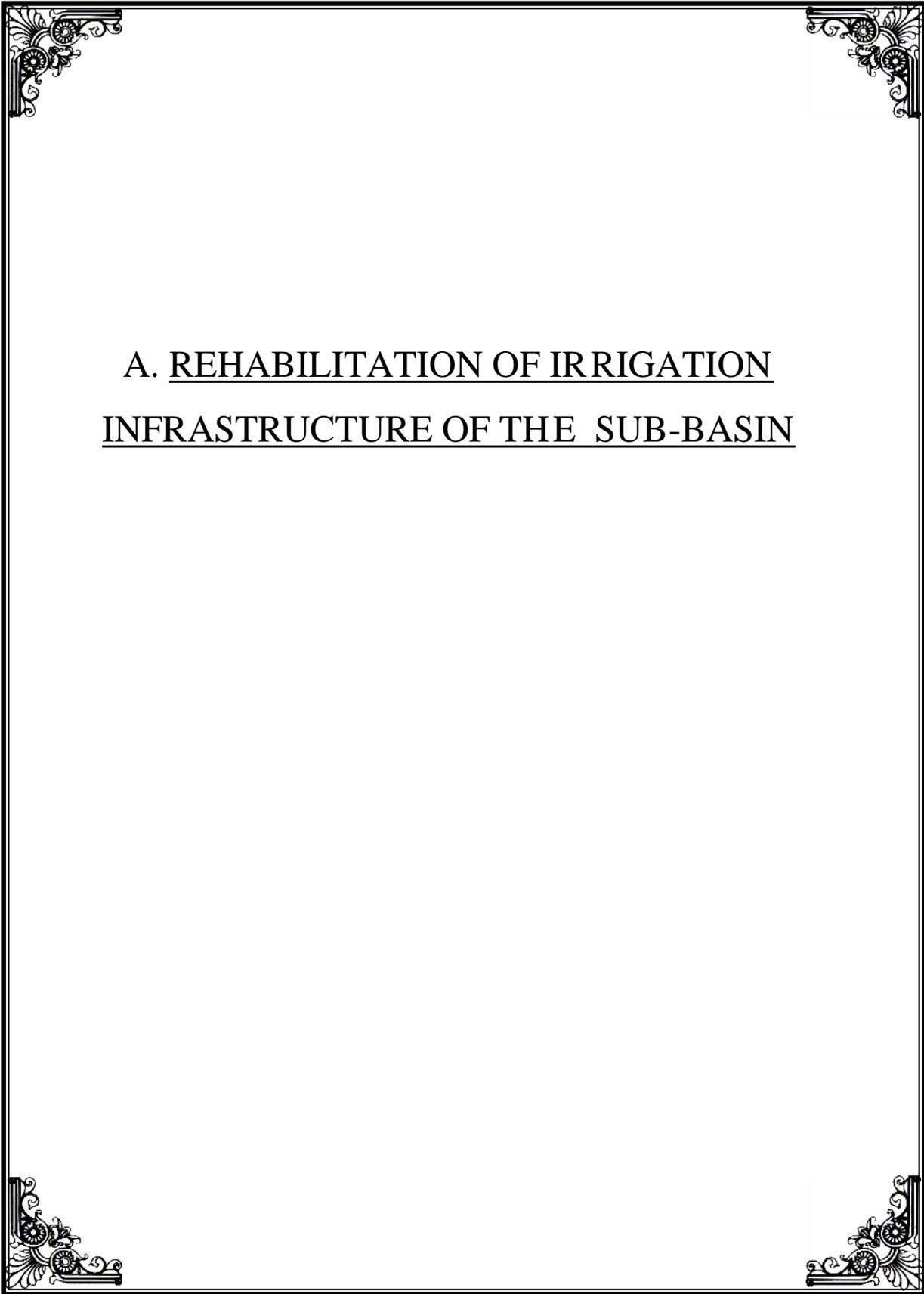
DETAILS OF WUAs PROPOSED / EXISTING IN ARJUNANADHI SUB -BASIN			
Sl. No.	WUA No.	Name of the WUA	Ayacut Area in Ha
Proposed WUAs			
1	AJN-1	Valaikulam tank Water Users' Association	228.650
2	AJN-2	Rengappanaikar tank Water Users' Association	51.490
3	AJN-3	Veppankulam tank Water Users' Association	75.500
4	AJN-4	Velankulam tank Water Users' Association	50.060
5	AJN-5	Srivilliputhur big tank Water Users' Association	401.860
6	AJN-6	Vellakkulam tank Water Users' Association	45.370
7	AJN-7	Amuthakulam Tank Water Users' Association	46.830
8	AJN-8	Ponnanganni tank Water Users' Association	50.960
9	AJN-9	M.Velankulam tank Water Users' Association	45.580
10	AJN-10	Maravankulam tank Water Users' Association	58.680
11	AJN-11	Kosavankulam tank Water Users' Association	13.265
12	AJN-12	Athikulam-Sengulam tank Water Users' Association	50.300
13	AJN-13	Rajakularamaperi tank Water Users' Association	51.490
14	AJN-14	Sholankulam tank Water Users' Association	118.580
15	AJN-15	Deivendri tank Water Users' Association	50.510
16	AJN-16	Nochikulam tank Water Users' Association	67.000
17	AJN-17	T.Managaseri tank Water Users' Association	57.160
18	AJN-18	Vadamalaikurichi tank Water Users' Association	149.330
19	AJN-19	Pottakkulam-kurukkal kulam tank Water Users' Association	41.950
20	AJN-20	Nakkamangalam tank Water Users' Association	44.890
21	AJN-21	Thailakulam tank Water Users' Association	42.600
22	AJN-22	Malli big tank Water Users' Association	80.940
23	AJN-23	Mulli tank Water Users' Association	86.600
24	AJN-24	Thadankanni tank Water Users' Association	54.450
25	AJN-25	Pattakkulam tank Water Users' Association	50.180
26	AJN-26	Viluppanur tank Water Users' Association	69.200
27	AJN-27	Kuppankulam tank Water Users' Association	58.280
28	AJN-28	Padarankulam tank Water Users' Association	97.130
29	AJN-29	Ayakulam tank Water Users' Association	66.900
30	AJN-30	Alaganeri tank Water Users' Association	42.790
31	AJN-31	Ayadharmam tank Water Users' Association	45.730
32	AJN-32	Ilandhai kulam tank Water Users' Association	61.160
33	AJN-33	Mathur tank Water Users' Association	102.790
34	AJN-34	Thambipatti tank Water Users' Association	43.120

35	AJN-35	Chettikurichi tank Water Users' Association	97.130
36	AJN-36	Thirumagalkulam tank Water Users' Association	69.690
37	AJN-37	Thirumalaikulam tank Water Users' Association	107.650
38	AJN-38	Pilavukkal neertheekka thittam Khansapuram Village Water Users' Association	618.520
39	AJN-39	Pilavukkal neertheekka thittam S.Kodikulam Village Water Users' Association	572.340
40	AJN-40	Pilavukkal neertheekka thittam Watrap Village Water Users' Association	642.130
41	AJN-41	Pilavukkal neertheekka thittam W.Pudupatti Village Water Users' Association	551.635
42	AJN-42	Pilavukkal neertheekka thittam Sundarapandiyam Village Water Users' Association	372.635
43	AJN-43	Pilavukkal neertheekka thittam Nathampatti Village Water Users' Association	282.785
44	AJN-44	Pilavukkal neertheekka thittam Mangalam Village Water Users' Association	181.310
45	AJN-45	Pilavukkal neertheekka thittam Thachakudi Village Water Users' Association	231.160
46	AJN-46	Koovalapuram tank, stimulate Periyakulam tank Water Users' Association	106.420
47	AJN-47	Modhagam Periyakulam tank, Muruganeri periya kanmoi, M.Sengulam tank Water Users' Association	138.600
48	AJN-48	Pudukottai Periyakulam tank, Kandaneri tank, Nalliyankulam, Kothaneri tank Water Users' Association	204.620
49	AJN-49	Thatha perumal kulam tank Water Users' Association	43.560
50	AJN-50	Servaikaranpatti tank Water Users' Association	36.420
51	AJN-51	Nattarkmangalam tank Water Users' Association	55.440
52	AJN-52	Mathyasenai tank Water Users' Association	80.940
53	AJN-53	Kalaiyarkurichi tank Water Users' Association	70.700
54	AJN-54	Ondipulinaikanur tank Water Users' Association	42.060
55	AJN-55	Enjar sengulam and Enjar naduvappatti tank water user association	148.240
56	AJN-56	Thiruthangal Periyakulam, ruing kulam, (No Suggestions) Pudukulam tank Water Users' Association	96.390
57	AJN-57	Vadi tank and Rengasamudram tank Water Users' Association	110.860
58	AJN-58	Kanniseri tank, E.kumaralingapuram tank Water Users' Association	71.920
59	AJN-59	Veppilaipatti tank Water Users' Association	48.120
60	AJN-60	Golwarpatti Periyakulam tank Water Users'	273.380

		Association	
61	AJN-61	Anaikuttam Reservoir Main canal Water Users' Association	1214.000
62	AJN-62	Vannankulam tank Water Users' Association	38.290
63	AJN-63	Veppankulam tank Water Users' Association	4.560
64	AJN-64	Thathankulam tank Water Users' Association	35.260
Existing WUAs			
65	VNR-5	Golwarpatti Reservoir Mavilpatti Water Users' Association	795.690
66	VNR-6	Golwarpatti Reservoir N.Mettupatti Water Users' Association	1025.310
67	VNR-7	Golwarpatti Reservoir Irukkankudi Water Users' Association	216.690
Total Ayacut Area in Ha			11185.780



CHAPTER - 5
IRRIGATION INFRASTRUCTURE OF
THE SUB-BASIN



A. REHABILITATION OF IRRIGATION
INFRASTRUCTURE OF THE SUB-BASIN

A. REHABILITATION OF IRRIGATION INFRASTRUCTURE OF THE SUB-BASIN

STRUCTURAL STATUS & DEFICIENCIES IN THE SYSTEM

The following are the present structural condition of the Arjunanadhi sub basin system.

1. This system is a old system existing for more than 100 Years as such requires Rehabilitation.
2. Heavy accumulation of silt due to hilly region and contour nature of canal system.
3. Lack of adequate control of regulating structures like Anicuts, Head Sluices, Sand/ scour vents etc.,
4. The damaged (or) dilapidated condition of the existing anicuts, diversion head works etc. and supply channels causes to poor standard of the entire conveyor system.
5. The System and Non system tanks are to be rehabilitated.

In order to improve the conveyance and Operational Efficiency in Irrigation, it is now proposed to improve and modernize the Irrigation Infrastructures in Arjunanadhi Sub basin.

1. **Training the River by removing the Shoals accumulated in the U/s and D/s of the anicuts & evicting the encroachments by earthwork excavation using machineries**
2. **Conversion of Mud korambu into Masonry Anicut**
3. **Reconstruction of Collapsed Anicuts**
4. **Repairs to the damaged Anicuts**
5. **Providing Head Sluice to some of the supply channels to avoid breaches during floods and for better water management**
6. **Providing Scour vent in anicuts**
7. **Desilting the supply channels & surplus courses by earthwork excavation using machineries**
8. **Providing revetments and Retaining walls in selective area of the supply channels**

9. Providing model sections to maintain the bed level and inner slopes of the supply channels
10. Providing steps in the supply channels for easy approach to the fields by the farmers wherever necessary
11. Reconstruction of damaged lining in Reservoir Canals
12. Rehabilitation of Jeep Track of Reservoir Canals
13. Reconstruction of damaged cross masonries in Reservoir Canals
14. Providing Wooden blanks to Anicut / Weir Dam stones
15. Repairing, Restoring the traditional water bodies (i.e. tanks)
 - a. Restoring the capacity of the tanks, supply channels by desilting
 - b. Strengthening the bunds of the tanks and channels wherever necessary for effectively storing the water and conveying it to the entire command area and also for conveying agriculture inputs to the field.
 - c. Reconstruction of Collapsed weirs
 - d. Repairs to the damaged weirs
 - e. Reconstruction of Collapsed Sluices
 - f. Repairs to the damaged Sluices
 - g. Providing revetments and Retaining walls in selective area of the tanks
 - h. Providing S.G. Shutter / Plug arrangements to Sluices, Head sluices, Scour vents etc.,
 - i. Removing, Repairing and refixing in position of the existing S.G. shuttering arrangements and providing locking arrangements etc.,

Outcome of the Project

1. Increase in conveyance efficiency by 25%
2. The present Gap area of 5559 ha. is to be converted as a fully irrigated area
3. The following irrigation infrastructure development works are proposed in the sub basin
Reconstruction of 9 Anicuts.

Construction of 2 Bed Dams

Rehabilitation works for 30 anicuts, 110 tanks

Rehabilitation of supply channel for 212 KM

**TAMIL NADU IRRIGATED AGRICULTURE MODERNIZATION AND
WATER BODIES RESTORATION AND MANAGEMENT (TN IAM WARM) PROJECT
PROCUREMENT-PLAN FOR WORKS FOR FIRST 18 MONTHS**

1. Abbreviations:																
ICB-International Competitive Bidding { ³ 10, 000,000 US\$ equivalent }; NCB- National Competitive Bidding { < 10,000.000 US\$ equivalent }; and Force Account / Community Participation { <30,000 US\$ equivalent }.																
Name of Basin:		VAIPPAR														
Name of Sub-Basin:		ARJUNANADHI														
Name of Region:		Madurai Region, Madurai														
Name of Circle:		Vaippar Basin Circle, Virudhunagar														
Name of Division:		Upper Vaippar Basin Division, Rajapalayam & Vaippar Basin Division, Virudhunagar														
SL. No.	Package No.	Description of Work	Estimated cost (Rs. Lakh)	Pre / Post Review	Method of Procurement- ICB/NCB/FA		Preparation of detailed project report (DPR) & bid documents	Bank's no objection to bidding document	Bid Invitation date	Bid Opening date	Evaluation & Contract award Recommendation	Bank/competent authority no objection to contract award	Date of Contract Signing	Date of Commencement of works	Date of completion of works	
1	01/IAMWARM /AJN/ WRO/ UVB/ NCB/ 06-07	Rehabilitation of Periyar & Kovilar Reservoir Canals, Anicuts, Supply channels and tanks Upto Watrap - Viragasamudram tanks in Arjunanadhi sub basin in Watrap Block / Srivilliputhur Taluk of Virudhunagar district	850.67	Pre Review	NCB		Appraisal	Start day	15th	25th	55th	115th	130th	160th	190th	18 Months
							Revised									
							Actual									

2	02/IAMWARM /AJN/ WRO/ UVB/ NCB/ 06-07	Rehabilitation of Anicuts, Supply channels and tanks below Watrap - Viragasamudram tanks upto Nathampatti Anicut in Arjunanadhi sub basin in Watrap, Srivilliputhur & Sivakasi Blocks / Srivilliputhur & Sivakasi Taluks of Virudhunagar district	1090.33	Pre Review	NCB	Appraisal	Start day	15th	25th	55th	115th	130th	160th	190th	18 Months
						Revised									
						Actual									
3	03/IAMWARM /AJN/ WRO/ UVB/ NCB/ 06-07	Rehabilitation of Non system tanks, its Anicuts and Supply channels in Arjunanadhi sub basin in Watrap Block / Srivilliputhur Taluk of Virudhunagar district	549.70	Pre Review	NCB	Appraisal	Start day	15th	25th	55th	115th	130th	160th	190th	18 Months
						Revised									
						Actual									
4	04/IAMWARM /AJN/ WRO/ UVB/ NCB/ 06-07	Rehabilitation of Non system tanks, its Anicuts and Supply channels in Arjunanadhi sub basin in Srivilliputhur Block / Srivilliputhur Taluk of Virudhunagar district	845.00	Pre Review	NCB	Appraisal	Start day	15th	25th	55th	115th	130th	160th	190th	18 Months
						Revised									
						Actual									
5	05/IAMWARM /AJN/ WRO/ VB/ NCB/ 06-07	Rehabilitation of Anaikuttam & Golwarpatti Reservoir system and Non system tanks, its Anicuts and Supply channels in	1221.40	Pre Review	NCB	Appraisal	Start day	15th	25th	55th	115th	130th	160th	190th	18 Months

		Arjunanadhi sub basin in Peraiyur Taluk of Madurai district and Sivakasi, Sattur & Virudhunagar Taluks of Virudhunagar district				Revised									
						Actual									
		Total	4557.10	Lakhs											

Package No: 01 / IAMWARM / AJN / WRO / UVB / NCB / 06 -07

Name of Package: Rehabilitation of Periyar & Kovilar Reservoir Canals, Anicuts, Supply channels and tanks upto Watrap-Viragasamudram tanks in Arjunanadhi Sub basin in Watrap Block/ Srivilliputhur taluk of Virudhunagar district

Slice No.	Name of Slice	Est. Amt Rupees.
Slice - 1	Rehabilitation of Periyar main canal, Periyar Branch canal and Kovilar main canal in Arjunanadhi Sub basin in Srivilliputhur taluk of Virudhunagar district	16200000
Slice - 2	Rehabilitation of Vannaparai Anicut, Pooriparai tank and its Supply channel in Arjunanadhi Sub basin in Srivilliputhur taluk of Virudhunagar district	10800000
Slice - 3	Rehabilitation of Sivaneri Anicut, its Supply channel and tanks in Arjunanadhi Sub basin in Srivilliputhur taluk of Virudhunagar district	9800000
Slice - 4	Rehabilitation of Gunavanthaneri Anicut, and its Supply channels, Punkankulam, Gunavanthaneri tanks in Arjunanadhi Sub basin in Srivilliputhur taluk of Virudhunagar district	13500000
Slice - 5	Rehabilitation of Kodikulam Anicut, and its Supply channel, tank in Arjunanadhi Sub basin in Srivilliputhur taluk of Virudhunagar district	6300000
Slice - 6	Rehabilitation of Pethankulam Anicut, Pethankulam tank, Koonikulam tank and its Supply channels in Arjunanadhi Sub basin in Srivilliputhur taluk of Virudhunagar district	7700000
Slice - 7	Rehabilitation of Watrap Big Tank and Viragasamudram tanks and its Supply channels in Arjunanadhi Sub basin in Srivilliputhur taluk of Virudhunagar district	8100000
Slice - 8	Rehabilitation works to Kuppankulam Anicut, tank and Supply channel in Srivilliputhur taluk	6650000
Slice - 9	Rehabilitation works to Padarankulam Anicut, tank and Supply channel in Srivilliputhur taluk	6017000
	TOTAL	85067000

Package No: 02 / IAMWARM / AJN / WRO / UVB / NCB / 06 -07

Name of Package: Rehabilitation of Anicuts, Supply channels and tanks below Watrap - Viragasamudram tanks upto Nathampatti Anicut in Arjunanadhi sub basin in Watrap, Srivilliputhur & Sivakasi Blocks / Srivilliputhur & Sivakasi Taluks of Virudhunagar district

Slice No.	Name of Slice	Est. Amt Rupees.
Slice - 1	Rehabilitation of Thiruthakal Anicut, Alangulam Supply channel and Alankulam, Medankulam & Pan nikulam tanks in Arjunanadhi Sub basin in Srivilliputhur taluk of Virudhunagar district	8700000
Slice - 2	Rehabilitation of Madhavarayankulam Anicut, and its Supply channels, Madhavarayankulam, Panikkankulam, Sathampadi and Kosavankulam tanks in Arjunanadhi Sub basin in Srivilliputhur taluk of Virudhunagar district	9800000
Slice - 3	Rehabilitation of Anuppankulam and Vilvarayankulam Anicuts, and its Supply channels, tanks in Arjunanadhi Sub basin in Srivilliputhur taluk of Virudhunagar district	8800000
Slice - 4	Rehabilitation of Unjankulam and Senkulam Anicuts, and its Supply channels & tanks in Arjunanadhi Sub basin in Srivilliputhur taluk of Virudhunagar district	8600000
Slice - 5	Rehabilitation of Vennikondan Anicut, Vennikondan tank, Senkulam tank, Nangoor kulam tank and its Supply channel in Arjunanadhi Sub basin in Srivilliputhur taluk of Virudhunagar district	8300000
Slice - 6	Rehabilitation of Kovaneri Anicut, Sundarapandiyam Periyakulam & Kovaneri tanks and its Supply channels in Arjunanadhi Sub basin in Srivilliputhur taluk of Virudhunagar district	8800000
Slice - 7	Rehabilitation of Nathampatti Anicut, tank and its supply channel in Arjunanadhi Sub basin in Srivilliputhur taluk of Virudhunagar district	8400000
Slice - 8	Rehabilitation of Sathaneri Anicut, Supply channel and tank in Arjunanadhi Sub basin in Srivilliputhur taluk of Virudhunagar district	7700000
Slice - 9	Rehabilitation of Karisalpatti Semmandikulam, Karisalpatti Pudukulam, Kalliputhur and Mangalam tanks and its Supply channels in Arjunanadhi Sub basin in Srivilliputhur taluk of Virudhunagar district	9300000

Slice - 10	Rehabilitation of Thondamankulam, Kondavarayan kulam, Thiralankulam and Panankulam tanks and its Supply channels in Arjunanadhi Sub basin in Srivilliputhur taluk of Virudhunagar district	8300000
Slice - 11	Rehabilitation of Thatchakudi Periyakulam, Thatchakudi Pudukulam and Krishnaperi kulam tanks and its Supply channels in Arjunanadhi Sub basin in Sivakasi taluk of Virudhunagar district	12500000
Slice - 12	Rehabilitation of Nedunkulam tank and its Supply channel in Arjunanadhi Sub basin in Sivakasi taluk of Virudhunagar district	6000000
Slice - 13	Rehabilitation works to Veppankulam Anicut, Tank, Supply channel and Thathankulam Anicut in Srivilliputhur taluk	3833000
	TOTAL	109033000

Package No: 03 / IAMWARM / AJN / WRO / UVB / NCB / 06 -07

Name of Package: Rehabilitation of Non system tanks, its Anicuts and Supply channels in Arjunanadhi sub basin in Watrap Block / Srivilliputhur Taluk of Virudhunagar district

Slice No.	Name of Slice	Est. Amt Rupees.
Slice - 1	Rehabilitation works to Ayakulam and Vannankulam Anicuts, tanks and Supply channels in Srivilliputhur taluk	7748000
Slice - 2	Rehabilitation works to Mathur Anicut, tank, Supply channel and Surplus Course in Srivilliputhur taluk	8526000
Slice - 3	Rehabilitation works to Alaganeri Supply channel feeding to Alaganeri tank in Srivilliputhur taluk	5338000
Slice - 4	Rehabilitation works to Alaganeri tank, Thambipatti tank and Supply channel in Srivilliputhur taluk	8512000
Slice - 5	Rehabilitation works to Chettikurichi and Thirumagalkulam tanks and Supply channels in Srivilliputhur taluk	7582000
Slice - 6	Rehabilitation works to Ilandaikulam and Ayardharmam tanks and Jungle Stream supply channels and Ilandaikulam Surplus course in Srivilliputhur taluk	8609000
Slice - 7	Rehabilitation works to Thirumalaikulam tank, Supply channel and Surplus Course in Srivilliputhur taluk	8655000
	TOTAL	54970000

Package No: 04 / IAMWARM / AJN / WRO / UVB / NCB / 06 -07

Name of Package: Rehabilitation of Non system tanks, its Anicuts and Supply channels in Arjunanadhi sub basin in Srivilliputhur Block / Srivilliputhur Taluk of Virudh unagar district

Slice No.	Name of Slice	Est. Amt Rupees.
Slice - 1	Rehabilitation works to Anaithalaiyar Dividing Dam, Grade wall, Head Sluice and Valaikulam tank Supply channel in Anaithalaiyar river in Srivilliputhur taluk	9000000
Slice - 2	Rehabilitation works to Valaikulam, Veppankulam, Rengappanaikarkulam tanks and Supply Channels and Veppankulam-Rengappanaikarkulam Dividing Dam in Srivilliputhur taluk	9000000
Slice - 3	Rehabilitation works to Nochikulam and Deivendri tanks, Supply Channels and Surplus Courses in Srivilliputhur taluk	6900000
Slice - 4	Rehabilitation works to Sholankulam Anicut, tank, Supply channel, Surplus course and Rajakularamaperi tank and Supply channel and Vellakulam tank in Srivilliputhur taluk	7300000
Slice - 5	Construction of Dividing Dam across Peyanar river near Athithundu in Mamsapuram village in Srivilliputhur taluk of Virudhunagar District	3350000
Slice - 6	Rehabilitation works to Amuthakulam and M.Valankulam tanks, Supply channels, Surplus courses and Construction of two dividing dams across Peyanar river to feed Amuthakulam and M.Valankulam tanks in Srivilliputhur taluk	6500000
Slice - 7	Rehabilitation works to Maravankulam Dividing Dam, Supply channel, Tank and Kosavankulam tank in Srivilliputhur taluk	4400000
Slice - 8	Rehabilitation works to Srivilliputhur Big Tank and Valaikulam Surplus course and Ponnanganni tank and Velankulam tank and Supply Channel in Srivilliputhur taluk	6800000
Slice - 9	Rehabilitation works to Thiruvannamalai Anicut, Vadamalaiku richi tank, Supply Channels and Surplus Courses (No Suggestions) tank and Supply Channel in Srivilliputhur taluk	7800000
Slice - 10	Rehabilitation works Athikulam-Sengulam Tank and Surplus course and Surplus course of Vadamalaikurichi tank and Srivilliputhur big tank in Srivilliputhur taluk	4150000
Slice - 11	Rehabilitation works to Mullikulam big tank, Thailakulam tank and Surplus Course and Nakkamangalamkulam tank, supply channel and surplus course in Srivilliputhur taluk	8300000
Slice - 12	Rehabilitation works to Thadankanni and T.Managaseri tanks and supply channels and surplus courses in Srivilliputhur taluk	4800000

Slice - 13	Rehabilitation works to Pattakkulam and Viluppanur tanks and supply channels in Srivilliputhur taluk	6200000
	TOTAL	84500000

Package No: 05 / IAMWARM / AJN / WRO / VB / NCB / 06 -07

Name of Package: Rehabilitation of Anaikuttam & Golwarpatti Reservoir system and Non system tanks, its Anicuts and Supply channels in Arjunanadhi sub basin in Peraiyur Taluk of Madurai district and Sivakasi, Sattur&Virudhunagar Taluks of Virudhunagar district

Slice No.	Name of Slice	Est. Amt Rupees.
Slice - 1	Rehabilitation and modernisation of Sengulam Dividing Dam, Modhagam Tank, Sengulam Tank, Murugan eri Tank, Koovalapuram Tank and Sittilotti Tank in Peraiyur Taluk of Virudhunagar District	13200000
Slice - 2	Rehabilitation and modernisation of Pudukottai Anicut and Pudukottai Periyakulam Tank, Kandaneri Tank, Nalliyankulam Tank, Kothaneri kulam Tank in Virudhunagar Taluk of Virudhunagar District	17200000
Slice - 3	Rehabilitation and modernisation of Thathaperumalkulam Tank, Servaikaranpatti Tank, Mathyasenai Tank and Nattarmangalam Tank in Virudhunagar Taluk of Virudhunagar District	9680000
Slice - 4	Rehabilitation and modernisation of Kalaiyarkurichi Anicut and Kalaiyarkurichi Tank in Virudhunagar Taluk of Virudhunagar District	4190000
Slice - 5	Rehabilitation and modernisation of Thiruthangal Anicut , Thiruthangal Periyakulam Tank, Urinjikul am Anicut , Urinjikulam Tank, Enjar Naduvapatti Tank, Enjar Sengulam Tank in Sivakasi Taluk of Virudhunagar District	11100000
Slice - 6	Rehabilitation and modernisation of Alamarathupatti Tank, Rengasamudram Tank and Anicut, Kanniseri Tank and Vadi Anicut and Tank in Virudhunagar Taluk and Sivakasi Taluk of Virudhunagar District	13380000
Slice - 7	Rehabilitation and modernisation of Anaikuttam Reservoir in Virudhunagar Taluk of Virudhunagar District	8800000
Slice - 8	Rehabilitation and modernisation of Veppilaipatti Tank, E.Kumaralingapuram Tank, Ondipulinaikanur Tank and V.Muthulingapuram Tank in Sattur Taluk of Virudhunagar District	7600000
Slice - 9	Rehabilitation and Modernisation of Golwarpatti Tank in Virudhunagar Taluk and Sattur Taluk of Virudhunagar District	17940000
Slice - 10	Rehabilitation and modernisation of Golwarpatti Reservoir Canal in Sattur Taluk of Virudhunagar District	14200000
Slice - 11	Rehabilitation and modernisation of Sirukulam Tank, Vannankulam Tank, Sevalkulam Tank, Melamadai Tank and Onampatti Tank in Sattur Taluk of Virudhunagar District	4850000
	TOTAL	122140000

ABSTRACT					
Sl. No.	Component		Qty		Amount in Lakhs
I		Tank Bund Improvements			
	a	Earthwork for Bund	171363	M	754.00
	b	Retaining wall	5948	M	446.10
	c	Model section	361	Nos	75.60
	d	Revetment	4425	M	44.30
II		Improvement of sluices			
1		Reconstruction			
	a	Tower Head	65	Nos	126.80
	b	Wing Wall	52	Nos	96.20
2		Repair			
	a	Tower Head	62	Nos	31.00
	b	Wing Wall	77	Nos	30.80
3		Retaining wall	1970	M	147.80
III		Improvement of Weir			
1		Reconstruction	22	Nos	110.00
2		Repair	76	Nos	76.00
IV		Shutter Arrangement			
1		S.G.Shutter			
	a	Sluice	150	Nos	45.00
	b	Weir	63	Nos	44.10
	c	Anicut	89	Nos	66.80
2		S.G.Plug for Sluice	128	Nos	25.60
3		Wooden Needle Shutters			
	a	Weir / Canal Sluice	281	M2	14.10
	b	Anicut	86	M2	4.30
V		Supply Channel Improvement			
1		Earthwork	193175	M	438.50
2		Retaining Wall	5907	M	366.20
3		Revetment	1370	M	13.70
4		Culvert	5	Nos	30.00
5		Head Sluice	15	Nos	45.00
6		Canal Sluice	29	Nos	14.50
7		Lining	18250	M	390.00
8		Syphon	5	Nos	15.00
9		Drop	11	Nos	22.080
VI		River Training			
1		Anicut			
	a	Repair	25	Nos	300.00
	b	Reconstruction	9	Nos	270.00

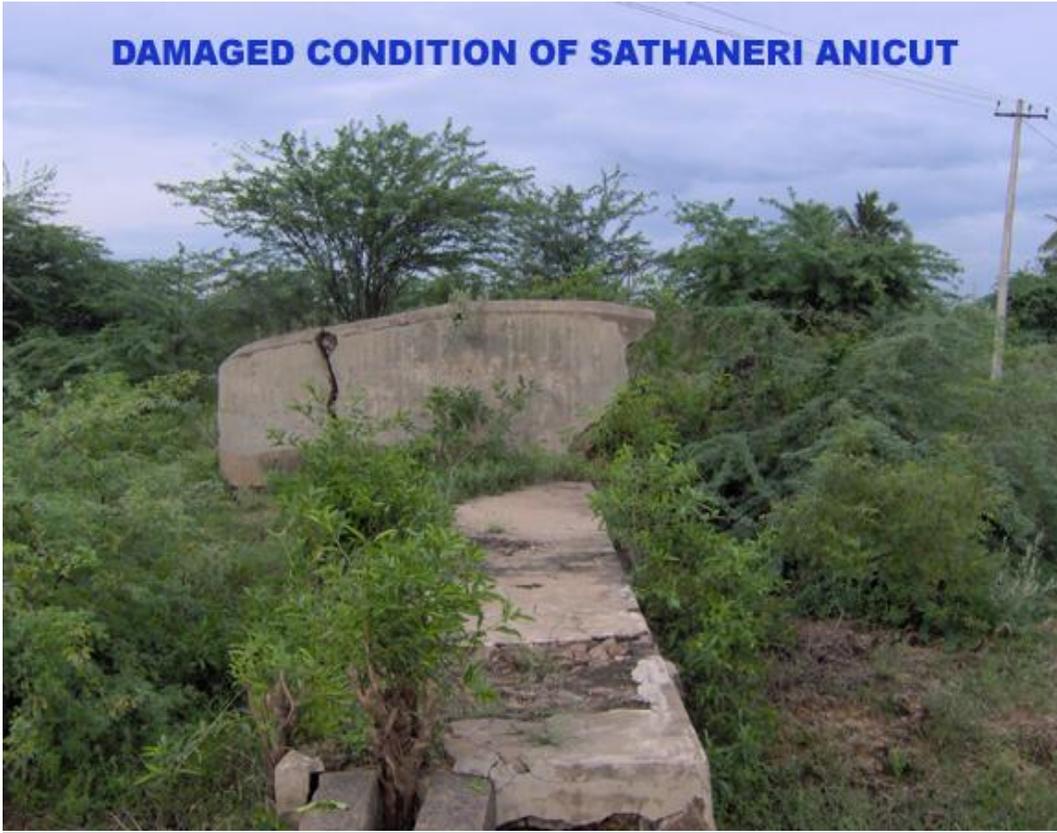
2		Earth work	25480		M	267.50
VII		L.S.Provision				246.20
		TOTAL				4557.10

WRO COST TABLE (PHYSICAL AND FINANCIAL PROGRAM)

Sl.No	Description	I Year		II Year		Total		
		Quantity	Amount in Lakhs	Quantity	Amount in Lakhs	Quantity	Amount in Lakhs	
1	Anicuts							
a	Construction of Anicuts (at existing off takes)	14	253.00	20	362.00	34	Nos	615.00
b	Desilting	10192	107.00	15288	160.50	25480	RM	267.50
c	Repairs to Sluice	16	20.00	24	31.10	40	Nos	51.10
d	Reconstruction of Sluice	2	4.00	2	4.40	4	Nos	8.40
e	Shutters Renewal	39	33.00	59	48.68	98	Nos	81.68
f	Construction of Groyne wall in anicut system	Nil	Nil	Nil	Nil	Nil		Nil
g	Construction of Culverts&CD works in anicut system	8	26.00	13	41.00	21	Nos	67.00
h	Construction of Divide wall in anicuts	Nil	Nil	Nil	Nil	Nil		Nil
i	Protection walls at vulnerable points in anicuts	1082	108.00	1623	162.50	2705	RM	270.50
j	Rehabilitation of Supply Channels from Anicut	46362	257.00	69543	386.60	115905	RM	643.60
k	Selective Lining of Channels from Anicut	18250	390.00	0.00	0.00	18250	RM	390.00
l	Strengthening of River Banks	Nil	Nil	Nil	Nil	Nil		Nil
m	Construction of Bed Dam	0	0.00	1	30.00	1	No	30.00
n	Catchment Area	Nil	Nil	Nil	Nil	Nil		Nil

	works							
II	PWD Tanks			0	0.00			
a	Desilting	Nil	Nil	Nil	Nil	Nil		Nil
b	Repairs to Surplus weir	30	30.00	46	46.00	76	Nos	76.00
c	Reconstruction of Surplus Weir	9	45.00	13	65.00	22	Nos	110.00
d	Repairs to Sluice	56	57.00	83	85.00	139	Nos	142.00
e	Reconstruction of Sluice	47	117.00	70	173.55	117	Nos	290.55
f	Shutters Renewal	136	47.00	205	71.23	341	Nos	118.23
g	Rehabilitation of Supply Channels from Tank	30908	70.00	46362	105.40	77270	RM	175.40
h	Selective Lining of Channels from Tank	Nil	Nil	Nil	Nil	Nil		Nil
i	Standardisation of Tank Bund	68545	390.00	102818	583.95	171363	RM	973.95
VII	Others							246.20
	Total Cost		1954.00		2603.10			4557.10

DAMAGED CONDITION OF SATHANERI ANICUT



OPERATIONAL DIFFICULTIES - WOODEN SHUTTER



DAMAGED SLUICE



WEAKER TANK BUND (BELOW STANDARD)



FARMERS MEETING WITH LINE DEPARTMENT OFFICIALS



FILED VISIT ALONG WITH LINE DEPARTMENT OFFICIALS

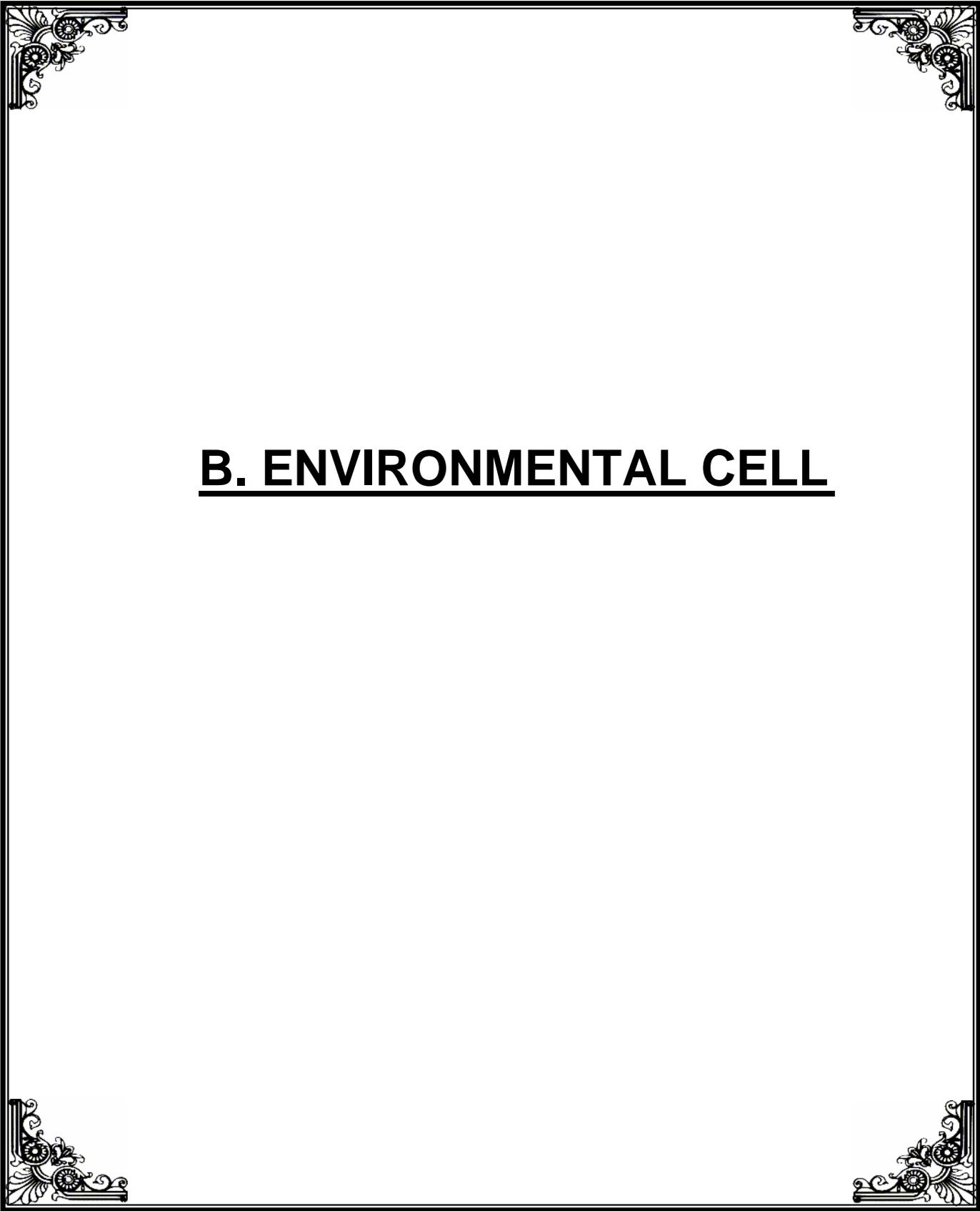


WALK THROUGH SURVEY-KOVILAR CANAL



WALK THROUGH SURVEY - KODIKULAM ANICUT





B. ENVIRONMENTAL CELL

ENVIRONMENTAL MANAGEMENT FRAMEWORK

INTRODUCTION:

Under TNWRCP, with World Bank assistance, special emphasis was given for the first time to assess the environmental status and degradation caused for all River basins in TamilNadu. Soil Assessment Study has been conducted by Environment Protection Training and Research Institute (EPTRI), Hyderabad. The institute has identified the Environmental issues, social issues, mitigatory measures and given the recommendations as below.

- i) Environmental Issues :
 - a) Soil Erosion
 - b) Sand Mining
- ii) Social Issues :
 - a) Dry Land Agriculture
 - b) Reduction in Livestock
 - c) Women empowerment-SHG's
 - d) No storing facilities
- iii) Mitigatory Measures :
 - a) Non-judicial and excessive sand mining have to be controlled and regulated.
 - b) Livestock services delivery and management
 - c) Common storage facilities may be established
- iv) Agency:
 - a) The above measures can be improved by the combined working of Environmental Cell wing and Animal Husbandry Department.

The Environmental Cell of WRO assessed Soil and water samples in this River basin. The assessment include Environmental impact on the quality of surface and Ground water and Soil by collecting water & soil samples and testing them; preparation of Micro level Environmental Status Reports for all the River basins with the World Bank assistance for these works up to March 2004.

Also few awareness programs & workshops were conducted to create awareness on the environmental issues & remedies among the public, farmers, Govt. officials and NGOs; Seminars were conducted to find out new techniques and methods developed recently to solve environmental problems.

Now under IAMWARM project, focus at each sub basin level is to identify and prioritize the requirements for improvements to storage structures, rehabilitation, new schemes for water harvest, and diversification of crops. Any new schemes or rehabilitation of existing one, consideration of the environment issues pertaining to that area and remedial action to overcome the problems is must.

ENVIRONMENTAL PROBLEMS:

SAND MINING:

Sand mining was alarming on the Upstream and down stream of the check dam constructed across Peyanar from where drinking water is pumping for Srivilliputhur town.

Rampant Sand mining was in operation, 1.60 Km down stream of Kovilar & Periyar River sand mining was a roaring activity on the right side of the road bridge leading to Watrap.

Also, Sand mining was done near D/S of road bridge in the Sivakasi – kanniseriputhur road, in Peyanar and Kombaiyar in Sivakiri Village.

Now the sand mining has come under the control of WRO only at the approved site sand is being collected and the Regular Territorial division is closely monitoring.

INDUSTRIAL POLLUTION:

In this sub basin, chemical industries, printing, match & fire works & textile industries are predominant. Part of Sivakasi town & Srivilliputhur are the leading industrial towns in this sub basin.

1) Match & Fire Works:

Sivakasi town is famous for matches & fire industries. Around 500 firework factories are functioning in and around Sivakasi. Solar pan evaporation is suggested by TNPCB to treat the effluent.

2) Printing Industry:

Sivakasi is well known for printing, Litho press and offset printing.

However the trade effluent discharged from these factories is very minimal. The major Industries and the trade effluent from them are tabulated. Treatment of the trade effluent is closely monitored by TNPCB.

CATCHMENT DEGRADATION:

The following are the major reservoirs constructed in this sub basin,

- 1) Pilavukkal Project
- 2) Anaikuttam Reservoir
- 3) Golwarpatti Reservoir

The area of Arjuna watershed is 950 Sq.km. The head reaches of the above reservoirs constitute series of hills, valleys and plains. As per the Watershed Atlas of Virudhunagar District, in some parts of Sivakasi and Srivilliputhur taluks the soil erosion is reported to be very high.

Already heavy silt has been deposited in the reservoir by which capacity has been considerably reduced. In respect of conservation of forest wealth and prevent soil erosion, effective measures were taken up under Tamilnadu Afforestation Project (TAP) by the Forest Department and under the Western ghat development programme by the Agricultural Engineering Department.

SOLID WASTE DISPOSAL:

The problem of Garbage collection and its disposal has assumed importance, in the context of rapid growth of population, urbanization, industrial growth and development. There is no organized scientific method of disposal in all the Municipalities and Panchayats in this sub basin.

At present, in Sivakasi Municipality, solid waste to the tune of 30 MT per day collected through lorries and dumped in the compost yard at Paraipatti village over an area of 3 ha.

In Srivilliputhur Municipality, the daily collection of solid waste is about 24 MT and it is dumped in the compost yard in the eastern side of town in an area of 4.4 ha.

In Watrap urban town panchayat, about 5 MT of solid waste is collected and dumped in the nearby places and tank.

In Thiruthangal urban town panchayat, about 14.75 MT of solid waste is collected and dumped in the nearby places.

SEWAGE DISPOSAL LET INTO WATER BODIES:

Regarding this sub basin it is noted that in the following location Sewage is directly let into the nearby watercourse, river or tank.

1. Watrap tank
2. Srivilliputhur big tank

More over in almost all the village no safe disposal of sewage or proper treatment method is adopted. This affect the near by water source directly or affecting the ground water potential indirectly.

So, creating awareness among the presidents of the local bodies is must and to motivate them to adapt Solid waste management and Sewage management, wherever required, workshop including field visits, exclusively for them is to be conducted under the IAMWARM project.

ACTIVITIES PROPOSED

To monitor the quality of water and soil and create database regarding the Environmental Status for each sub basin, this proposal has now been proposed with the following activities at sub basin level.

I. Collection and Testing of Water and Soil Samples.

Water samples were collected and tested in this sub basin at Moovaraivendran, Anaikuttam reservoir & Golwarpatti reservoir and tested regularly from 2002. Continuance of collection and testing of water samples is essential as good and long - range data will enable to understand the problems more precisely. Hence, now it is

proposed to collect and test water samples at two more points in addition to the above three points for a period of three years to assess the Environmental impact on the quality of surface water of this sub basin more accurately. Water samples at the following location will be collected once in 3 months.

- i) Above Watrap
- ii) Below Watrap
- iii) Moovaraivendran
- iv) Anaikuttam reservoir
- v) Golwarpatti reservoir

In addition to the above identified locations, water samples will also be collected once in 6 months from tanks and near by wells to estimate the level of pollution in five locations, where sewage is directly let into tanks and Channels. These samples will be tested, to assess the impact on the quality of surface and ground water.

Soil samples are to be collected from selected locations to assess the impact on the quality of soil due to various Environmental problems like use of chemical fertilizer and using the polluted water. From these locations number of samples at regular one-year interval have to be collected and tested to determine precisely the impact on the degradation of the quality of the soil. Therefore testing soil samples are essential. Soil samples thus collected will be tested in the Agricultural College.

Under this item following provisions have been made.

1. Testing charges for the water & soil samples.
2. Provision of Labour charges, purchase of materials, conveyance, driver salary and computer operator.

II. Transfer of Technical Know how for Solid Waste Management System (including source)

Segregation, recycle of dry waste and linkage with user agencies.

Now, a new scheme for Solid waste Management plan is under implementation in all Municipalities and Panchayats. Under this scheme, collection tank for disposable and non-disposable garbage have been constructed in most of the Local bodies. But, recycling the waste and converting the solid waste into manure and production of energy from them are yet to come up.

Hence Demonstration and action programs are planned with user agencies and necessary field visits are programmed to transfer of Technical Know how for Solid Waste management.

III. Conducting Awareness Programs .

Awareness Programs are necessary to create awareness among the public about environmental aspects and the action to be taken by them to remove or reduce the impacts due to the environmental problems. So far, no awareness Programs were conducted in this sub basin.

Hence, to create and motivate the people, 6 Nos. of awareness programmes are to be conducted in the villages where sewage is directly let into water bodies. It is also proposed to conduct 5 nos of awareness meetings in School/ Institutions during the study period of three years covering the following subjects in addition to placing Stickers, Tin sheets and Pamphlets containing messages about Environmental Awareness.

- **Sanitation.**
- **Solid waste treatment.**
- **Sewage treatment and converting the same into Gas.**
- **Natural farming.**
- **Conversion of aquatic weeds into manure etc.**

Mode of Execution: All the works proposed are to be carried out by outsourcing through an Educational Institute.

Total Cost.

The total Proposal cost works out to Rs. **29.00 Lakhs.**
(Rupees Twenty Nine Lakhs Only).

Name of work: Environmental Monitoring on water and soil quality and Creating awareness, updating of " Environmental and Social Assessment report" for ARJUNANADHI SUB -BASIN IN VAIPPAR BASIN

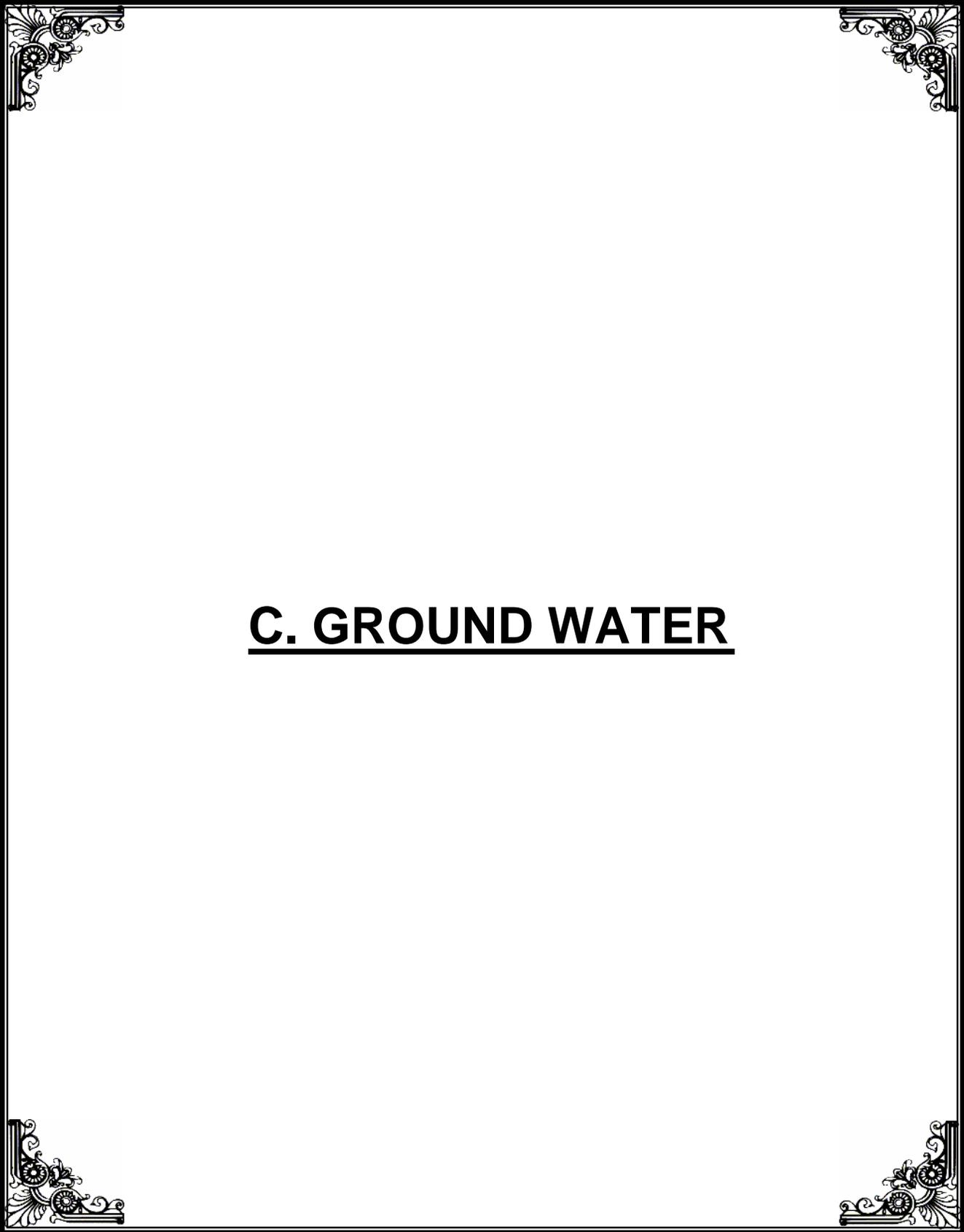
ABSTRACT ESTIMATE

SI.No.	Qty.	Description of Work	Rate Rs.	Per	Amount Rs.
I. Water & Soil Quality Monitoring by fixing nodal agency (any educational institution)					

1.	75 Nos.	Water sample Testing	1400	each	105000
2.	12 Nos	Soil sample Testing	7350	L.S	88200
3.	18 Man months	Hiring Jeep Driver	3500	1 Man month	63000
4.	LS	Conveyance, Purchases of Chemical Bottles, Camera, Documentation of water quality data	L.S	L.S	45000
II. Environmental , Social knowledge base by fixing nodal agency(any educational institution)					
1.	18 Man months	Village level Data collection on Environmental and Social state.	5000	month	90000
2.	LS	Expert analysis and development reporting			30000

III. Transfer of technical know how for solid waste & weed management by fixing nodal agency (any educational institution)					
1.	18 Nos	Motivating Office bearers of Local bodies for Solid waste & Sewage treatment to prevent pollution of Water Sources through Demo, Technical Visit.	15000	each	270000
2.	15 Nos	Herbal Gardens in Institutions	20000	each	300000
3.	20 Nos.	Demonstration and consultative meeting for eradication of weed and making manure	10000	each	200000
IV. Environmental Social Awareness creation by fixing nodal agency					
		Through NGO			
1.	LS	Propagation through Stickers, Tin Sheets, Pamphlets, Banners	L.S	L.S	200000
		Through Any Educational Institution			
2.	9 Nos.	Awareness program for public	15000	each	135000
3.	30 Nos.	Awareness meeting in School/ Institution	10000	each	300000
4.	3 Nos.	Awareness meeting for Officials	10000	each	30000
5.	3 Nos.	Annual Workshop at Sub basin level	50000	each	150000
6.	1 No	Annual Workshop at Region level	100000		100000
7.	6 Nos.	Exposure field visit to Eco friendly Practices	20000	each	120000
8.	3 Nos.	Environmental fair/ Exhibition, Green Awards	50000	each	150000

i)	L.S.	Preparing and publishing environmental Atlas for the sub basin for the use of line departments / Institutions for better management of sub basin	L.S.		100,000
j)	3 Years	Environmental related books / journals, publishing annual report for the sub basin	20000		60,000
k)	LS	Documentation of the entire activities and Hire of LCD, Upgradation of computer and accessories, Video Films and web site development	L.S		300000
IV.Variation in rates and unforeseen items.					63,800
		Total			2,900,000



C. GROUND WATER

Ground Water Scenario

In present scenario of water crises, artificial recharge of Ground Water becomes an essential phenomenon to meet out the water scarcity due to ever increasing demand on water.

Artificial recharge is a method to augment the natural infiltration of precipitation or surface water into under ground formation by some method of construction, spreading of water and injecting surface water into ground formation through dug well / bore well.

When the amount of average annual ground water extraction is more than the annual ground water recharge artificial recharge is required to balance the overdraft. Virudhunagar district is one of the drought prone districts in Tamil Nadu. In Arjunanadhi Sub – basin area of Virudhunagar district average annual rainfall is 847.5 mm. Due to frequent failure of monsoon or delay in monsoon setting agricultural activity has to depend on ground water to major extent. Hence we have to recharge the replenishable ground water resources whenever and wherever possible.

Under “IAM WARM” Project, it has been proposed to construct check dam across Arjunanadhi and construct recharge pits in major selected irrigation tanks to improve ground water storage to make it readily available to utilize it whenever required.

GEOLOGY:

Area is covered by crystalline metamorphic rocks of Achaean age . Top soil is followed by kankar, weathered rock, fractured rock and fresh rock of variegated gneissic rocks and Charnockite. Foot hill area covering North - North Western part is covered by valley filled with sediments of high fertility. Middle portion of the project area

is covered by block cotton soil, red soil and kankar soil. East and south eastern portion of the area is covered by black cotton soil of low fertility.

QUALITY:

In the upper and middle part of the Arjunanadhi sub basin quality of ground water is moderate to good. In lower Arjunanadhi area it is moderate to poor.

SCHEME DETAILS:

CONSTRUCTION OF CHECK DAM:

One Check dam with recharge pits has been proposed across Arjunanadhi near Kalaiyarkurichi village of Sivakasi block of Virudhunagar District to impound water and recharge ground water aquifer. The proposed check dam lies in the topo sheet of 58K/14 in the following Co-ordinates.

Latitude: 9°32'57" N

Longitude: 77°46'57" N

Length of Check dam: 55 m
Height of Check Dam : 1.30 m

2 Nos. of Recharge pits have been proposed in the upstream side of check dam to increase rate of seepage into ground water storage.

Size of the recharge pit is 10 x 10 x 2.0 m

Cost of the Check dam with recharge pit 2 Nos. works out to Rs. 10 Lakhs.

In this area number of irrigation wells are existing and 2 energised bore wells for water supply schemes are located in the vicinity of the proposed Check dam. Summer water level goes down below 10 m and shallow wells become dry. Quality of water is Moderate.

After implementation of scheme water level in this area will come up early and there by irrigation could be started in time, during monsoon period.

Existing water supply schemes could be maintained and improved.

Quality of ground water is likely to improve in this area.

CONSTRUCTION OF RECHARGE PITS WITHIN TANK AREA:

To increase the rate of ground water recharge through tanks, recharge pits are proposed in selected tanks where number of irrigation wells are used for irrigation in the respective ayacut lands. By artificially recharging the surface water into ground water storage then and there, surface and Ground Water resources can be increased more or less simultaneously, thereby overall irrigation sources can be improved. Tanks located in the upstream side nearer to Western Ghats and Periyar and Kovilar dams will get water frequently and they do not require any artificial recharge.

Tanks located in the black cotton and kankar soil in the eastern and south eastern part of the scheme area are not having sufficient irrigation wells to utilize the ground water due to poor quality of water. Hence deleting the tanks mentioned in the above said two areas, only hydro geologically feasible tanks are selected to construct artificial recharge pits.

Accordingly 25 No. of irrigation tanks are selected to locate recharge pits (Vide statements No. I enclosed). The proposed size of the recharge pit is 10m x 10m x 3m by constructing RR masonry in CM 1:5 with footing concrete CC 1:5:10, 20 cm depth around the recharging pit. Inside the pit, the first layer is pebbles 2.50m depth and top layer is coarse sand 0.5 m depth and 0.5 m free board. Two vertical bores of ϕ 8" and 10m depth from bottom of the pit are proposed per recharge pit.

Total cost of one recharge pit with bore wells works out to 1.50 Lakhs.

Total cost for 25 number of recharge pit with two vertical bore wells in each pit works out to $(1.5 \times 2 \times 25) = 75$ Lakhs.

Total cost of the scheme for one Check dam and 25 number of recharge pits works out to 85 Lakhs.

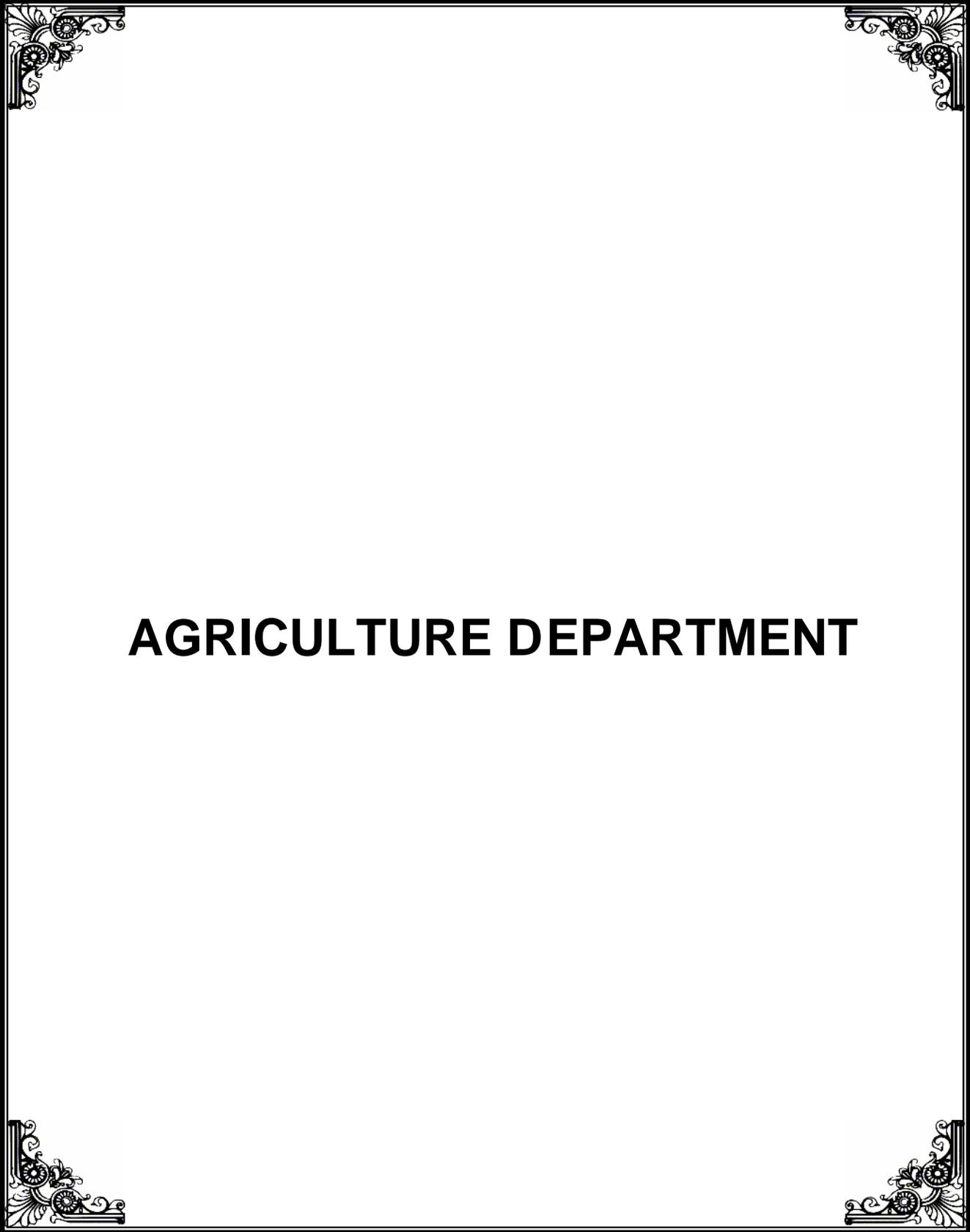
CONCLUSION:

At present irrigation has to be started (raising of nursery) with available surface water and poor ground water storage. During the failure or delay in on set of monsoon, raising of nursery has to be postponed. And also during the fake end of harvesting non availability of surface and ground water will affect the agricultural production in large extent. Hence after construction of recharge pits in irrigation tanks having number of irrigation wells, in their re spectve ayacut lands, Ground and surface water can be stored sufficiently even during normal rainfall period and irrigation can be started without any delay. Additional crops can also be raised depending on the availability of ground water.

LIST OF TANKS SELECTED IN ARJUNANADHI SUB BASIN FOR CONSTRUCTION OF RECHARGE PITS:

SI.No.	Name of Tank	Taluk No.	Name of Village	Name of Taluk	No.of Wells
1.	MATHURKULAM	16	MATHUR	SRIVILLIPUTHUR	25
2.	ALANKULAM	17	MAHARAJAPURAM	SRIVILLIPUTHUR	44
3.	SUNDARAPANDIAM	20	SUNDARAPANDIAM	SRIVILLIPUTHUR	23
4.	THAMBIPATTIKULAM	23	THAMBIPATTI	SRIVILLIPUTHUR	15
5.	ANUPPANKULAM	31	W. PUDUPATTI	SRIVILLIPUTHUR	49
6.	VILVARAYANKULAM	32	W. PUDUPATTI	SRIVILLIPUTHUR	36
7.	UNJANKULAM	33	SUNDARAPANDIAM	SRIVILLIPUTHUR	28
8.	SENKULAM	35	SUNDARAPANDIAM	SRIVILLIPUTHUR	42
9.	KOVANERIKULAM	39	SUNDARAPANDIAM	SRIVILLIPUTHUR	66
10.	NATHAMPATTI PERIYAKULAM	40	NATHAMPATTI	SRIVILLIPUTHUR	39
11.	NEDUNKULAM	53	NEDUNKULAM	SIVAKASI	25
12.	VALAIKULAM	55	VALAIKULAM	SRIVILLIPUTHUR	40
13.	VEPPANKULAM	58	SIVANTHIPATTI	SRIVILLIPUTHUR	21
14.	VADAMALAI KURICHIKULAM	68	NORTH SRIVILLIPUTHUR	SRIVILLIPUTHUR	25
15.	ATHIKULAM SENKULAM	69	ATHIKULAM SENKULAM	SRIVILLIPUTHUR	16
16.	MALLI PERIYAKULAM	72	MALLI	SRIVILLIPUTHUR	15
17.	SOLANKULAM	75	SRIVILLIPUTHUR	SRIVILLIPUTHUR	26
18.	VILLUPANUR PERIYAKULAM	80	VILLUPANUR	SRIVILLIPUTHUR	12
19.	PUDUKULAM	81	PUDUKOTTAI	SIVAKASI	29

	PERIYAKULAM				
20	MURUGANERI KANMOI	86	KUNNATHUR	PERAIYUR	12
21.	KOOVALAPURAMKULAM	88	KOOVALAPURAM	PERAIYUR	15
22.	PERIYAKULAM TANK OF KALAIYARKURUCHI	92	KALAIYARKURUCHI	VIRUDHUNAGAR	14
23	ENJAR NADUVAPATTI TANK	94	ENJAR	SIVAKASI	26
24	THIRUTHANGAL PERIYAKULAM	95	THIRUTHANGAL	SIVAKASI	24
25.	ONDIPULINAICKANUR PERIYAKULAM	103	ONDIPULINAICKANUR	VIRUDHUNAGAR	17



AGRICULTURE DEPARTMENT

**IAMWARM PROJECT
ARJUNANADHI SUB-BASIN
DETAILED PROJECT REPORT**

INDEX

Sl.No	DETAILS
1	Introduction
2	Month wise, Season wise Year wise Rainfall
3	Existing and proposed cropping pattern.
4	Existing irrigation potential
5	Existing agriculture practices
6	Ground Realities of Irrigation Practices
7	Diversification of crops
8	Challenges thrown up by diversification / area expansion / gap coverage
9	Solutions and recommendations
10	Constraints, challenges and counter measures
11	Abstract of the Agriculture components
12	Year wise component wise physical and financial
13	Block wise component of activities
14	Component wise work sheet
15	Outcome of the Project

IAMWARAM PROJECT
DETAILED PROJECT REPORT
AGRICULTURE DEPARTMENT

Sub basin : ARJUNA NADHI
Basin : VAIPPAR
District : VIRUTHUNAGAR
WRO Region : MADURAI
Blocks Covered : WATRAP, SRIVILLIPUTTUR, SIVAKASI, SATTUR
VIRUTHUNAGAR, AND PART OF T.KALLUPATTI
BLOCK IN MADURAI DISTRICT.

INTRODUCTION

Arjuna Nadhi is one of the following Nine Sub-basins selected for the first year implementation of IAMWARM Project in Tamil Nadu under World Bank Assistance.

1. Varaganadhi
2. Upper Vellar
3. South Vellar
4. Aliyar(PAP)
5. Palar(PAP)
6. Pambar
7. Manimuthar
8. Kottaikariyar
- and 9. Arjuna Nadhi.

The registered Ayacut area of the Arjuna Nadhi Sub-basin is 11186 Ha. The 6 year average rainfall in the district is 769 mm. The important crops grown in the sub basin are Paddy, Millets, Pulses, Cotton, Sugarcane, and Gingelly, etc.

OBJECTIVE

To increase the income of the farmers per unit of land / per unit of irrigation water.

Plan

- Diversification of low profit high water requirement crops to high profit, low water requirement crops, especially to commercial crops.
- Gap area coverage with irrigated crops.
- Transfer of latest production technologies to increase the productivity through.

- Demonstrations and area coverage
- Distribution of critical inputs in time
- Frequent field visits
- Distribution of farm implements & enhanced mechanization
- Trainings to farmers and field staff
- Strengthening information and publicity activities
- Exposure visits
- Agri. Clinic services
- Frequent review and documentation of reports and achievements

2. The details of month wise, season wise, and year wise rainfall of the Virudhunagar District is given in the table below for the last 6 years from 2000 to 2005

DETAILS OF RAINFALL RECEIVED (In mm)							
District: Virudhunagar.							
Month	Normal Rainfall	Actual Rainfall received					
		2000	2001	2002	2003	2004	2005
Winter							
January	26.4	48.8	41.0	0.5	0.4	8.0	0.3
February	19.5	156.1	8.8	51.8	17.7	0.8	28.0
Winter Total	45.9	204.9	49.8	52.3	18.1	8.8	28.3
Summer							
March	30.5	1.8	10.5	19.2	53.2	18.0	34.7
April	74.1	28.2	133.6	82.3	114.3	49.0	144.4
May	59.7	51.8	37.4	64.2	37.1	59.8	65.6
Summer Total	164.3	81.8	181.5	165.7	204.6	126.8	244.7
S.W.Monsoon							
June	21.5	6.8	12.2	15.9	31.8	10.0	7.6
July	26.8	22.0	68.2	3.4	21.6	28.6	36.5
August	53.8	57.8	13.7	37.6	54.0	4.4	49.3
September	67.6	172.1	116.5	38.8	38.0	158.1	36.2
S.W.Monsoon Total	169.7	258.7	210.6	95.7	145.4	201.1	129.6
N.E.Monsoon							

October	193.9	54.4	154.7	216.1	190.4	184.0	212.2
November	168.4	111.6	217.0	133.7	91.6	156.1	206.6
December	69.5	65.7	25.2	9.3	11.1	10.6	152.7
N.E.Monsoon Total	431.8	231.7	396.9	359.1	293.1	350.7	571.5
TOTAL	811.7	777.1	838.8	672.8	661.2	687.4	974.1

3. The details of existing and proposed cropping pattern is furnished in the table below

ARJUNA RIVER BASIN- CROPPING PATTERN

Crops	Without Project				With Project				
	Fully irrigated	Partially irrigated	Rainfed/ Gap	Total	Fully irrigated	Partially irrigated	Rainfed/ Gap	Total	
Perennial crops									
Coconut	439			439	480			480	+41
Sugarcane	436			436	500			500	+64
Banana	78			78	300			300	+222
Sapota				0	25			25	+25
Amla				0	25			25	+25
Guava				0	50			50	+50
Mango				0	25			25	+25
Fodder				0	250			250	+250
Total	953	0	0	953	1655	0	0	1655	+702
I crop (Sep-Jan)									
Paddy	3803	596		4399	4400			4400	+1
Cotton	185			185	1431			1431	+1246
Vegetables	41			41	80			80	+39
Chillies	20			20	180			180	+160
Pulses	29			29	1200			1200	+1171
Gingelly			1000	1000		500		500	-500
Cholam (fodder)			300	300				0	-300
Cumbu			300	300				0	-300
Maize			900	900	1700			1700	+800
Coriander				0	40			40	+40
Total	4078	596	2500	7174	9031	500	0	9531	+2357
II Crop (Feb-May)									
Paddy	872			872	875			875	+3
Cotton	445			445	980			980	+535
Vegetables	11			11	125			125	+114
Pulses	202			202	1530			1530	+1328
Periwinkle				0	40			40	+40
Marigold				0	60			60	+60
Maize				0		1300		1300	+1300

Celosia				0	10			10	+10
Senna				0	40			40	+40
Total	1530	0	0	1530	3660	1300	0	4960	+3430
Grand total	6561	596	2500	9657	14346	1800	0	16146	+6489
Cropping Intensity				86%				143%	+58%
Fully Irrigated	5031								
Partially Irrigated	596								
Gap	5559								

4. Existing Irrigation Potential

Out of the registered Ayacut area of 11186 ha. the present irrigation potential is

Fully	Irrigated	5031 ha
Partially	Irrigated	596 ha
Gap		5559 ha

Total		11186 ha

5. Existing Agricultural Practices in the Sub basin are:

1. Distribution of Inputs

(a) Seeds:

Certified /Hybrid/ improved/ quality seeds and planting materials are used by the Farmers to a limited extent only. The traditional low yielding, local millet varieties are still used by the farmers in certain pockets. However the area under such low yielding millets is limited in the sub basin. The major source of seeds for new varieties to the farmers is through the Agriculture Extension Centres. Many farmers use their own seeds and also exchange seeds among themselves. Few innovative farmers get the required seeds from the near by TNAU research stations, KVKs and private sources also.

(b) Soil

The Soil types are as follows.

1. Mekkarai Series
2. Mandarai Series
3. Ambasamudram Series

Farmers testing their soils mostly once in a year through the assistance of the Agriculture extension staff of the area. The soils are

mainly tested through the departmental Soil Testing Labs (STL) and Mobile Soil Testing Labs (MSTL) available in the District. Few farmers rarely test their soils through TNAU and private sources also. In view of the large number of soil samples proposed to be covered as a result of the proposed intensive cropping pattern, private sources like Agri Clinic, Spic, MFL services etc also will be utilized for testing if necessary.

C. Organic Farming

Organic farming is not in practice so far in the sub basin. Necessary steps are being taken to educate the farmers through demonstrations and other mass media channels. But many farmers apply organic manures to their fields along with chemical fertilizers. However 100% use of organic manures is not practiced in the sub basin by the farmers. Slowly farmers are aware of the benefits of the use of organic manures and it may take some more time to adopt significantly. In future, the chances of application of organic manures is more for horticulture crops, specially for vegetables and medicinal plants which fetches special price through elite consumers.

(d) INM and IPM Practices

Only limited farmers adopt INM and IPM practices. The adoption of these practices will increase significantly in future due to the extension efforts proposed to be taken in the IAMWARM Project period.

(e) Actual Extension Services Available for Transfer of Technology (TOT)

For transfer of latest farming techniques, many extension methods are being adopted. One of the main extension services is existence of Agriculture Extension Centres in all the block headquarters and sub depots in the needy locations. Through AECs, required critical farm inputs especially seeds, bio-fertilizers, bio-pesticides, micro nutrients, farm implements and sprayers are distributed to the farmers mostly under subsidized cost. Besides distribution of inputs, required technical advice essential for increased productivity are also given to the farmers. In addition, required publicity and propaganda are being made through various media to educate the farmers in time to adopt the latest production technologies. There is no private extension centre / services in the sub basin or in the district. As per the Training and Visit program norms, there must be one Village Extension Worker (VEW) for every 800 to 1000 farm families.

But such norm is not followed in reality due to vacancies at all levels of extension staff.

Actual Extension Services available for TOT

Government - Agricultural Extension Centres

Agricultural Development Officer	5
Agricultural Officer	9
Assistant Agricultural Officer	25
Total	<u>39</u>

6. Ground Realities of Irrigation Practices -

The details of water availability season wise and source wise are given below.

S. No	Source	Season	Period	Quality
1	Reservoir	Samba	Nov-Jan	Good
2	Tanks	Samba	Oct-Jan	Good
3	Wells	Samba	Oct-Jan	Good
		Summer	Feb-Aug	Average

Micro Irrigation

Micro irrigation practices are increasing year by year and becoming popular

among the farmers. The details of area to be covered under drip irrigation in the project is given under the head counter measures.

Drip with Fertigation

Fertigation practice is being popularized among the farmers and is used only for sugarcane crop now by few farmers. Slowly, the practice will be extended to the other crops like cotton.

7. Diversification of crops

The total Ayacut area of the sub-basin is 11186 ha, of which only 5626 ha is under cultivation. Hence there is a gap of 5599 ha which is kept as fallow. In this gap area, it is proposed to cover with maize, cotton & pulses in the project to start with and full gap will be covered with in the project period of 5 ye ars.

Strategy :

The farmers will be encouraged to go in for well irrigated maize, cotton & pulses crops till WRO works are completed and gap area is irrigated by Surface Water.

Location of the Diversification crops

Maize is to be introduced in the tail end of the Ayacut. Cotton & pulses to be introduced in the Kovilar Dam Canal irrigation area on receipt of the irrigation water.

Diversification and Introduction of New Crops:

During the joint meeting held with the Water Users Association/ Farmers Association (WUA / FA), WRO and other Line Department Officials it was decided to take up diversification of crops in the proposed cropping pattern for the project which are market driven / profit oriented commercial crops. **Accordingly cotton, maize, pulses, coconut, sugarcane and fodder crops** essential for the farm animals have been chosen.

The location of these crops in the respective tank areas have also been fixed based on the soil conditions and agro climatic suitability.

It was also decided to get the required certified, hybrid seeds and quality planting materials etc. through AEC, TNAU, NSC and also through private dealers.

The market potential for these crops have been consulted with the concerned local merchants and they are agreed to procure the produce as per the prevailing market rate at that time.

Agriculture marketing department will take up further steps to market the produce in time.

Cotton:

The cotton area has been increased from 185 ha to 1431 ha in the proposed cropping pattern during first season. Hence there is an increase in area of 1246 ha in cotton in the 1st season itself. Similarly, the area under cotton in the 2nd season has also been increased from 445 ha to 980 ha. Hence there is a additional area of 535 ha. In the 2nd crop.

To boost up the cotton production 100 Nos. of 10 ha. (1000 ha.) composite demonstration in cotton also been proposed @ the cost of Rs. 21.30 Lakhs

Maize:

The area of the maize has been increased from 900 ha to 1700 ha. During the first season. Hence there is an increase of 800 ha. in maize. There is no maize area in the 2nd season in the existing cropping pattern. But as per the demand of the farmers, new maize crop of 1300 ha have been proposed in the 2nd season under the project.

Pulses:

Under pulses also, an increase of 1171 ha over and above the existing area of only 29ha. in the 1st season has been suggested in the project. Similarly an additional area of 1328 ha. over and above the existing area of 202 ha in the 2nd season has also been suggested in the proposed cropping pattern.

To convince the farmers to take up more area under pulses and also to get more yield, 50 Nos. of 10 ha. composite demonstration (500 ha.) have been proposed at a cost of Rs. 4.85 Lakhs.

Coconut :

An additional coconut area of 41 ha. has been proposed in the project over and above the area of 439 ha. in existing cropping pattern. The requirement of coconut seedling for the proposed additional area could be met out through departmental coconut nurse ry. The entire additional area of 41 ha. will be brought under drip with Fertigation by Agricultural Engineering Department. In the existing coconut area, 226 ha. will be covered under drip and Fertigation. Hence there would be 267 ha. under drip with Fertigation in the sub basin which in about 55% of the coconut area of 480 ha.

The additional coconut production would be sold in the local Viruthunagar Market, for which Department of Agriculture Marketing and Agribusiness will make necessary tie up arrangement.

Sugarcane :

The area under sugarcane in the existing cropping patter is 436 ha. The proposed area for the project is 500 h.a with an increase of 64 ha. The additional requirement of Sugarcane planting materials could be met out through local sources. About 60% of the Sugarcane area is proposed to be covered with drip and Fertigation.

The issue of market for the additional production of sugarcane has been discussed with the local sugar mill which agree to purchase the cane from the farmers.

Fodder :

There is no green fodder crop in the existing cropping pattern of the sub basin. An area of 250 ha. has been suggested in the proposed cropping pattern for the project.

The fodder production could be utilized by the farmers to feed their own farm animals, besides selling to the needy farmers locally. The demand for fodder has been estimated by the Animal Husbandry Department. Accordingly, the area has been proposed under fodder cultivation.

8. Challenges thrown up by Diversification / Area Expansion / Gap Coverage

1. WRO should ensure quality irrigation water availability throughout the cropping period for the proposed cropping pattern. WRO should ensure flexibility in giving irrigation water during sowing to harvest seasons, so that farmers can get water in time to do various cropping operations as and when they need.
2. Proposed cropping pattern for the project given in the table is based on the Agro climatic suitability, market trend, soil type and also based on the choice of the farmers (WUA).
3. Required certified seeds and planting materials should be made available in all the Agriculture Extension Centres (AEC), and Regional Research Stations, TNAU and through private sources.
4. Regarding diversion and introduction of new crops / varieties, lengthy discussions were held with the WUA / FA during the joint walkthrough and also in joint discussion meetings and the farmers accepted the new approach. To change the mind-set of the farmers, trainings and demonstrations will be arranged to convince them. Required publicity and propaganda will be done through various media to educate farmers in time.
5. In addition to the available Agriculture Extension Services, in the sub-basin, the services of the Agrclinic to be set up with unemployed Agriculture / Horticulture graduates will be utilized if necessary. The

services of NGOS who are already in the Agriculture sector will also be tapped as and when needed on contract basis. The services of TNAU / KVK will also be utilized.

6. Information Education and Communication (IEC) facilities will be strengthened at AEC level. Required trainings will be imparted both to the farmers, extension workers periodically with the assistance of TNAU, Agri clinic to be set up, demonstrations, trainings, intern et services available in block development officers etc.
7. Based on necessity and farmers demand, the details of requirement of micro irrigation systems, hand and power operated sprayers will be distributed. The drip units will be supplied by Agriculture Engineering Department and sprayers by Agriculture department. Necessary financial provisions are made by the respective departments in the project in this regard.

9. Solutions and Recommendations

To overcome the constraints and challenges detailed above, the issues were discussed during the joint walkthrough in the sub-basin and also during the joint meetings with WRO, Line Department officials and WUA / FA etc. The joint meeting was held on the following dates.

6-12-05 – Srivilliputtur

13-12-05 – Periar Dam

28-02-06 – Maharajapuram and Sundarapandiam

08-03-06 – Srivilliputtur

17-07-06 – Srivilliputtur

24-07-06 – Srivilliputtur

During the above meetings and walkthrough, the farmers were consulted frequently and the demands were chalked out.

The details of WUA / FA demand & Agriculture components of activities which was finalized during the joint meeting are given below along with the cost estimate for five years.

DEMANDS

- 1) Clearance of encroachment in the canals supply channels, feeding channels, etc.
- 2) Strengthening of bunds in the canals.
- 3) Carrying out repairs in the structures of check dams, sluices in the tanks, etc.
- 4) Construction of thrashing floors.
- 5) Formation of farm approach roads.
- 6) Construction of Rural godowns.
- 7) Provision of community wells.
- 8) Desilting of tanks.
- 9) Supply of more number of sprayers and tarpaulins.
- 10) Supply of Agricultural Inputs at subsidized cost.

The need and the description of the components of activities finalised & agreed are given below:

1. INM – Paddy (Demonstration)

Many farmers not following the recommended doses of plant nutrients as per the soil test for most crops. Especially for paddy the adoption is poor. More nitrogenous fertilizers are applied often. Bio - fertilizers and Micro nutrient application are also poor for paddy crops. Hence 100 No. of 10 ha. (1000 ha.) INM demonstration for paddy crop have been proposed. The total cost of this component is Rs. 96.11 lakhs. Due to this demonstration, the present productivity of paddy from 5.250 Mt. / ha. could be increased to 6.00 MT/ ha. in the project. This demonstrations will be laid in the individual farmers fields.

2. Improvement in pulses production (Demonstrations)

The present productivity of pulses in the Sub basin is only 625 kg /ha. It is due to non adoption of DAP foliar spraying by many farmers during flowering and pod formation stages as recommended. Application of micro-nutrient like zinc sulphate is also not followed by many farmers.

Hence to educate the farmers and bring up the pulses productivity, 50 numbers of 10 ha. (500 ha.) pulses demonstration have been proposed. The total cost of the component is Rs. 9.70 lakhs. Through this demonstrations the present pulses productivity of 625 kg. / ha. could be increased to 875 kg. / ha. in the project period. This demonstration will be laid in the individual farmers fields.

3. INM – Cotton (Demonstration)

Similar to paddy crop, many farmers not following the recommended doses of balanced application of plant nutrients as per the soil test for cotton crop also. Application of Bio-fertilizers are also not followed fully by the farmers. Hence the present productivity is only 1 MT / ha. To improve this productivity to 1.6 MT / ha. 100 No. of 10 ha. (1000 ha.) demonstration have been suggested at a cost of Rs. 21.30 lakhs.

4. Supply of Hand Operated Sprayers

Farmers are unable to take up plant production measures in time, on notice of pests & diseases due to want of adequate number of sprayers in the Sub basin. The farmers have to adopt IPM norms to control the incidence. As a last resort, farmers have to take up chemical spraying which may be taken up simultaneously by all the farmers of the area. For this more sprayers are required. Hence supply of 450 No. of hand operated sprayers included in the components of activities. So that all the needy farmers could take up plant production measures at a time to control the incidence of pests and diseases. The total cost of the component is Rs. 7.20 lakhs. These sprayers will be distributed to the Farmers Associations where in they can access for spray.

The developmental components of activities for the sub-basin were finalised based on the field experience gained and the necessity felt during the joint walk through survey of the cross section of the sub-basin and also as per the decision taken during the joint meeting with the WRO, Line Department, WUA / FA and also as per the discussion had with the local Agriculture Extension officers of sub-basin. The main objective of the components proposed is to improve the productivity per unit of area / per unit of irrigation water. These components of activities may increase the standard of living of the farmers by getting more income than before.

The physical and financial requirement for the development components of activities have been worked out for five years of project period. The cost norms for this components of activities have been adopted mostly based on the existing cost norms followed in State / Centrally Sponsored Schemes being implemented by Agriculture / Horticulture Department.

10. The details of important constraints and the counter measures proposed are given below

Constrains & Challenges	Counter Measures
(a) Problem Soil	Only 1% of the area is under problem soil for which farmers are already applying gypsum. Hence no soil reclamation is necessary. In these areas saline and alkaline resistant crop varieties will be recommended to the farmers along with the technology support.
(b) Adverse climatic condition, drought.	The temperature is generally high and drought occurs once in five years. Suitable drought resistance varieties will be recommended to the needy areas. In addition drought proof agronomic / cultural practices will be introduced in these locations.
(c) Inferior quality of seeds (Low yielding traditional varieties still prevalent)	High yielding certified seeds and quality planting materials will be supplied to the farmers by the AECs, TNAU and KVK, etc. Only under minor millets few low yielding local varieties are prevalent in certain pockets, which will be replaced with the high yielding varieties during the project period by the Department.
(d) Limited availability and distribution of certified Seed from Govt. sources / private. High cost of hybrid seeds.	Certified seeds are stocked and distributed in the AECs as per the norms prescribed for each crop by the Agriculture department. Hybrid seeds cost more which are not distributed through AECs. However such seeds available with the private dealers could be utilized by the farmers. The services of TNAU regional research stations will also be utilized for supply of quality seeds and planting materials. Supply of seeds through National seeds corporation and other private sources will also be arranged.

(e) Improper irrigation practices (Flood irrigation)	SRI Technique in Paddy crop will be popularized among the farmers through SRI demonstrations to be laid by TNAU. Drip irrigation is going to be introduced by the AED for the crops like sugarcane cotton and coconut in the project as below.									
	<table border="1"> <thead> <tr> <th>Crop</th> <th>Area coverage (Ha)</th> <th>Area covered under drip (Ha)</th> </tr> </thead> <tbody> <tr> <td>Cotton</td> <td>2400</td> <td>96</td> </tr> <tr> <td>Sugarcane</td> <td>500</td> <td>200</td> </tr> </tbody> </table>	Crop	Area coverage (Ha)	Area covered under drip (Ha)	Cotton	2400	96	Sugarcane	500	200
Crop	Area coverage (Ha)	Area covered under drip (Ha)								
Cotton	2400	96								
Sugarcane	500	200								

	Coconut	480	267
(f) Inadequate extension services.	Departmental Extension Workers in all levels are limited in the sub-basin. Government extension service is the main extension source. Private extension services like Agri. clinic to be setup could be used during the project. The services of TNAU will also be utilized based on necessity.		
(g) Risk aversion	Few farmers have the knowledge of risk aversion. However many farmers have poor knowledge on this, due to non contact of AECs and departmental officials often. Farmers will be educated on risk aversion through trainings, capacity building, IEC facilities. Latest production technologies, price trends and market demand aspects will be covered in the trainings. Demonstrations will be laid in the farmers field for important crops like cotton, pulses, paddy, etc. to educate the farmers on various production technologies to be adopted.		
(h) Limited processing units.	Based on the necessity and demands of the farmers, required Agriculture processing units will be encouraged through private entrepreneurs.		
(i) Availability of labour	To overcome the existing labour problem required farm mechanization like drip and Fertigation will be introduced for crops like cotton, sugarcane, coconut and perennial crops.		

IAMWARM PROJECT- ARJUNA NADHI SUBBASIN

AGRICULTURE DEPARTMENT

11. Component wise project cost (Abstract)

Sl. No.	Name of the component	Full cost (Rs.)	Subsidy cost (Rs.)	Farmers contribution (Rs.)	Area to be covered in ha./ Nos.	Total cost in Lakh Rs.	Financial in Lakh Rs.	Farmers contribution in Lakh Rs.
1	Integrated Nutrition Management - Paddy	9611	7276	2335	1000	96.110	72.760	23.350

2	Improvement of Pulses production	970	857	113	500	4.850	4.285	0.565
3	Integrated Nutrition Management - Cotton	2130	1065	1065	1000	21.300	10.650	10.650

12. Component wise year wise project cost for five years [Split up Target]

SI.No	Name of the component	Unit cost IN Rs.	Area to be covered in ha.						Financial in Lakh Rs.					
			I year	II year	III year	IV year	V year	Total	I year	II year	III year	IV year	V year	Total
1	Integrated Nutrition Management - Paddy	7276	200	200	200	200	200	1000	14.552	14.552	14.552	14.552	14.552	72.760
2	Improvement of Pulses production	857	100	100	100	100	100	500	0.857	0.857	0.857	0.857	0.857	4.285
3	Integrated Nutrition Management - Cotton	1065	200	200	200	200	200	1000	2.130	2.130	2.130	2.130	2.130	10.650
4	Supply of Plant Protection Equipments -Hand operated sprayers	800	90	90	90	90	90	450	0.720	0.720	0.720	0.720	0.720	3.600
Total									18.259	18.259	18.259	18.259	18.259	91.295

4	Supply of Plant Protection Equipments- Hand operated sprayers [in numbers]	1600	800	800	450	7.200	3.600	3.600
Total						129.460	91.295	38.165

**IAMWARM PROJECT- ARJUNA NADHI SUB-BASIN
AGRICULTURE DEPARTMENT
VIRUDHUNAGAR DISTRICT**

13. Blockwise component wise year wise project cost

1) Integrated Nutrition Management - Paddy

Physical - Area in ha.

S.No.	Name of the block	I year	II year	III year	IV year	V year	Total
1	Watrap	70	70	70	70	70	350
2	Srivilliputtur	40	40	40	40	40	200
3	Sivakasi	40	40	40	40	40	200
4	Sattur	40	40	40	40	40	200
5	Virudhunagar	10	10	10	10	10	50
	Total	200	200	200	200	200	1000

1) Integrated Nutrition Management - Paddy

Financial in Lakh Rs. Rs.7276/ha.

S.No.	Name of the block	I year	II year	III year	IV year	V year	Total
1	Watrap	5.0932	5.0932	5.0932	5.0932	5.0932	25.466
2	Srivilliputtur	2.9104	2.9104	2.9104	2.9104	2.9104	14.552
3	Sivakasi	2.9104	2.9104	2.9104	2.9104	2.9104	14.552
4	Sattur	2.9104	2.9104	2.9104	2.9104	2.9104	14.552
5	Virudhunagar	0.7276	0.7276	0.7276	0.7276	0.7276	3.638
	Total	14.552	14.552	14.552	14.552	14.552	72.760

IAMWARM PROJECT- ARJUNA NADHI SUB-BASIN
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Blockwise component wise year wise project cost

2) Improvement of Pulses production

Physical - Area in ha.

S.No.	Name of the block	I year	II year	III year	IV year	V year	Total
1	Watrap	30	30	30	30	30	150
2	Srivilliputtur	20	20	20	20	20	100
3	Sivakasi	20	20	20	20	20	100
4	Sattur	20	20	20	20	20	100
5	Virudhunagar	10	10	10	10	10	50
Total		100	100	100	100	100	500

2) Improvement of Pulses production

Financial in Lakh Rs.

Unit cost Rs.857/ha.

S.No.	Name of the block	I year	II year	III year	IV year	V year	Total
1	Watrap	0.257	0.257	0.257	0.257	0.257	1.285
2	Srivilliputtur	0.171	0.171	0.171	0.171	0.171	0.855
3	Sivakasi	0.171	0.171	0.171	0.171	0.171	0.855
4	Sattur	0.171	0.171	0.171	0.171	0.171	0.855
5	Virudhunagar	0.086	0.086	0.086	0.086	0.086	0.430
Total		0.856	0.856	0.856	0.856	0.856	4.280

**IAMWARM PROJECT- ARJUNA NADHI SUB-BASIN
AGRICULTURE DEPARTMENT
VIRUDHUNAGAR DISTRICT**

Blockwise component wise year wise project cost

3) Integrated Nutrition Management - Cotton

Physical - Area in ha.

S.No.	Name of the block	I year	II year	III year	IV year	V year	Total
1	Watrap	70	70	70	70	70	350
2	Srivilliputtur	40	40	40	40	40	200
3	Sivakasi	40	40	40	40	40	200
4	Sattur	40	40	40	40	40	200
5	Virudhunagar	10	10	10	10	10	50
Total		200	200	200	200	200	1000

3) Integrated Nutrition Management - Cotton

Financial in Lakh Rs.

Unit cost Rs.1065/ha.

S.No.	Name of the block	I year	II year	III year	IV year	V year	Total
1	Watrap	0.746	0.746	0.746	0.746	0.746	3.730
2	Srivilliputtur	0.426	0.426	0.426	0.426	0.426	2.130
3	Sivakasi	0.426	0.426	0.426	0.426	0.426	2.130
4	Sattur	0.426	0.426	0.426	0.426	0.426	2.130
5	Virudhunagar	0.107	0.107	0.107	0.107	0.107	0.535
Total		2.13	2.13	2.13	2.13	2.13	10.655

**IAMWARM PROJECT- ARJUNA NADHI SUB-BASIN
AGRICULTURE DEPARTMENT**

Blockwise component wise year wise project cost

4) Supply of Plant Protection Equipments -Hand operated sprayers

Physical - Nos.

S.No.	Name of the block	I year	II year	III year	IV year	V year	Total
1	Watrap & Peraiyur	35	35	35	35	35	175
2	Srivilliputtur	30	30	30	30	30	150
3	Sivakasi	10	10	10	10	10	50
4	Sattur	10	10	10	10	10	50
5	Virudhunagar	5	5	5	5	5	25
Total		90	90	90	90	90	450

4) Supply of Plant Protection Equipments -Hand operated sprayers

Financial in Lakh Rs.

Unit cost Rs.800/No.ha.

S.No.	Name of the block	I year	II year	III year	IV year	V year	Total
1	Watrap & Peraiyur	0.280	0.280	0.280	0.280	0.280	1.400
2	Srivilliputtur	0.240	0.240	0.240	0.240	0.240	1.200
3	Sivakasi	0.080	0.080	0.080	0.080	0.080	0.400
4	Sattur	0.080	0.080	0.080	0.080	0.080	0.400
5	Virudhunagar	0.040	0.040	0.040	0.040	0.040	0.200
Total		0.720	0.720	0.720	0.720	0.720	3.600

14. COMPONENTWISE WORKSHEET

1) Integrated Nutrition Management - Paddy

Sl. No	Details	Full cost [Rs.]	Subsidy [Rs.]	Farmers Contribution [Rs.]	Remarks
1	Application of Vermicompost 1 M.T./ha. Rs.5000/M.T.	5000	4500	500	Soil is deficient in organic content. As It is a new component, the subsidy pattern is 90%
2	Application of Biofertilisers 31x Rs.6 Azospirillum-18 Phosphobacteria -13	186	93	93	Subsidy 50% as in demonstration in ISOPOM Scheme.
3	Application of chemical fertilisers based on soil testing lab. Analysis Soil analysis Soil health card N - 150Kg (app.)x10.92 = 1638 P - 50Kg (app.)x20.35 = 1018 K - 50 Kg (app.) x 7.73 = 387 Total =Rs. 3043	5 2 3043	 1521	5 2 1522	Subsidy 50% as in demonstration under ISOPOM Schemes. Fertiliser recommendation as per STL recommendation limited to 50% or Rs.1521 whichever is less
4	Zinc sulphate application 25 Kg. Rs. 25/Kg	625	562	63	Subsidy 90% as soil is deficient in Zinc and it is a new component. The crop response is also high with regard to yield.
5	Gypsum application 500 Kg/ha. Rs.1500 /M.T.	750	600	150	Subsidy 80% as in ISOPOM Scheme.
Total		9611	7276	2335	

Area in ha. 1000
Unit cost [subsidy] Rs.7,276
Total Subsidy amount in Rs.72.760 lakhs

COMPONENTWISE WORKSHEET

2) Improvement of Pulses production

Sl. No	Details	Full cost	Subsidy	Farmers Contribution	Remarks
1	DAP 2% Spraying Dose 10Kg/ha/spraying For 2 spryaing - 20 Kg DAP 20 Kg x Rs.9.72	195	175	20	90% subsidy since this technology is more important one for increasing the yield.
2	Zinc sulphate application 25 Kg. Rs. 25/Kg	625	562	63	90% subsidy since this technology is more important one for increasing the yield.
5	Gypsum application 100 Kg/ha. Rs.1500 /M.T.	150	120	30	80% subsidy as in ISOPOM Scheme
Total		970	857	113	

Area in ha.	500
Unit cost [subsidy]	Rs.857
Total Subsidy amount in lakhs	Rs.4.285 lakhs

COMPONENTWISE WORKSHEET

3) Integrated Nutrition Management - Cotton

S. No.	Details	Full cost	Subsidy	Farmer's Contribution	Remarks
1	Application of Biofertilisers 24x Rs.6 Azospirillum-11 Phosphobacteria -11	132	66	66	50% subsidy as in ISOPO M Scheme
2	Application of chemical fertilisers based soil testing lab. Analysis				50% subsidy as in ISOPO M Scheme
	Soil analysis				
	N - 80Kg (app.)x10.92 = 874				
	P - 40Kg (app.)x20.35 = 814				
	K - 40 Kg (app.) x 7.73 = 310				
	=Rs. 1998	1998	999	999	
	Total	2130	1065	1065	

Area in ha. 1000
Unit cost [subsidy] Rs.1,065
Total subsidy amount in lakhs Rs.10.65

COMPONENTWISE WORKSHEET

4) Supply of Plant Protection Equipments

Hand operated sprayers

S.No.	Details	Full cost	Subsidy	Farmers Contribution	Remarks
1	Supply of hand operated sprayers for effective control of pest and diseases	1600	800	800	Subsidy 50% as in Cotton Minimission -II
Total		1600	800	800	

No.of sprayers	450
Unit cost [subsidy]	Rs.800
Total in lakhs	Rs.3.600

15. Expected Outcomes

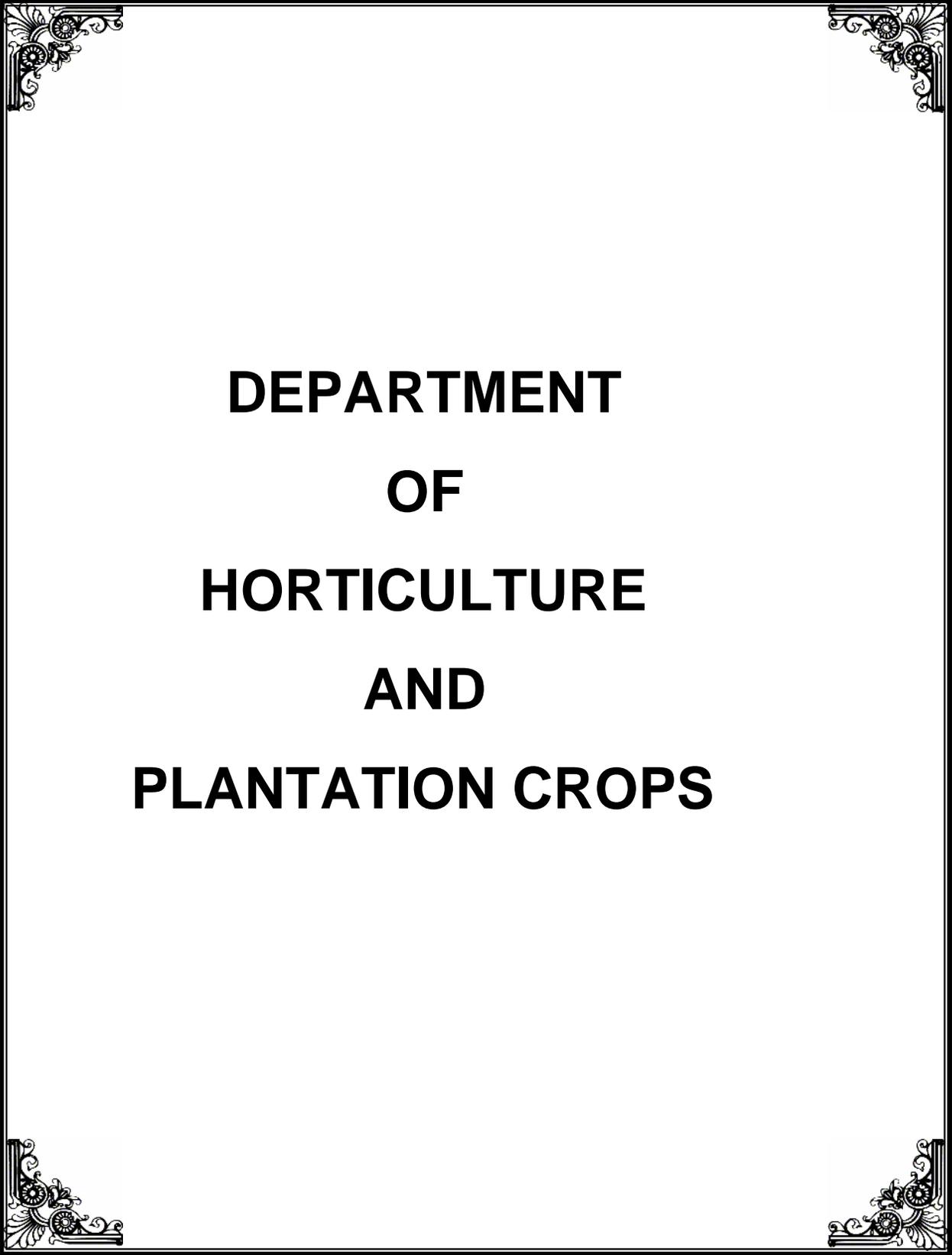
- 10% to 20 % shift from paddy to other commercial crops.
- 30% to 40% adoption of INM and IPM practices.
- 10% to 20 % increase in productivity.
- 10 % to 20 % increase in farm income.

FARM IMPLEMENTS - REAPER IN ACTION



MAIZE CULTIVATION





**DEPARTMENT
OF
HORTICULTURE
AND
PLANTATION CROPS**

**HORTICULTURE
IRRIGATED AGRICULTURE MODERNIZATION AND WATER BODIES
RESTORATION MANAGEMENT PROJECT**

I AM - WARM

Sub basin : ARJUNA NADHI
District : VIRUDHUNAGAR
WRO Region : MADURAI
Blocks covered : SRIVILLIPUTTUR, SIVAKASI, VIRUDHUNAGAR, SATTUR

I. Existing Horticulture Crop Scenario

The following horticulture crops are grown in the sub basin.

S.No	Crop	Varieties	Without Project Area (Ha)	Production (M.T)	Productivity (M.T)/Ha
I.	AREA EXPANSION				
A.	Fruits Plants				
1.	Banana	Rasthali Monthan Poovan	78	2457.00	31.50
	Total		78	2457.00	31.50
B.	Vegetables				
	1. Tomato	PKM 1	30	285.90	9.53
	2. Bhendi	Arka anamica	22	184.80	8.40
B.	Spices				
1.	Chillies	K1, K2	20	30.00	1.50 (dry)
	Grand Total		150	2487	

II. Existing Horticulture Practices:

Existing Cropping Pattern and Season :

1. Banana - January - February, November - December
2. Vegetables - June to September - Adipattam
Dec to Jan - Thai pattam

Proposed Generic Cropping Pattern:

1. Banana January - December
2. Vegetables - September - January
3. Vegetables - February - May.

Existing Irrigation Potential:

Out of the registered Ayacut area of 11186 Ha. The present irrigation potential is :

Fully irrigated	5031 Ha
Partially Irrigated	596 Ha
Gap	5559 Ha

	11186 Ha

Proposed Irrigation Facilities:

Out of **850Ha.** under Horticulture Crops, an area of **690 Ha.** is proposed to be covered under **micro irrigation** with fertigation by the Agricultural Engineering Department.

INM & IPM:

None of the farmers adopting INM but few farmers are adopting IPM in pre project.

It is proposed to adopt INM in **347Ha.** under **fruits** and **153 Ha.vegetables.**

1. Inputs:

a. Seed:

Certified seeds and traditional low yielding varieties of vegetable seeds are used by farmers at present. Many farmers use their own seeds and also exchange seeds among themselves. Few innovative farmers get the required seeds from the near by TNAU research stations, KVKs and private sources also.

It is proposed to procure Planting materials from the Government farms, Horticulture Research Station. The Hybrid seeds are available from the private sources and it will be procured and supplied to the farmers under Tender acts.

b. Soil:

In Arjuna Nadhi sub-basin mostly the soil is red loam, sandy loam and black soils with PH- ranging from 7 to 8.9. Soil is tested by soil testing laboratory at Arupukottai. Few farmers are practicing the STL recommendation and mobile soil laboratory at Arupukottai. The climate is mainly tropical in nature with the temperature ranges from 28 to 39 °c and relative humidity ranging from 64 to 96%.

In the view of the large number of soils samples proposed to be covered in the proposed intensive cropping pattern, private sources like Agri Clinic, Spic, MFL services etc also will be utilized for testing.

C. Prevalence of Organic Farming :

Organic farming is practiced by few farmers, less than 5 Ha.

It is proposed to cover 160 Ha.under Organic farming in chillies and 80 Ha. In medicinal plants.

2. Micro Irrigation :

1. Irrigation :

Irrigation is by open well and borewell. Mostly farmers are using ridges and furrow irrigation system. Only 20% of the farmers are using drip irrigation.

Mainly farmers are raising crops under rainfed condition.

There is lot of scope for developing Orchards in the sub-basin area by introducing Micro irrigation system.

Drip and Sprinkler irrigation are proposed during the current year.

Out of 850Ha under Horticulture Crops, an area of 690 Ha. Is proposed to cover under micro irrigation with fertigation by the Agricultural Engineering Department.

S.No	Crop	W.O.P. Area (Ha)	Diversi- fication Area Ha	W.P. Area (Ha)	Micro Irrigation (Ha)		
					Drip	Sprinkler	Total
1	2	3	4	5	6	7	8
				(3+4)			(6+7)
A.	Fruits Plants						
1.	Mango	0	25	25	20	0	20
2.	Guava	0	50	50	50	0	50
3.	Sapota	0	25	25	20	0	20
4.	Amla	0	25	25	20	0	20
5.	T.C.Banana	78	222	300	200	0	200
B.	Vegetable Crops	52	153	205	80	125	205
C.	Spices	0	0	0	0	0	0
1.	Chillies	20	160	180	0	110	110
2.	Coriander	0	40	40	0		
D.	Medicinal Plants	0	80	80	0	25	25
E.	Flowers	0	70	70	0	40	40
	Total	150	850	1000	390	300	690

C. Fertigation :

Farmers apply fertilizers directly. Awareness on Fertigation among the farmers is inadequate.

It is proposed to adopt INM in 347 Ha. under fruits.

d. Contract farming :

Contract farming is not practiced in command area. Farmers are reluctant to adopt contract farming practice due to fluctuation in produce prices and for want of legal guarantee. However steps are being taken to convince the farmers to take up contract farming atleast for commercial crops, to start with.

e. Pre & Post harvest practices adopted :

Chillies - Stalk less chillies are sun dried and exported. Oleoresin from chillies also extracted and exported.

f. Labour issues :

Availability of labour is very scarce. Labour availability is a problem due to migration of labours to urban area to get more wages by doing non agricultural works. Spinning mill/ Ginning factories, Match industries, Firework industries are more popular in this district. Hence labour availability is a problem for farm work. Many farmers use family labours in addition to hired labours by paying over wages. Skilled labours are more scarce than the unskilled labourers.

g. Actual Extension Service Available for TOT - Government / Private.

Available extension officers - No	Horticulture Officer, Srivilliputtur -	1
No	Horticulture Officer, Rajapalayam -	1
	Assistant Agricultural Officers	
Nos	1) Virudhunagar block -	2
Nos	2) Srivilliputtur block -	2
Nos	3) Sivakasi block -	2
Nos	4) Sattur block -	2

Available extension officers provide extension service to the farmers which are found to be inadequate. To compensate this, few NGO's are providing extension service to the farmers.

Name of the NGO's :	Place
1) SPEECH	Sivakasi
2) RIDO	Virudhunagar
3) ASSEFA	Sivakasi, Virudhunagar.

For transfer of latest farming techniques, many extension methods are being adopted. Besides distribution of inputs, required technical advice essential for the increased productivity are also given to the farmers. As per the Training and Visit programme norms, there must be one Village Extension Worker (VEW) for every 800 to 1000 farm families. But such norms are not followed in reality due to vacancies at all levels of extension staff.

In view of the above, it is proposed to outsource the Technical Input Provider (TIP) for 144 man months for 5 years.

2. Ground Realities of Irrigation Practices :

Improper irrigation practices (Ridges and Furrows, Basin irrigation)

Ridges and Furrows system is followed for Vegetables and Basin irrigation is followed for Fruits. Micro irrigation is going to be introduced by the Agriculture Engineering Department for 690 Ha.

3. Agri - Processing – Industries in the Sub Basin

There is one processing centre for fruits and vegetables i.e., Padmavathy Agro foods at Rajapalayam. There are four regulated markets with nine storage Godown, the fruits marketed through middle men to local markets of Sivakasi and Madurai. Vegetables are marketed to local markets in Sivakasi, Sattur, Srivilliputtur Virudhunagar and Madurai. Three Fruits and Vegetable processing units are available at Virudhunagar and Thenkasi.

The major production of TC Banana (about 10000 MT) would be marketed in Kerala besides terminal market proposed at Madurai. The production of Vegetables (2800 MT) would be marketed at the terminal market proposed during this project. The staggered planting methods recommended to the farmers will maintain price stability in Vegetables especially during peak period of harvest.

III. Constraints :

1. Constraints in Existing Scenario :

a. Problem Soil :

- 1) Soil PH is slightly alkaline in about 1% of the area. Farmers for applying Gypsum @ 500 kg/ha to all crops in the sub basin.
- 2) Less humus content.
- 3) Water stagnation during rainy season in black soil.

To overcome the problem soil,

The farmers are advised to take up soil sampling and soil testing. Organic farming is suggested in this project for medicinal plants and flowers to improve soil quality. Crop with Mango, Sapota, Amla, Guava, which can come up in all kinds of soil are suggested in this sub basin.

b. Adverse Climatic Condition :

These blocks are drought prone. Rainfall is not distributed uniformly throughout the year. Maximum rainfall is received during South West monsoon. Drought resistant crops like mango and Guava are suggested in this sub-basin.

c. Inferior Quality of Seed and Planting Material :

Farmers are using local and poor quality seeds. Truthful seeds are used by very few farmers. Many farmers use their seeds and also exchange seeds among themselves.

Quality plants will be supplied through Department of Horticulture and Plantation Crops (DOHPC). There are 2 State Horticulture Farms (SHF) are available at Srivilliputhur and Poovani to supply the plants.

The hybrid seeds are available from the private sources and it will be procured and supplied to the farmers under Tender Acts.

d. Inadequate Seed & Plants Supply from Government Sources

Required quantity of seeds are not available with DOHPC.

Seeds are supplied to farmers by Department after procuring the hybrid seeds through Tender systems.

Seeds and plants will be supplied to the farmers according to the target fixed by Government.

e. Improper Varieties

Few farmers are using local and poor quality seeds. Quality seeds supplied by DOHPC is not adequate. Certified seeds are used by farmers in some areas.

h. Low Price for Produce :

There is price fluctuation for fruits and vegetables. Due to Inadequate storage facilities, Middleman are taking the major portion of the profit of the farmers. Farmers are cultivating same vegetables in a particular season. So produce arrival to the market is heavy, leads to low price.

The staggered planting methods recommended to the farmers so as to maintain price stability in Vegetables especially during peak period of harvest. It is recommended to plant early and late season varieties.

i. Poor Adoption of Pre & Post Harvest Technologies:

Farmers are not following pre and post harvest technologies, this needs more attention.

1. Banana

- The farmers are not following pre harvest technologies to overcome the problem of seeds in Poovan variety.
- Bunch covering
- Removal of male flowers
- Fruit ripening
- Grading

2. Chillies

- To prevent fruit drop spraying of NAA
- Conventional sun drying
- Inadequate storage facilities
- Lack of processing units

3. All fruits and Vegetables

- Grading
- Processing
- Packing
- Refrigerated vans for transport

Awareness should be created among the farmers in pre and post harvest techniques by giving training to the farmers.

j. Limited Availability of Credit Facilities :

Credit facilities are available through Primary Agriculture cooperative Banks (PACB) and Nationalized banks. However to avail these facilities many formalities has to be met with. Hence simplification of procedure and single window system is essential.

k. Risk Aversion:

Few farmers have the knowledge of risk aversion. However many farmers have poor knowledge on this, due to non visit to Horticulture depots and Departmental Officers often. Due to lack of training, lack of capacity building, awareness on the new technologies in cultivation of crops and price trend of the produce at various levels are low.

l. Limited Processing Units :

Processing units available is limited in the sub-basin. Required type of processing unit for the required crop is not available. There is only one processing unit at Rajapalayam for processing fruits. i.e., Padmavathy Agro foods.

IV. Diversification / Future vision proposed :

S.No	Component s	Physical Target in Hectares						Production MT	PROPOSED MT/Ha
		I year	II Year	III Year	IV Year	V Year	Total		
I.	AREA EXPANSION								
A.	Fruits Plants								
1.	mango	25	0	0	0	0	25	375	15
2.	Guava	25	25	0	0	0	50	1000	20
3	Sapota	0	25	0	0	0	25	550	22
4	Amla	0	25	0	0	0	25	500	20
5.	TC Banana	50	70	70	32	0	222	9990	45
	Total	100	145	70	32	0	347	12415	
B.	Vegetables Crops								
1.	Hybrid Tomato	15	15	23	0	0	53	1590	30
2.	Hybrid Bhendi	25	25	50	0	0	100	1200	12
	Total	40	40	73	0	0	153	2790	
C.	Spices								
1.	Chillies	25	25	55	55	0	160	320	2
2.	Coriander	10	15	15	0	0	40	16	0.4
	Total	35	40	70	55	0	200	336	
D.	Medicinal plants								

1.	Senna	10	10	10	10	0	40	40 leaves 1.6 pods	1 0.4
2.	Periwinkle	10	10	10	10	0	40	30 roots 40 stems	0.75 1
	Total	20	20	20	20	0	80	111.6	
E.	Flowers								
1.	Marigold	15	15	15	15	0	60	1080	18
2.	Celasio	5	5	0	0	0	10	100	10
	Total	20	20	15	15	0	70	1180	
	Grand Total	215	265	248	122	0	850	16832.6	

Arjuna Nadhi sub-basin, Virudhunagar
Places of Diversification of crops are furnished as follows

S.No	Crops	Area Increased in ha during W.P	Places of Diversification
I.	Fruits		
1.	Mango(Alphonsa)	25	Watrap Srivilliputtur.Sivakasi, irudhunagar.
2.	Guava(L.49)	50	Watrap, Sivakasi, Srivilliputtur
3	Sapota (PKM-3)	25	
4	Amla (NA-7,Kanchan)	25	
5.	TC Banana (G.9)	222	Watrap, Srivilliputtur, Sivakasi, Sattur
II.	Vegetables		
1.	Tomato (Ruchi & Suruchi)	53	Watrap, Srivilliputtur, Sivakasi

2.	Bhendi M10	100	Watrap, Srivilliputtur, Sivakasi, Sattur
III.	Spices		
1.	Chillies (K1, K2)	160	Watrap, Srivilliputtur, Sivakasi, Sattur Virudhunagar,
2.	Coriander	40	Watrap, Srivilliputtur, Sivakasi, Sattur Virudhunagar,
IV.	Medicinal Plants		
1.	Senna	40	Watrap, Srivilliputtur, Sivakasi, Sattur Virudhunagar,
2.	Periwinkle	40	Watrap, Srivilliputtur, Sivakasi, Sattur Virudhunagar,
V.	Flowers		
1.	Marigold	60	Watrap, Srivilliputtur, Sivakasi
2.	Celosia	10	Watrap
	Total	850	

V. Challenges Thrown up by Diversification /Area Expansion :

1. Judicious Utilization of Water.

WRO should ensure quality and required quantum of irrigation water especially during the sowing season and the peak period of water requirement for each crop till harvest. Water can be judiciously utilized by adopting micro irrigation and mulching techniques.

2. Identification of Suitable Crops/Varieties

The cropping pattern proposed in this project are suggested based on the micro climatic suitability market trend, soil type and based on the choice of the farmers (WUA) / FA.

3. Production of Quality/ Planting Materials.

Timely supply of good quality and required quantity of pedigree planting materials and that will be made available through the State Horticulture Farms.

4. Farmers Acceptability for New Crops.

On farm training at the successful / progressive farmers fields, training, meetings, motivation campaigns, should be conducted. Publicity and propaganda to be taken up.

5. Lack of Transfer of Technology

Transfer of Technologies at field will be made available through TIP and NGOS.

6. Strengthening of Horticulture Information Centers

Information Education and communication facilities should be strengthened. Required training should be given to the extension person al and field level workers.

VI. Solutions and Recommendations :

- Soil reclamation will be made as per the recommendations of Soil Testing Labs.
- Mulching, addition of organic manure.
- Extension service should be provided to the farmers at the rate of 100 ha/TIP.
- Farmers can be advised early or delayed and late varieties and off season planting
- Efficient water usage by adoption of micro irrigation and mulching.
- The drought tolerant crops like mango, Amla, Sapota etc. are identified for this sub basin.

The walk through survey was conducted on 29.07.2006, 02.08.2006 at khansapuram S. Kodikulam villages. Discussion was held on 10.08.2006 with farmers and their requirement was assessed. Then based on the decision of the discussion meeting the cropping pattern was revised and updated.

6. Stakeholders Demands

- i. Instead of local variety, farmers demanded hybrid variety of vegetables and quality seeds.
- ii. Demand for micro irrigation.
- iii. Latest - production technology and post harvest technology and its transfer.
- iv. Inputs for organic farming.
- v. Credit facilities
- vi. Processing unit for preserving vegetables and fruits.
- vii. Need technical advise,
- viii.** Need market intelligence information.

8. Marketing Intervention Proposed with Reference to Identified Constraints:

S.No.	Constraint & Challenges	Counter Measures
1.	Problem soil	To overcome the problem soil, the farmers are advised to take up soil sampling and soil testing. Organic farming is suggested in this project for medicinal plant and flowers to improve the soil quality. The crops like mango, Sapota, Amla, and Guava which can come up in all kinds of soil are suggested in this sub basin.
2.	Adverse climatic condition	Drought resistance crops like, Mango, Sapota, Amla and Guava are suggested in this sub basin.
3.	Inferior quality of seed and planting material	Quality planting materials supplied through Department of Horticulture. There are two State Horticulture farms available at Srivilliputtur and Poovani to supply the planting materials. The Hybrid seeds are available from the private sources and it will be procured and supply to the farmers under Tender acts.
4.	Limited planting material available from government sources	Seeds are supplied to the farmers by department after procuring the Hybrid Seeds through tender system.
5.	Improper irrigation practices (Ridges and Furrows, Basin irrigation)	Micro irrigation is going to be introduced by the Agriculture Engineering Department for 690 Ha.
6.	Inadequate extension service	To cater the need technical input providers are proposed to be hired for 144 man months for 5 years.
7.	Low price for produce	Staggered planting methods recommended to the farmers will maintained price stability in vegetables especially during peak period of harvest. It is recommended to plant early and late season varieties.
8.	Poor adoption of Pre & Post harvest technologies	Awareness should be created among the farmers in pre and post harvest techniques by giving training to the farmers.

9.	Risk aversion	Training should be given to the farmers on new techniques.
10.	Limited processing units	Entrepreneurs should be motivated through training and seminars to start new processing units. Seeking new market for the produce eg for Banana, Kerala is a new market.
11.	Availability of labour	Farm mechanization is essential. Providing farm machineries for drudgery reduction, weeding, spraying to the WUA is needed.

**PROJECT ON DEVELOPMENT OF HORTICULTURE CROPS IN ARJUNA
NADHI SUB-BASIN**

Physical In Ha

Fin in Rs.

S.No.	Components	Fin in Rs.			Physical target in Hectares					
		Unit cost	Assistance 75%	25% share by farmer	I Yr	II Yr	III Yr	IV Yr	V Yr	Total
I.	AREA EXPANSION									
A.	Fruits plants									
1.	mango	30000	22500	7500	25	0	0	0	0	25
2.	Guava	30000	22500	7500	25	25	0	0	0	50
3.	Sapota	30000	22500	7500	0	25	0	0	0	25
4.	Amla	30000	22500	7500	0	25	0	0	0	25
5.	TC Banana	50000	37500	12500	50	70	70	32	0	222
	Total				100	145	70	32	0	347
B.	Vegetables crops									
1.	Hybrid tomato	30000	22500	7500	15	15	23	0	0	53
2.	Hybrid Bhendi	30000	22500	7500	25	25	50	0	0	100
	Total				40	40	73	0	0	153
C.	Spices									
1.	Chillies	15000	11250	3750	25	25	55	55	0	160
2.	Coriander	15000	11250	3750	10	15	15	0	0	40
	Total				35	40	70	55	0	200
D.	Medicinal plants									
1.	Senna	15000	11250	3750	10	10	10	10	0	40
2.	Periwinkle	15000	11250	3750	10	10	10	10	0	40
	Total				20	20	20	20	0	80
E.	Flowers									
1.	Marigold	24000	18000	6000	15	15	15	15	0	60
2.	Celasio	24000	18000	6000	5	5	0	0	0	10
	Total				20	20	15	15		70
	Grand Total				215	265	248	122	0	850

PROJECT ON DRIP IRRIGATION FOR HORTICULTURE CROPS

S.No	Crop	W.O.P. Area (Ha)	Diversi- fication Area Ha	W.P. Area (Ha)	Micro Irrigation (Ha)		
					Drip	Sprinkler	Total
1	2	3	4	5	6	7	8
				(3+4)			(6+7)
A.	Fruit Plants						
1.	Mango	0	25	25	20	-	20
2.	Guava	0	50	50	50	-	50
3.	Sapota	0	25	25	20	-	20
4.	Amla	0	25	25	20	-	20
5.	T.C.Banana	78	222	300	200	-	200
B.	Vegetable Crops	52	153	205	80	125	205
C.	Spices			0			
1.	Chillies	20	160	180	-	110	110
2.	Coriander	0	40	40			
D.	Medicinal Plants	0	80	80	-	25	25
E.	Flowers	0	70	70	-	40	40
	Total	210	850	1000	390	300	690

PROJECT ON INM / IPM

S.No.	Components	Fin in Rs.		Physical Target in Hectares					
		Unit cost	Assis- tance 75%	I Year	II Year	III Year	IV Year	V Year	Total
A.	Fruit plants								
1.	Mango	1000	1000	25	0	0	0	0	25
2.	Guava	1000	1000	25	25	0	0	0	50

3.	Sapota	1000	1000	0	25	0	0	0	25
4.	Amla	1000	1000	0	25	0	0	0	25
3.	TC Banana	1000	1000	50	70	70	32	0	222
	Total			100	145	70	32	0	347
B.	Vegetables Crops								
1.	Hybrid tomato	1000	1000	15	15	23	0	0	53
2.	Hybrid Bhendi	1000	1000	25	25	50	0	0	100
	Total			40	40	73	0	0	153
	Grand Total			140	185	143	32	0	500

PROJECT ON ORGANIC FARMING

S.No.	Components	Fin in Rs.	Physical Target in Hectares					
			I Year	II Year	III Year	IV Year	V Year	Total
A	Spices	Financial proposal already given in area expansion programme						
1.	Chillies		25	25	55	55	0	160
	Total		25	25	55	55	0	160
B	Medicinal Plants							
1.	Senna		10	10	10	10	0	40
2.	Periwinkle		10	10	10	10	0	40
	Total		20	20	20	20	0	80
	Total		45	45	75	75	0	240

**PROJECT ON DEVELOPMENT OF HORTICULTURE CROPS IN ARJUNA
NADHI SUB-BASIN**

Physical In Ha

Fin in Lakhs

S.No.	Components	Estimated cost	Financial in lakhs					Total (in lakhs)
			I Year	II Year	III Year	IV Year	V Year	
I.	AREA EXPANSION							
A.	Fruit plants							
1.	Mango	30000	7.50	0	0	0	0	7.50
2.	Guava	30000	7.50	7.50	0	0	0	15.00
3.	Sapota	30000	0	7.50	0	0	0	7.50
4.	Amla	30000	0	7.50	0	0	0	7.50
5.	TC Banana	50000	25.00	35.00	35.00	16.00	0	111.00
B.	Vegetable crops							
1.	Hybrid Tomato	30000	4.50	4.50	6.90	0	0	15.90
2.	Hybrid Bhendi	30000	7.50	7.50	15.00	0	0	30.00
C.	Spices							
1.	Chillies	15000	3.75	3.75	8.25	8.25	0	24.00
2.	Coriander	15000	1.50	2.25	2.25	0	0	6.00
D.	Medicinal plants							
1.	Senna	15000	1.50	1.50	1.50	1.50	0	6.00
2.	Periwinkle	15000	1.50	1.50	1.50	1.50	0	6.00
E.	Flowers							
1.	Marigold	25000	3.75	3.75	3.75	3.75	0	15.00
2.	Celasio	25000	1.25	1.25	0	0	0	2.50
	Total		65.25	83.50	74.15	31.00	0	253.90
II-1	Technical Input Provider	96000 / No	2.88	2.88	2.88	2.88	0	11.52
2	IEC / Capacity Building		1.00	1.00	0.50	0.50	0	3.00
	Total		3.88	3.88	3.38	3.38	0	14.52
III.	Organic farming	Amount already proposed in area expansion programme.						
IV	INM /IPM	1000	1.40	1.85	1.43	0.32	0	5.00
V	Micro Irrigation	Implemented by Agricultural Engineering Department.						
	Overall Total		70.53	89.23	78.96	34.70	0	273.42

Arjuna Nadhi Sub-Basin, Virudhunagar.
Places of Diversification of crops are furnished as follows

S.No	Crops	Area increased in ha during W.P.	Places of diversification
I.	Fruits		
1.	Mango(Alphonsa)	25	Watrap and Srivilliputtur.
2.	Guava(L.49)	50	Watrap, Sivakasi, Srivilliputtur
3.	Sapota (PKM.3,4)	25	Watrap, Srivilliputtur, Sivakasi, Virudhunagar.
4.	Amla (NA.7,Kanchan)	25	Watrap, Srivilliputtur, Sivakasi, Sattur.
3.	TC Banana (G.9)	222	Watrap, Srivilliputtur, Sivakasi, Sattur
II.	Vegetables		
1.	Tomato (Ruchi & Suruchi)	53	Watrap, Srivilliputtur, Sivakasi
2.	Bhendi M10	100	Watrap, Srivilliputtur, Sivakasi, Sattur
III.	Spices		
1.	Chillies (k1,k2)	160	Watrap, Srivilliputtur, Sivakasi, Virudhunagar, Sattur
2.	Coriander	40	Watrap, Srivilliputtur, Sivakasi, Virudhunagar, Sattur
IV.	Medicinal plants		
1.	Senna	40	Watrap, Srivilliputtur, Sivakasi, Virudhunagar, Sattur
2.	Periwinkle	40	Watrap, Srivilliputtur, Sivakasi, Virudhunagar, Sattur
V.	Flowers		
1.	Marigold	60	Watrap, Srivilliputtur, Sivakasi
2.	Celasio	10	Watrap
	Total	850	

**Arjuna Nadhi Sub-Basin, Virudhunagar.
Technologies Proposed under Horticulture .**

S.No	Technology/Practices	Existing output tons/ha	Area proposed in ha	Proposed output tons/ha	Percentage of increase	Budget outlay Rs.in lakhs
I. Varietal Diversification, Micro Irrigation, INM in Fruits.						
1.	Mango (Alphonso)	-	25	15	-	7.50
2.	Guava (L.49)	-	50	20	-	15.00
3.	Sapota (PKM.3,4)	-	25	22	-	7.50
4.	Amla (NA.7,Kanchan)	-	25	20	-	7.50
5.	TC Banana (G.9)	31.50	222	45	43	111.00
II. Varietal Diversification, Micro Irrigation, IPM in Vegetables						
1.	Tomato (Ruchi & Suruchi)	9.53	53	30	214	15.90
2.	Bhendi M10	8.40	100	12	43	30.00
III. Varietal Diversification, Micro Irrigation, Organic Farming in Spices						
1.	Chillies (k1,k2)	1.5	160	2.0	50	24.00
2.	Coriander	-	40	0.4	-	6.00
IV. Varietal Diversification, Micro Irrigation, Organic Farming in Medicinal Plants						
1.	Senna	-	40	1.5 leaves 0.6 pods	-	6.00
2.	Periwinkle	-	40	0.75 roots 1.0 stems 1.5 leaves	-	6.00
V. Varietal Diversification, Micro Irrigation in Flowers						
1.	Marigold	-	60	18	-	15.00
2.	Celasio	-	10	10	-	2.50
	Total	50.93	850	199.75	350	253.90
VI.1	Tech.Input Provider	96000/No	NA	NA	NA	11.52

2	IEC Capacity Building	-	-	-	-	3.00
	Total	-	-	-	-	14.52
VII	Organic Farming	Amount already proposed in area expansion programme.				
VIII	INM/IPM	1000/-per Ha	-	-	-	5.00
IX	Micro Irrigation	Implemented by Agriculture Engineering Department				
	Over all Total	-	-	-	-	273.42

**Arjuna nadhi sub-basin, Virudhunagar.
REQUIREMENTS OF INPUTS**

S.No	Name of the component	Varities	Area in ha	Seeds and plants requirement/Ha.	Total Requirement	Source of Plantting material
I.	Varietal Diversification in Fruits.					
1.	Mango	Alphonsa	25	100	2500	SHF, Poovani & Srivilliputtur
2.	Guava	L.49	50	275	13750	SHF, Poovani & Srivilliputtur
3.	Sapota	PKM.3,4	25	160	4000	SHF, Poovani & Srivilliputtur
4.	Amla	NA-7,Kanchan	25	275	6875	SHF, Poovani & Srivilliputtur
3.	T.C. Banana	Grand Nine	222	2500	555000	Spic Coimbatore, Grow more Hosur.
II.	Vegetables					
1.	Tomato	Ruchi, & Suruchi	53	0.150	7.950	Private source through tender
2.	Bhendi	M10	100	4kg	400	Private source through tender
III.	Spices					

1.	Chillies	K1, K2	160	1kg	160	NHRDF, Dindhugal Horticulture research station, Periyakulam
2.	Coriander		40	10kg	400	Private source through tender
IV.	Medicinal Plants					
1.	Senna		40	20kg	800	Private source through tender
2.	Periwinkle		40	2.5kg	100	Private source through tender
V.	Flowers					
1.	Marigold		60	1.5kg	90	Private source through tender
2.	Celosia		10	1kg	10kg	Private source

OUTCOME OF THE PROJECT

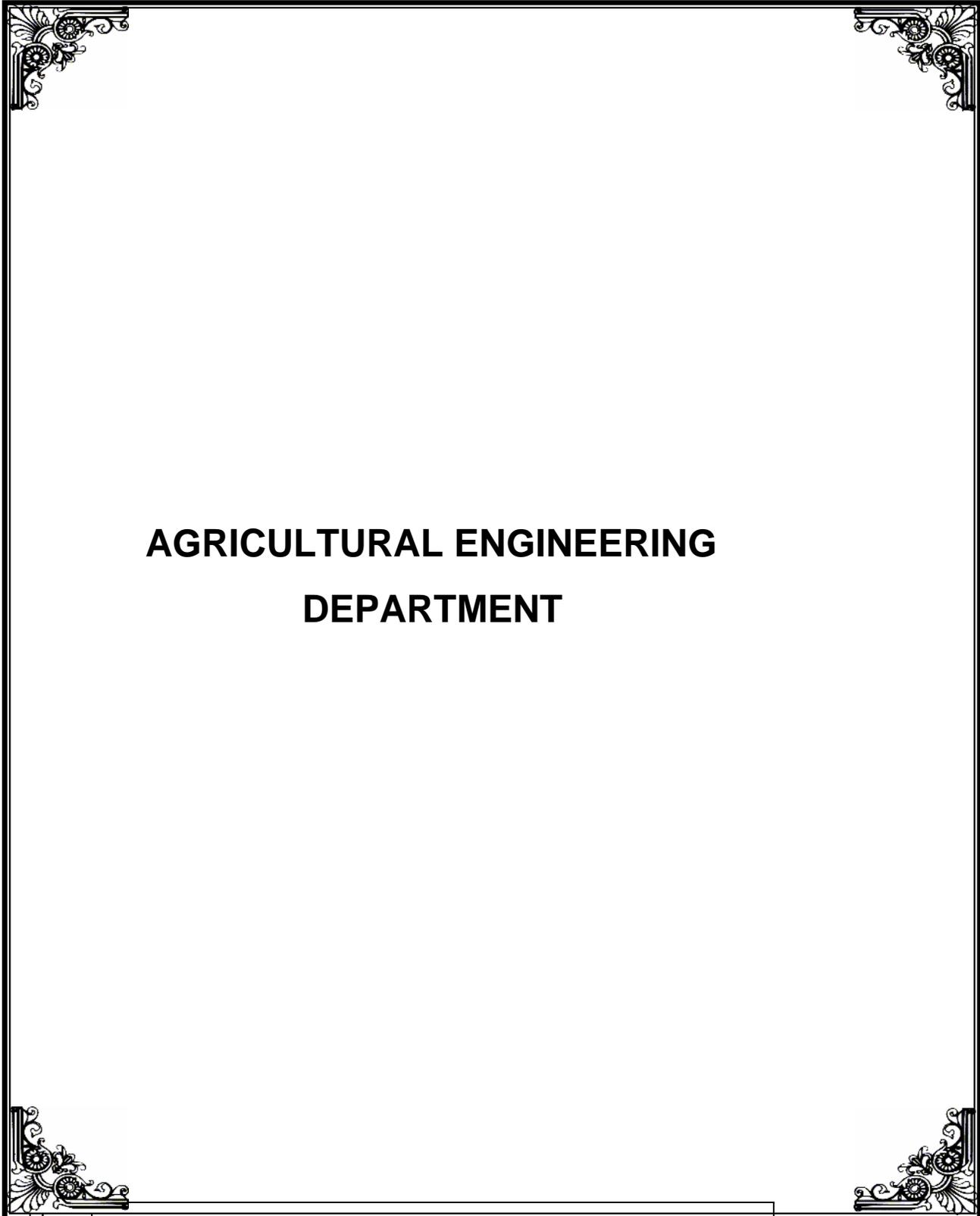
S.No.	DETAILS	WITHOUT PROJECT	WITH PROJECT	% INCREASE OVER WOP
1.	Area in Horticulture Crops(Ha)	150	850	466
2.	Introduction of Micro Irrigation (Ha)	0	690	690
3.	Introduction of IPM/INM(Ha)	0	500	500
4.	Introduction of Organic Farming (HA),	0	240	240
5.	Average Increase in Production (MT)	2958	16833	469

FRUIT CROP - MANGO



TISSUE BANANA





**AGRICULTURAL ENGINEERING
DEPARTMENT**

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2	Existing practices of farm mechanisation
3	Existing Farm Practices In Arjunanadhi Sub-Basin
4	Labour Availability In Arjunanadhi Sub-Basin
5	Ground realities of Farm Practices
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10	Details Of Development Components Proposed
11	Anticipated Benefits, Beneficiaries Contribution & Implementation Strategy
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Annexure:

1. Tank wise/Crop wise/Year wise MIS Components, Precision Farming, Community Bore Wells, Farm Ponds

AGRICULTURAL ENGINEERING DEPARTMENT
DETAILED PROJECT REPORT ON IAMWARM PROJECT IN ARJUNANADHI
SUB-BASIN IN VIRUDHUNAGAR DISTRICT

1. Existing ayacut scenario:

Total Registered Ayacut in Ha	:	11185.780
Total Irrigated Area in Ha	:	5626.615
Fully Irrigated	:	5030.830
Partially Irrigated	:	595.785
Average cultivation	:	5626.615
Gap	:	5559.165

a. Land Holdings:

The details of agriculturist (farmers) based on the land holdings of Arjunanadhi Sub basin are given below :-

Category	Size of holdings	Numbers	Percentage
Marginal	Below 1.00 Ha	52303	63.20 %
Small	1.00 – 2.00 Ha	23336	28.20 %
Medium	2.00 – 5.00 Ha	5933	7.20 %
Big	5.0 ha & above	1183	1.40 %
Total		82755	100 %

2. Existing practices of farm mechanisation

a. Implements and equipments usage:

In the Arjunanadhi sub-basin area, there are 245 tractors, 75 Power tillers, 40 Seed drills, 457 sprayers and about 4000 bullock carts available for carrying out farm operations, transport of materials and agricultural produce from villages to the towns. As per the norms for coverage area, one tractor can cover 80 Ha. approximately. so as to have optimal utilization. Hence, availability of tractors is more than sufficient. The same condition holds good for power tiller also. Taking the Farm Implements presently available in the Sub Basin into consideration, suitable farm Implements are proposed as popularization measure in this project.

b. Level of Mechanization:

The preparatory cultivation is being done by the tractors for wet ploughing. The Level of mechanization in respect of transplanting, sowing, inter cultivation is very poor. Besides, there is shortage of farm labour due to their mobilization to industries like textiles, fire works, matches, etc, and so farm mechanization is must for this sub-basin area. There is no awareness among the farmers regarding usage of agricultural machinery such as paddy transplanter, seed drills, weeder, etc. In respect of plant protection, the farmers use knapsack and power sprayers. For harvesting, the farmers are using combine harvester due to acute labour problems. The farmers do not have sufficient threshing floors and drying yards for post harvesting operations.

3. Existing irrigation practices :

The farmers of Arjunanadhi sub-basin follow Flood irrigation method and adopt field to field irrigation while using tank water. During non -seasonal periods, they use well water for irrigation in furrow systems. In tank ayacut area, the adoption of micro irrigation systems and other type of specialized irrigation are not followed. The farmers do not adopt conjunctive usage of surface and ground water.

The condition of distributory canals, supply channels are below standards. They are not lined up to standard specifications. There are no flow measurement devices. The field channels are in damaged condition and also not in proper alignment. Among, 110 M.I. Tanks, a couple of tanks were included for Modernisation of Tank Irrigation scheme and carried out OFD works before 15 years and the lined channels are also in damaged condition. Presently, the irrigation system is being maintained by PWD/WRO Department. The Water User Associations are under formation stage and election formalities are to be finalized.

4. Labour Availability:

As per 2001 census, the total population of Arjunanadhi sub-basin area is about 5,70,000. Among them, about 20% of population is agriculture labours. In view of heavy industrialization viz. textile industries, fireworks and match factories in the Arjunanadhi sub-basin area, the labour availability during seasonal period is much acute. The labour force prefers to go to industries due to higher salaries as compared to farm operations and income. Migration of labour to urban areas as well as shifting to other professions like mason, artisans etc is on the increase due to discontinued agricultural operations in view of monsoon failures or scanty rainfall.

5. Ground realities of Farm Practices:

There is no adoption of fertigation by the farming community in Arjunanadhi sub-basin. Lot of information on INM/IPM technologies is to be imparted to the farmers for attaining more farm productivity. There are no proper farm roads for transporting of harvested produces and the farmers use tank bunds for transportation.

6. Constraints observed:

The Walkthrough surveys have been carried out along with the line departments viz. PWD, Agricultural Engineering, Agriculture, Horticulture, Animal Husbandry, Fisheries etc. The field personnel of Agricultural Engineering

Department have carried out walkthrough survey along with the PWD officials exclusively in each tank. During walkthrough surveys and interactions with the ayacut farmers, the following constraints were widely observed.

- Deficit of water for irrigation
- Lack of equity in distribution between Head reach and Tail end farmers
- Field to field irrigation
- Uneven gradient of Channel
- Wastage of water due to flood irrigation
- Non-availability of labour for all agricultural practices
- Non-availability of water during the critical period of crop growth
- Low field application efficiency
- Not harvesting the excess rain water in the ayacut
- No supplementary irrigation during critical period of crop growth
- No correlation between available water and cropping pattern being followed
- Excess water received at a given point of time, was not stored and utilized.
- Non-adoption of modern micro irrigation methods and new agricultural practices.
- Inadequate farm mechanization.
- Traditional method of farming.
- Excess use of chemical fertilizers and pesticides.
- Inadequate post harvest management facilities.

7. Diversification / future vision proposed:

Water saving technologies and appropriate cropping pattern should be followed in order to achieve the maximum profitability per unit of water available, by implementing the work components proposed by PWD, Agricultural Engineering, Agriculture, Horticulture, Animal Husbandry, Fisheries departments. Thus, integrated development approach is essential to attain the desired results.

In order to address the problems/grievances evinced by the farming community, the following features are incorporated in the project for entire development of Arjunanadhi sub-basin.

1. Assuring supply of water at 4R (Right quantity, Right time, Right method and Right Place)
2. Promotion of conjunctive use of surface and ground water.
3. Devising water saving technologies
4. Introduction of Micro Irrigation System essentially for the gap areas under Agri/Horti crops proposed by the respective departments.
5. Augmenting the ground water potential by provision of rainwater harvesting structures like farm ponds in tail end areas of the M.I.Tanks.
6. Adoption of optimum cropping pattern to achieve maximum cropping intensity.
7. Promotion of farm mechanization for effective farm operations.
8. Provision of bore wells with energisation where surface irrigation potential lacks and in the gap areas for covering the registered ayacut areas under cultivation.

8. Challenges thrown up by Diversification / Area Expansion:

To meet the challenges, the farmers should be trained and educated on the following issues:

1. Equity distribution of irrigation water from head reach to tail end through Rotational Water Supply system
2. Significance of implementation of Micro Irrigation System
3. Conjunctive use of surface and ground water
4. Mechanization of farm operations
5. Consolidation of fragmented land holdings.
6. Contribution to be made for the beneficiary oriented work components.

9. Solutions and Recommendations:

To redress the problems/grievances explained by the ayacut farmers, appropriate strategies should be arrived. For this, active participation of ayacut farmers, who are water users, is essentially needed. The Water Users Associations are proposed to be formed on village basis by PWD as per the prescribed rules. Around 64 WUAs are to be formed in Arjunanadhi sub-basin and till date, 3 WUA viz. Golwarpatti Dam Mavilpatti Village Water Users Association, Golwarpatti Dam N.Mettupatti Village Water Users Association and Golwarpatti Dam Irukkankudi Village Water Users Association are formed and election formalities are completed.

The ayacut farmers/WUA meetings were conducted and on the basis of the interactions with the ayacut farmers, the following work components are recommended by the field personnel of Agricultural Engineering Department. Accordingly, the tankwise work components are arrived to implement the project.

1. Suitable Cropping Pattern to be evolved based on the available water and for agricultural/horticulture crops. Micro irrigation system is to be implemented to improve the application efficiency and to fetch more productivity.
2. Provision of bore wells with energisation at appropriate places, where irrigation potential lack/gap areas and to explore the ground water and using micro irrigation systems, the area could be cultivated effectively.
3. Demonstration and supply of farm machineries and equipments like power weeder, seed drills, Rotovators, Post Hole Diggers, etc, to save time and labour during farm operations will be done.
4. Provision of farm ponds in specific areas such as tail end of the ayacut areas where shortage of irrigation water prevails. Farm ponds are water harvesting structures which would facilitate supplementary irrigation of crops in lean periods, augment ground water potential and to facilitate the farmer to undertake fish culture for additional income.

10. Details of Development Components Proposed:

In the IAMWARM project, the following work components are proposed on the basis of needs and requirements of water users/beneficiary farmers in view of achieving the project objectives and uplifting the socio economic status of the farmers of the Arjunanadhi sub-basin.

10.1 Micro Irrigation:

The Micro Irrigation System components are proposed in accordance with the cropping pattern proposed by the Agriculture and Horticulture Departments in their DPR (with project) and minimum of 80% - maximum of 100% of the crop area in respect of Banana, Mango, Guava, Coconut, Sugarcane, Vegetables, Chillies, Medicinal plants, Flowers and Cotton, subject to the assurance of cropping by the concerned departments and availability of water sources. The remaining farmers would be motivated to visit the adjoining areas to witness the benefits of precision farming components so that the same may be replicated in their fields. The unit cost adopted is as per Govt. of India guidelines and Rs.3000/- per ha. has been proposed for earthwork and installation charges.

The benefits of MIS are increase in crop yield, productivity, savings in irrigation water, and input items like fertilizer and labour; increase in crop area with available water, controlled weed growth etc., by implementation of MIS, the gap area will be brought under cultivation. The MIS will be implemented with project investment from World Bank, assistance by GOI and contribution from the beneficiaries. The cost sharing will be decided by the Government. TNAU has proposed MIS for 34 Ha under adaptive research trial demo plots and it is not overlapped with the area proposed by AED under MIS.

The table showing the crop wise proposed area for micro irrigation system is given below

Sl. No.	Name of Crop	With project area in Ha	Existing area under Drip/Sprinkler (Ha)	Area Proposed by TNAU (Ha)	Balance area available (Ha)	Proposed by AED for micro Irrigation (Ha)	
						Drip	Sprinkler
1	2	3	4	5	6	7	8
	I CROP						
1	Banana	300	-	10	290	232	-
2	Fruits (Mango, Amla, Sapota)	75	-	-	75	60	-
3	Guava	50	-	-	50	50	-
4	Fodder	250	-	-	250	0	-
5	Coconut	480	-	-	480	384	-
6.	Cotton	1431	-	-	1431	250	-
7	Sugarcane	500	-	24	476	381	-
8	Paddy	4400	-	-	4400	0	-
9	Vegetables	80	-	-	80	80 (Precision Farming)	
10.	Chillies	180	-	-	180	0	110
11	Pulses	1200	-	-	1200	0	-
12	Gingelly	500	-	-	500	0	-
13	Maize	1700	-	-	1700	0	-
14.	Coriandar	40	-	-	40	0	-
	Total	11186		-	11186	0	110
	II CROP					0	
14	Medicinal plants	80	-	-	80	0	25
15	Flowers	70	-	-	70	0	40
16.	Vegetables	125	-	-	125	0	125
	Total	275	0	0	275	0	190
	Grand Total	550	0	34	550	1437	300

a. Drip Irrigation System:

Drip irrigation systems with fertigation component are proposed over an area for horticultural crops like banana, guava, mango, etc., and for agricultural crops like coconut, sugarcane and cotton and the total extent under Drip Irrigation System would be 1357 Ha.

Sugarcane is one of the commercial crops with higher water requirement of 2000-2500mm. Unlike surface method of irrigation, the water use efficiency is extremely higher in drip method of irrigation, as this technology helps to supply the required quantity of irrigation water directly to root zone besides reducing conveyance, evaporation and distribution losses. The Agriculture Department and TNAU have recommended latest Pit Method for sugarcane for higher yields. Pit Method is more effective only with the adoption of Drip Irrigation System. Under Pit method, the yield will be increased by more than two times of nominal yield obtained from conventional method. To minimize the usage of groundwater and to save the labor costs, the drip irrigation system shall be adopted for sustained income to the farmers.

Sugarcane is the major crop next to Paddy grown in an extent of 436 Ha which would be increased to 500 Ha in post project period. Out of this, 80% area i.e. 381 Ha are proposed under drip irrigation with fertigation. Besides, 80% of Coconut area to an extent of 384 Ha. out of 480 Ha. would be brought under drip irrigation with fertigation.

b. Sprinkler Irrigation System:

Sprinkler irrigation system component is proposed for vegetables, chillies, medicinal plants and flowers to the extent of 348 hectares for economic usage of irrigation water to attain the field capacity for effective growth of crops. The conveyance and application efficiency will be enhanced with the adoption of sprinkler irrigation system. The pests are also effectively controlled by the sprinkler irrigation in the case of vegetables, chillies and flowers.

c. Precision Farming:

Precision farming is a farm practice, in which, all inputs such as water, seed, nutrients, fertilizers, plant protection chemicals, other production technologies are supplied in optimum quantity at right time in right manner to get the highest possible yield. Fertigation is a system wherein application of plant nutrients to a crop is done through drip irrigation. By adopting Fertigation practices through drip irrigation, 25% savings of fertilizers and complete utilisation of applied nutrients by the plants are noticed by farmers as reported by TNAU.

Out of 205 Ha. proposed under Vegetables by Horticulture Department, 125 Ha as II crop has been proposed under Sprinkler Irrigation and balance of 80 Ha as I crop is proposed under Precision Farming, which will be 100% funded from the project. The beneficiaries contribution shall be 10% of the total cost and deposited in corpus fund for maintenance of the Precision Farming Systems.

The tank wise/crop wise area proposed under the above components are furnished in annexure (Page No.178)

10.2. Farm Mechanization:

To promote and demonstrate the farm mechanization among the farmers, the labour and time saving agricultural machinery and implements shall be distributed to the Water Users' Associations (WUA) (100% funding) to attain more farm productivity. These implements are proposed on popularization mode. These implements shall be hired out to the beneficiaries by the WUA and hire charges will be prescribed by the WUA. The collected hire charges will be utilized for maintenance mechanism.

Tractor drawn Rotovators are proposed for pulverizing the soil clods and crop remains especially sugarcane stubbles. Post Hole Diggers would be utilized for Sugarcane under pit method. Power Weeders would be useful for irrigated dry crops and hence proposed. Seed Drills, for cotton, maize, pulses, are proposed.

Due to this, the farm operations shall be effectively carried out by the farmers without excess dependence on labour force, since the urbanization and industrialization being occurred in Arjunanadhi sub-basin areas.

10.3. Community Bore Wells with PVC pipe lines :

Adopting new pattern of irrigation (conjunctive use of surface and ground water) as executed in Hanumanadhi sub-basin, i.e., linking of all sluices of the tank by PVC pipe lines and construction of sump for storage of surface water, provision of community well and to store the ground water in the above said sump in non-season periods and installation of drip/sprinkler irrigation by utilizing the water stored in the sump using hydrants. As a demonstrative model, **Eenjar Naduvapatti tank (ayacut area: 102 ha)** has been selected (where no assured supply of irrigation water to all the parts of the ayacut areas) for linking of sluices, construction of sump, provision of community bore well and to install the drip and sprinkler irrigation.

The laying of PVC pipe lines and construction of sumps will be carried out with the farmers' contribution of 10% of the cost estimate for works and 10% of cost estimate will be collected from the beneficiaries for community bore wells and deposited as corpus fund for maintenance. The recurring expenditure (electricity charges, operating charges and repair charges) shall be met from the water charges to be collected from the beneficiaries on hour basis and non recurring expenditure shall be met from the interest of corpus fund.

To facilitate the conjunctive use of irrigation water and also to irrigate gap areas where elevated fields are located, which could not get assured supply of irrigation water, the community bore wells-15 nos. are proposed in direct ayacut areas like Periar Main canal, Kovilar Main canal, Anaikuttam main canal, Golwarpatti main canal and Eenjar Naduvapatti M.I. Tank as need based experiment. The Micro Irrigation System installations will be carried out in the command areas of these Bore Wells for more farm productivity and sustained income generation to the farmers. On evaluation of the performance of the above community bore wells, the same will be extended to other M.I. Tanks on need basis.

10.4 Farm Ponds:

The Farm Ponds are ideal water harvesting structures, proposed in tail end areas of the ayacut area. The excess run off in the ayacut area shall be stored in the Farm Ponds during monsoon seasons. Unexpected heavy run off received during summer seasons shall also be harvested in these Farm Ponds. During the critical stage of crops (before harvesting stage) when irrigation water could not be extended, the water stored in Farm Ponds shall be utilized as life saving irrigation. This will give assured yield of crops for the farmers.

The Farm Ponds are constructed in the dimension of 30M X 30M X 1.50M and the capacity of farm pond would be 1350 Cubic meters. With the help of 13.50 lakhs liters of water, an extent of 2.7 hectares under dry irrigated crops like maize, millets, pulses shall be given life saving irrigation. The Farm Ponds will have 4 to 6 fillings of rain water during one year period due to all monsoonal rains.

For instance, if maize crop is raised in an extent of 2.7Ha. with the life saving irrigation from Farm Ponds, an yield of 9.45 M.T. could be obtained @ 3.5 M.T./Ha) which could fetch Rs.56,700/- to the farmer (@ Rs.6000/- per M.T. with project. The farmer could get nominal profit of Rs.11,000/- per Ha after deduction of cultivation cost of Rs. 10,000/- which exceeds the unit cost of farm pond Rs.40,000/- over a period of four years.

Besides, the Farm Ponds shall act as Fish ponds for Fish Production giving additional income to the farmers of the tail end. The Fisheries Department has proposed Fisheries Development activities in 30 Farm Ponds and Fish Culture would yield income of Rs.10,000/- per crop to the farmer. About 50 nos. of Farm Ponds are proposed @ Rs.40,000/-. The Farmers who opted for Farm Ponds would be motivated for adopting Drip / Sprinkler irrigation for raising their crops.

The contribution @ 10% of the total estimate cost will be collected from the beneficiaries for the work component.

11. Benefits Anticipated:

The following benefits will be derived from ayacut area development works under IAMWARM project:

1. Improved irrigation efficiency resulting in enhanced farm productivity per unit of irrigation water.
2. The Gap area is bridged.
3. Sustained farm income to the farming community.
4. The farm productivity per unit area is increased.
5. Increase in cropping intensity.
6. Improvement in socio-economic status of the farmers.

a. Contribution By the Beneficiaries:

The beneficiaries are motivated to contribute for the works component proposed for their effective participation in the project. The work components like Micro Irrigation System implementation are individual oriented benefit schemes and so it was insisted to contribute 50% contribution during WUA/Farmers' meeting. But, the farmers expressed that they could only contribute 10% of the total cost in view of their socio economic status and 5% in the case of SC/ST farmers. Hence, the beneficiary contribution may be fixed as 10%. In respect of common benefited/community oriented works such as Bore wells with energisation, 10% contributions shall be collected as beneficiaries' contribution which is appraised with the ayacut farmers during WUA meeting.

b. Implementation Strategy:

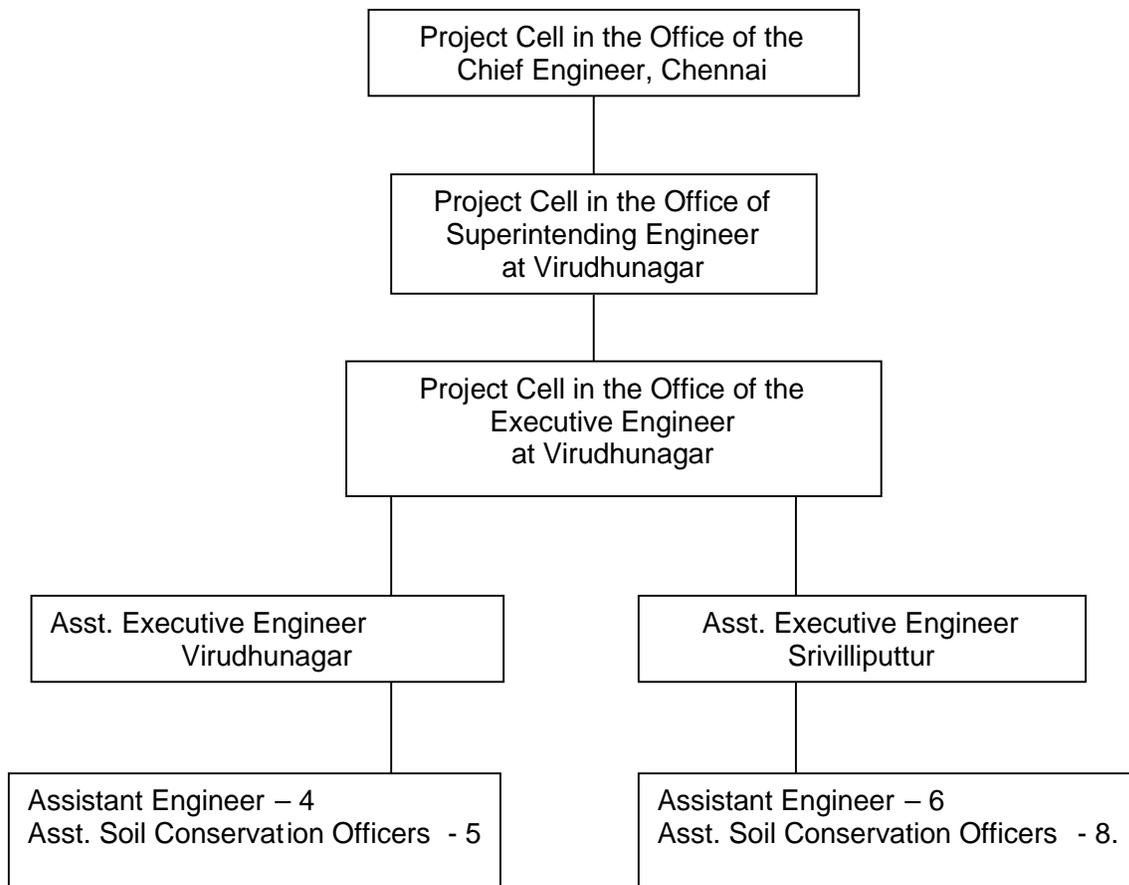
The Project Cell for IAMWARM project has been created in the office of Chief Engineer (AE), Chennai-35 comprising Superintending Engineer (AE), Executive Engineer (AE), Asst. Executive Engineers (AE) and Assistant Engineers (AE) to formulate project proposals, to carry out procurement plans, to co-ordinate with the line departments and to monitor the performance of the district level officers.

The District level Project Cell for IAMWARM project has been formed comprising the Executive Engineer (AE), Asst. Executive Engineers (AE) and

Asst. Engineers (AE) to finalize the DPR, to co-ordinate with the district level line departments and to monitor the performance of the field personnel.

The Flow Chart showing the HR Pattern and the sanctioned strength of the available field personnel for implementation of IAMWARM project is furnished below:

c. HR Pattern



The Work components viz. Community Bore Wells along with the buried PVC Pipe Lines and Farm Ponds shall be executed through the concerned Beneficiaries / WUA.

In respect of Farm Mechanization, the farm implements will be procured by the Agricultural Engineering Department from the approved suppliers and distributed to the concerned WUA.

The Work Components viz. Micro Irrigation System Installation and Precision Farming will be executed by National Shopping, adopting procurement procedures.

12. **Outcome Indicators:**

1. The Crop Diversification and crop intensity in post project period due to installation of Drip & Sprinkler Irrigation systems in the extent of 2581 Ha.
2. Increased area under Hi-Tech Irrigation like Drip and Sprinkler Irrigation.
3. Precision Farming practices in an extent of 80 Ha. For increased income.
4. Increased Farm Productivity per unit area and unit of irrigation water
5. Irrigated Agriculture in gap area.
6. Increase in irrigation efficiency by way of 15 nos. of Community Bore Wells along with PVC Buried pipe lines
7. Technology dissemination to the farmers.
8. Increase in awareness in farm mechanization
9. Supplement income generation by diversified farm activities through fisheries (from farm ponds), cattle breeding (fodder development).
10. Increase in per capita income to the beneficiary farmers.

Annexure
ARJUNANADHI SUB-BASIN

Sl. No.	Components Proposed	Unit	Unit cost (Rs.)	Physical (Ha.)	Fin. (Rs. in Lakhs)
I	Micro Irrigation				
a)	Drip Irrigation with Fertigation				
1	Banana (2m x 2m)	Ha.	52800	232	122.50
2	Guava (6m x 6m)	Ha.	33200	50	16.60
3	Fruits (10m x 10m)	Ha.	21000	60	12.60
4	Sugarcane (1.5m x 1.5m)	Ha.	58000	381	220.98
5	Coconut (8m x 8m)	Ha.	22900	384	87.94
6	Cotton (1MX1M)	Ha.	58000	250	145.00
	Total	Ha.		1357	605.62
b)	Sprinkler Irrigation System				
1	Chillies	Ha.	15000	144	21.60
2	Medicinal Plants	Ha.	15000	39	5.85
3	Flowers	Ha.	15000	40	6.00
4	Vegetables (II Crop)	Ha.	15000	125	18.75
	Total	Ha.		348	52.20
II	Precision Farming				
	Vegetables (I Crop)	Ha.	75000	80	60.00
III	Community Bore Wells along with the Buried PVC Pipe Lines				
1	Cost of Pipe laying for Eenjar naduvapatti M.I.Tank as demo model	M	15000	102	15.30
2	Construction of sump	Nos.	90000	1	0.90
3	Bore Wells with energisation	Nos.	200000	15	30.00
	Total				46.20
IV	Farm mechanisation with advanced user friendly implements				
1	Rotovators		90000	3	2.70
2	Power Weeder		75000	11	8.25
3	Seed drill for Maize		35000	8	2.80
4	Post Hole Digger		90000	3	2.70
	Total	Ha.			16.45
V	Water Harvesting Structures				
	Farm Ponds	No	40000	50	20.00
	Grand Total (Rs. in Lakhs)				800.47

DRIP IRRIGATION



SPRINKLER IRRIGATION





Tamil Nadu Agricultural University

**Irrigated Agriculture Modernization and Water Bodies Restoration and
Management Project**

(IAMWARM)
Arjuna Nadhi Sub Basin
Tamil Nadu Agricultural University
A. Implementing Station

Cotton Research Station, Srivilliputhur is identified as implementing centre for Arjunanadhi sub-basin activities under TNAU. This centre is located in Southern Agro-climatic zone of Tamil Nadu. This centre released six cotton varieties viz., MCU 2, MCU 5, MCU 8, SVPR 1, SVPR 2 and SVPR 3. Among this SVPR 2 is more popular in summer season and it is being cultivated in 80% of the cotton area of the sub basin. This centre also released one sesame variety (SVPR 1) and palmyrah (SVPR 1). Besides, this centre developed the following technologies for summer irrigated cotton.

- NPK schedule of 60 : 30 : 30 kg/ha is optimum for summer irrigated cotton
- Cotton sowing in ridges and furrows and subsequent earthing up on 40 days after sowing (DAS) reduce stem weevil incidence.
- The jassid incidence of summer cotton could be reduced by spraying 3 % neem oil.
- This centre developed IPM module for irrigated cotton.

B. Cropping Pattern in the Sub Basin (In ha)

Crops	WOP				WP			
	FI	PI	RF	Total	FI	PI	RF	Total
Annual crops								
Sugarcane	436			436	500			500
Banana	78			78	300			300
Perennial crops								
Coconut	439			439	480			480
Sapota					25			25
Amla					25			25
Guava					50			50
Mango					25			25
Fodder					250			250
I crop (Sep – Jan)								
Paddy	3803	596		4399	4400			4400
Cotton	185			185	1431			1431
Vegetables	41			41	80			80
Chillies	20			20	180			180
Pulses	29			29	1200			1200
Gingelly			1000	1000		500		500
Cholam (Fodder)			300	300				
Cumbu			300	300				
Maize			900	900	1700			1700
Coriander					40			40
II crop (Feb – May)								
Paddy	872			872	875			875

Cotton	445			445	980			980
Vegetables	11			11	125			125
Pulses	202			202	1530			1530
Periwinkle					40			40
Marigold					60			60
Maize						1300		1300
Celosia					10			10
Senna					40			40

9658

16146

Total Regd. Ayacut	11186	
11186		
Cropping intensity (%)	86	144
Fully irrigated	5031	
Partially irrigated	596	
Gap	5559	

Climate:

Arjunanadhi sub basin starts from Watrap and Periyakulam and extends up to Golwarpatti Reserve Forest (Thiruthangal area) with warm day and night temperature throughout the year. This region is mostly benefited by North – East Monsoon rainfall. The Vaippar basin in which Arjuna River sub basin receives an annual mean rainfall of 722 mm. South West monsoon contribute 148 mm (20%), north-east monsoon contribute 414 mm (53%). The mean annual rain fall recorded at 6 rain gauge station is furnished below.

<u>Sl No</u>	<u>Name of Rain Gauge Station</u>	<u>North East Monsoon (mm)</u>	<u>Summer (mm)</u>	<u>South west monsoon (mm)</u>	<u>Annual (mm)</u>
<u>1.</u>	<u>Watrap</u>	<u>682.5</u>	<u>221.6</u>	<u>82.1</u>	<u>986.2</u>
<u>2.</u>	<u>Srivilliputhur</u>	<u>604.8</u>	<u>215.6</u>	<u>71.6</u>	<u>892.0</u>
<u>3.</u>	<u>Sivakasi</u>	<u>486.6</u>	<u>170.3</u>	<u>69.8</u>	<u>726.7</u>
<u>4</u>	<u>Sattur</u>	<u>459.1</u>	<u>158.6</u>	<u>71.6</u>	<u>689.3</u>
<u>5</u>	<u>Virudhunagar</u>	<u>506.6</u>	<u>170.4</u>	<u>127.6</u>	<u>804.6</u>

Soil Type:

The sub basin is dominated by alfisols, vertisols and inceptisols.

C. Objectives

- ◆ To promote water saving technologies (SRI / Drip) in agricultural and horticultural crops for large scale adoption
- ◆ To enhance the crop and water productivity
- ◆ To increase the cropped area by crop diversification
- ◆ To converge with WRO and other line departments for an over all improvement of total farm income

D. Special Issues

- Non adoption of SRI in rice
- Non-adoption of Micro Irrigation System in banana, coconut and sugarcane
- Lack of crop diversification are identified as special issues of the sub basin
- Low productivity and quality of cotton.
- To address the special issues (prevalent in the sub basin), the counter measures are proposed through project mode and mission mode approaches.

e. Counter Measures Proposed

- ❖ Drip fertigation in sugarcane, Banana and Coconut
- ❖ Improved production technologies in maize & pulses
- ❖ Adoption of SRI Techniques in Paddy
- ❖ Improved Cotton production technology

I. PROJECT MODE ACTIVITIES

Technologies for Transformation

a. Drip Fertigation in Sugarcane and Banana

The productivity of water is the inter-dependent relationship between the amount of water used and the economic yield realised, which is also termed as Water Use Efficiency (WUE) at different levels. The productivity of water could be increased in field level either by reducing the water requirement without detrimental effect on yield or by increasing the production per unit water by controlling loss of water through conveyance, distribution, application, seepage, percolation *etc.*, Micro irrigation techniques like drip irrigation in sugarcane and Orchard crops improves the Water Use Efficiency.

DRIP FERTIGATION IN SUGARCANE



In Arjunanadhi sub basin it is proposed to conduct drip fertigation in sugarcane and banana under precision farming mode to an extent of 34 ha viz., 24 ha in sugarcane and 10 ha in banana. This demonstration is much helpful to expand the area under drip fertigation in post project period.

Sl.No.	Technology	Total Area (ha)	Unit Cost (Rs./ha)	Total (Rs. in lakhs)
1	Drip Fertigation in sugarcane	24	64000	15.36
2	Drip Fertigation in Banana	10	69800	6.98

Technology	Total area (hectares)	Location of Technology Demo
Drip Fertigation in Sugarcane	24	Nathampatti (10), Anaikuttam dam (10), Veppankulam(4),
Drip Fertigation in Banana	10	Nalapatti anicut (5), Srivilliputhur Periya kulam(5)

Justification for the Unit Cost for Sugarcane

Sl.No	Particulars		Amount in (Rs.)
1	Drip system	:	58000.00
2	Fertigation		
	Urea 598 kg @ Rs. 5 /kg	:	3000.00
	Super Phosphate - 400 kg @ Rs. 4 /kg		1600.00
	Muriate of Potash – 187.4 kg @ Rs.4.75/ kg	:	890.00
	Bio fertilizers and micro nutrients		550.00
	Total cost		64000.00

Worksheet for Improved Technology transfer in Banana

Sl.No	Particulars		Amount in (Rs.)
1	Cost of Drip System		52800.00
	Cost of fertilizers 210:50:390 g NPK/plant/year	:	
	Urea - 1139.25Urea /ha. @ Rs. 5 /kg	:	5697.00
	Super Phosphate - 781.25 @ Rs. 4 /kg	:	3128.00
	Muriate of Potash - 1618.5 kg @ Rs.4.75/ kg	:	7690.00
	Micro nutrients		500.00
	Total		69815.00

Only N& K will be given as critical input for fertigation

b. Drip Fertigation in Coconut

The demonstrations of 50 ha will be conducted in drip irrigation area laid out by Agricultural Engineering Department. Here the cost of fertilizers for 1 year is worked out and included in the budget and the fertigation technology will be demonstrated. So this will be much helpful for other farmers to adopt the fertigation in more precise manner. For that purpose, field days will be conducted to have collective influence.

Sl.No.	Technology	Total Area (ha)	Unit Cost (Rs./ha)	Total (Rs. in lakhs)
1	Drip Fertigation in coconut in AED	50	5500	2.75

Technology	Total area (hectares)	Location of Technology Demo
Drip Fertigation in Coconut in AED	50	Pilavukkal Periyar(25), Pilavukkal Kovilar (15), Viragasamudram (5), Nathampatti (5)

Worksheet for Improved Technology Transfer in Coconut

Sl.No	Particulars		Amount in (Rs.)
1	Cost of fertilizers (1.3: 2: 3 kg NPK / tree) for 200 trees	:	
	Urea - 260 kg @ Rs. 5 / kg	:	1300.00
	Super Phosphate - 400 kg @ Rs. 4 /kg	:	1600.00
	Muriate of Potash - 600 kg @ Rs.4.75/ kg	:	2850.00
	Total cost		5750.00

C. Improved Production Technologies in Maize

Under Arjuna Nadhi sub basin nearly 1700 ha can be brought under maize cultivation in the post project period by the Agricultural Department. TNAU included its transfer of technology in maize, which helps in the large scale adoption. The technologies are seed drill sowing, improved varieties (CO1) / hybrids (COH M 4), balanced nutrition and scientific water management. Under this the cost of critical inputs like seeds, seed drill and nutrients are included. The cost on field days and publications showing the success of the technology are included. Five seed drills will be purchased and supplied to the Water User Association (Koovalapuramkulam, Sholankulam anicut, Pattakulam, Sittilotti tank and Mathyasenai)

Sl. No.	Technology	Total Area (ha)	Unit Cost (Rs./ha)	Total(Rs. in lakhs)	Location
1	Improved production technology in Maize	150	6000	9.00	As per the activity chart given in Annexure - I
	a.Maize sheller (1 Equipment)			0.50	
	b.Field day for 3 years			0.30	
	Total			9.80	

Justification for the Unit Cost

Sl. No	Particulars		Amount in (Rs.)
1	Hybrid Seed cost with seed treating chemicals (20kg/ha) @ Rs. 90 /kg	:	1800.00
2	Cost of fertilizers (150:75:75 kg NPK / ha)	:	
	Urea - 326 kg @ Rs. 5 / kg	:	1630.00
	Super Phosphate - 469kg @ Rs. 4 /kg	:	1876.00
	Muriate of Potash – 124.5 kg @ Rs.4.75/ kg	:	592.00
	Cost of Bio fertilizer	:	
	Azospirillum and Phospho bacteria @ 10 pockets each	:	120.00
	Total cost		6018.00

D. Model Village Concept (MVC)

The main objective of this activity is to promote the concept of conservation of natural resources such as soil and water. Adoption of organic farming and IFS are the practices to achieve this concept. Besides demonstration of water saving irrigation practices aid in conservation of irrigation water. Keeping these aspects in view under IAMWARM project TNAU adopts one village in each sub basin and will demonstrate the sustainable agricultural practices in an area of 20 ha.

A	Quality Seed Production	Total area (ha)	Unit cost (Rs./ha)	Total (Rs. in Lakhs)
	Rice	50	600	0.30
	Cotton	20	900	0.18
	Green gram	30	600	0.18
Demonstration of Technologies				
	Organic farming & IFS in rice, improved water management practices	20	5000	1.00
		Total cost		1.66

Seed Village		
Rice	50	Viragasamudram, Alankulam, Golwarpatti
Cotton	20	Golwarpatti, Anaikuttam,
Pulses	30	Golwarpatti, Anaikuttam

On Farm Demonstration and Skill Development

Component	No. of batches (50 farmers / batch)	Cost / batch	Total cost in lakhs
Sugarcane Drip Fertigation	2	20000	0.40
Banana Drip Fertigation	2	20000	0.40
Coconut Drip Fertigation	1	20000	0.20
Production Technology Maize	3	20000	0.60
SRI in Rice	10	20000	2.00
SRI laborers (Rs. 100/person)	10 (200/batch)	20000	2.00
			5.60

II. MISSION MODE ACTIVITIES

Technologies for Large Scale Adoption

a. System of Rice Intensification (SRI)

Scientific management techniques of allocating irrigation water, based on soil and climatic condition to achieve maximum crop production per unit of water applied over an unit area in unit time is very much essential under the present condition. System Rice Intensification (SRI) is one of the scientific management tools. Under conventional system of rice cultivation the rice yield will be low due to poor weed management increased competition among crop and weeds, Poor aeration affects the root activity and tiller production and Poor water management increases the water requirement. SRI does not require the purchase of new seeds or the use of new high-yielding varieties and SRI dose require skillful management of the factors of production and at least initially, additional labor input – between 25 and 50% particularly for careful transplanting and for weeding. Square planting ensures rotary weeder operation in either direction. Rotary weeder operation incorporates the weed biomass and aerates the soil for better root activity and tillering. Efficient water management reduces the irrigation water requirement.

SYSTEM OF RICE INTENSIFICATION TECHNIQUE (SRI)



As farmers gain skill and confidence in SRI methods, labor input decreases and can eventually become the same or even less compared with conventional rice-growing methods. **The SRI technique has the following features**

- Young and robust seedlings (14-15 days)
- One seedling per hill
- Square planting under wider spacing (22.5 x 22.5 cm)
- Rotary weeding up to 40 days at 7-10 days interval.
- Irrigation after the disappearance of ponded water
- “N” management through Leaf Colour Chart

ADVANTAGES OF SRI

- Saving of seed material 50-65 kg /ha.
- Saving of 300-400 mm of irrigation water
- Saving of 12-16 women laborers in weeding
- Saving of 15-45 kg N/ha. by following Leaf Colour Chart method of N management

Rotary Weeding has the following advantages

- Increases soil aeration,
- Enrichment of O₂ near the root zone,
- Increases the microbial population,
- Better nutrient availability and uptake by the plants,
- More tillering ability

Why This Project

To increase the yield of rice in first season and to off set the production loss due to reduced rice area in post project, SRI practices are proposed.

Area of Implementation	: 500 ha
Period	: 5 years
Implementation	: 2 years
Area Expansion	: 3 / 4 / 5 years

Cost estimate

Sl.No	Technology	Cost of input (Rs.)	Total area (ha)	Budget (lakh)
1	SRI	10000	500	50.0

Villages (Location of SRI)

Pilavukkal Periyar dam (20), Golwarpatti (35), Padarankulam anicut (20), Sivaneri anicut (35), Vannaparai anicut (25), Gunavandaneri (25), Viragasamudram tank 965), Alankulam tank (50), Anuppankulam (25), Nathampatti (20), Anaithalalyar (35) Srivilliputhur Periyakulam (35), Puthukottai anicut (35), Thiruthangal Periyakulam (35), Golwarpatti anicut (40)

Justification for the Unit Cost

Sl.No	<u>Particulars</u>		Amount (Rs.)
1	Seed cost with seed treating chemicals (8kg/ha) @ Rs. 25 /kg	:	200.00
2	Raising nursery (wooden frame, rosecan, polythene sheet)	:	1000.00
3	Square transplanting cost @ 50 B/ha @ Rs.80/labour (Labour cost should be borne by the farmers)	:	4000.00 * borne by the farmers
4	Rotary weeder 5 No. Rs.500/no for square planting	:	2500.00
5	Cost of row marker for planting (One no.)	:	1000.00
6	Cost of fertilizers (150:50:50 kg NPK / ha)	:	
	Urea - 330 kg @ Rs. 5 / kg	:	1650.00
	Super Phosphate - 312.5kg @ Rs. 4 /kg	:	1250.00
	Muriate of Potash - 83 kg @ Rs.4.75/ kg	:	390.00
	ZnSO ₄ 25 kg @ Rs. 25 / kg	:	625.00
	Cost of Bio fertilizer	:	120.00
	Azospirillum and Phospho bacteria @ 10 pockets each	:	

7.	Cost of Plant protection chemicals	:	
	Pseudomononas 2.5 kg / ha @ Rs. 75 /kg		200.00
	Monocrotophos 1.5 litre/ha @ Rs. 300 /litre		450.00
	Quinylphos 2 litres / ha @ Rs. 250 / litre		500.00
	Mancozeb 2 kg/ha @ 250 / kg		500.00
	Total cost		14,385.00

b. Mission Approach in increasing the Productivity and Quality of Cotton

This project has been proposed to increase the productivity and quality of cotton in Arjunanadhi sub basin, for which assured market linkages are available in this basin. The technologies identified under mission mode for cotton are

1. Introduction of Hybrid cotton with superior quality
2. Seed drill sowing
3. IPM module
4. Improved production technology



களை எடுக்கும் கருவி

The area for implementation under Arjunanadhi sub -basin is 400 Ha

- Five seed drills will be supplied to the water user association
- IPM modules will be supplied with 100 % assistance

Project to be implemented : 400 ha during Aug - Sep to Jan – February.

Why This project

In Arjunanadhi majority of the farmers faced the problem of low price for their produce due to medium quality with SVPR 2. Hence introduction of hybrids in August month sowing will be the better solution for getting better price with superior quality produce. Under this concept, the activity is proposed by TNAU under mission mode concept in **400 Ha** during Aug-Sep sowing.

S. No	Technology	Cost of input (Rs.)	Total Area (ha)	Budget (lakh)
1	Increasing the productivity and quality of cotton	9375	400	37.5

Justification for the Unit Cost

Sl.No	Particulars		Amount in (Rs.)
1	Hybrid Seed cost with seed treating chemicals (15kg/ha) @ Rs. 100 /kg	:	1500.00
2	Cost of fertilizers (80: 40: 40 kg NPK / ha)	:	
	Urea - 176 kg @ Rs. 5 / kg	:	880.00
	Super Phosphate - 250kg @ Rs. 4 /kg	:	1000.00
	Muriate of Potash – 67 kg @ Rs.4.75/ kg	:	320.00
	Cost of Bio fertilizer	:	
	Azospirillum and Phospho bacteria @ 10 pockets each	:	120.00
3	KNO ₃ spray (3%) for two sprays		200.00
4	IPM		
	Pseudomonas 5.5 kg/ha @Rs.75/ha		413.00
	Trichoderma viride		200.00
	Neem cake 250 kg@ Rs. 5/kg		1150.00
	Pheromone trap @ 5 trap/ha (Rs. 40/no)		200.00
	Trap crop (Sunflower and castor) seed cost		400.00
	Chemicals		3000.00
	Total		9383.00

C. Pulse Production Technology (PPT) - 300 ha

Pulse crop will be raised in sequence after the harvest of I season rice (Sep - Oct). Fifty percent of SRI demo area will be covered under this programme. The amount allotted under SRI will be utilized for purchasing pulse seed and it will be broadcasted in to standing rice crop (10 days prior to harvest). Introduction of pulses in rice field offers following advantages.

- Increases cropping intensity
- Maintain soil fertility
- Additional Income to the farmer
- Reduce pest / disease load

The area under pulses is expected to increase both under SRI and Non SRI areas also.

D. Capacity Building

Under the head of capacity building, an amount of Rs. 4 lakhs was added to give training and exposure visits to the implementing officers of Tamil Nadu Agricultural University at sub basin level

III. Year wise activity (ha)

Activity	I	II	III	IV	V
Drip Fertigation in Sugarcane	-	12	12	-	-
Drip Fertigation in Banana	-	10	-	-	-
Drip Fertigation in Coconut AED	-	50	-	-	-
Improved Production Technologies in Maize	55	65	30	-	-
SRI in Rice	250	250	-	-	-
Improving Productivity and Quality of	120	100	110	70	-

cotton					
Pulse production technology	-	75	150	75	-
OFD and skill development		-	-	-	-
Demo in model village	20	-	-	-	-
Seed production	50	30	20	-	-

Adoption Rate (year wise) (in ha)

Activity	I	II	III	IV	V	Total
Drip Fertigation in Sugarcane	-	-	-	60	60	120
Drip Fertigation in Banana	-	-	-	50	50	100
Drip Fertigation in Coconut AED	-	-	-	100	150	250
Improved Production Technologies in Maize	-	350	350	400	600	1700
SRI in Rice	-	-	500	1000	1000	2500
Improving Productivity and Quality of Cotton	-	-	-	600	1000	1600
Pulse Production Technology	-	300	300	300	600	1500
OFD and skill development	-	-	-	-	-	-
Demo in Model Village	-	-	-	-	-	-
Seed Production	-	-	-	-	-	-

IV. Year Wise Budget (Rs. Lakhs)

Sl.No	Particulars	I	II	III	IV	V	Total
I	Activities						
1	Drip Fertigation in Sugarcane	-	7.68	7.68	-	-	15.36
2	Drip Fertigation in Banana	-	6.98	-	-	-	6.98
3	Drip Fertigation in Coconut in AED	-	2.75	-	-	-	2.75
4	Improved Production Technologies Maize	3.90	4.00	1.90	-	-	9.80
5	Seed Production	0.30	0.18	0.18	-	-	0.66
6	Modal Village Demonstration	1.00	-	-	-	-	1.00
7	OFD and skill Development	5.60	0	-	-	-	5.60
8	SRI	25.00	25.00	-	-	-	50.00
9	Cotton Productivity	11.20	9.38	10.30	6.60	-	37.50
	Total	47.00	55.97	20.06	6.60	-	129.65

II	Out Sourcing	14.40	14.40	14.40	4.80	4.8	52.80
III	Contingencies	1.50	1.50	1.50	1.00	1.0	6.50
IV	Equipments	2.00	0	0	0	0	2.00
	Total	64.90	71.87	35.96	12.40	5.8	190.95

V. EXPECTED OUT PUT

Crop Productivity

Sl. No	Activity	Demonstration/implementation	Without project		With project		
			Area covered (ha)	Productivity (kg or t/ha)	Area to be covered with the technology (ha)	Productivity (kg or t/ha)	Addl. Productivity
1	Drip Fertigation in Sugarcane	24	0	100 t	120	120 t	25 t
2	Drip Fertigation in Banana	10	0	40 t	100	55 t	15 t
3	Drip Fertigation in Coconut in AED	50	0	16000 Nuts	250	20000 Nuts	4000 Nuts
4	Improved Production Technologies Maize	150	900	2800	1700	4000	1200
5	SRI	500	0	4384	2000	6084	1700
6	Improving Productivity and Quality of Cotton	400	75	1400	1600	2000	600
7	Improved Production Technology for Pulses	300	200	600	1500	700	100

TOTAL BUDGET FOR ARJUNANADHI

Sl.No	Particulars	Physical	Financial (in lakhs)
I	Activities		
1	Drip fertigation in Sugarcane	24 Ha	15.36
2	Drip fertigation in Banana	10 Ha	6.98
3	Drip fertigation in coconut in AED	50 Ha	2.75
4	Improved Production technologies Maize	150 Ha	9.00
	a. Organizing field day	3 Nos	0.30
	b. Maize Sheller	1 No	0.50
5	Quality seed production	100 Ha	0.66
6	Demonstration of organic farming and IFS modal in Model villages	1 No	1.00
7	SRI	500 Ha	50.00
8	Productivity and quality of cotton	400 Ha	37.50
9	Production technology for pulses	300 Ha	-
10	On farm demos and skill development	-	5.60
	Sub Total		129.65
II	Outsourcing for Technical Assistance		
1	12 nos for 3 years, 4 nos for 4 th and 5 th year	9000 Salary + 1000 FTA per Month	52.80
	Sub Total		52.80
III	Contingencies		
	a. Vehicle hire charge for Scientists @ Rs.60000/yr		3.00
	b. Demonstration, stationeries, exhibits and Reports		2.50
	d. Miscellaneous		1.00
	Sub Total		6.50
IV	Equipments Computer, Printer, Scanner, LCD		2.00
	Sub Total		2.00
	Total		190.95
	Incentive 1% of the total cost		1.91
	Total		192.86
	Institutional charges @ 7.5 %		14.46
	Sub Total		207.32
V	Capacity Building		4.00
VI	Grand Total		211.32

* 50 % of the drip cost for the project for sugarcane 6.96 lakhs

Banana 2.64 lakhs

Impact

- ❖ Crop: Rice
- ❖ Technology: SRI
- ❖ Area under demonstration: 500 ha
- ❖ Area under adoption : 2500 ha

- ❖ Crop: Maize
- ❖ Technology: Improved production technologies in maize
- ❖ Area under demonstration: 150 ha
- ❖ Area under adoption : 1700 ha

- ❖ Crop: Sugarcane
- ❖ Technology: Drip fertigation
- ❖ Area under demonstration: 24 ha
- ❖ Area under adoption : 120 ha

- ❖ Crop: Banana
- ❖ Technology: Drip fertigation
- ❖ Area under demonstration: 10 ha
- ❖ Area under adoption : 100ha

- ❖ Crop: Coconut
- ❖ Technology: Drip fertigation
- ❖ Area under demonstration: 50 ha
- ❖ Area under adoption : 250 ha

- ❖ Crop: Cotton
- ❖ Technology: Improved production technology for cotton
- ❖ Area under demonstration: 400 ha
- ❖ Area under adoption : 1600 ha

- ❖ Crop: Pulses
- ❖ Technology: Production technology
- ❖ Area under demonstration: 300 ha
- ❖ Area under adoption: 1500 ha

An amount of Rs. 211.32 has been proposed under various project mode and mission mode activities to bring the impacts delineated above.

Nodal Officer (IAMWARM)
TNAU Component
Director (WTC), TNAU, Coimbatore -3

Annexure –I

Project Mode Activities (ha)

Sl.No	Tank	Village	I	II	III	IV	V
Drip fertigation in Sugarcane							
1	Nathampatti	Nathampatti Semmandi Karisalkulam	-	10	-	-	-
2	Anaithalalyar dividing dam	Valaikulam	-	-	10	-	-
3	Veppankulam	Srivilliputhur	-	4	-	-	-
Banana							
1	Nathampatti	Nathampatti	-	5	-	-	-
2	Srivilliputhur Periyakulam	Srivilliputhur	-	5	-	-	-
Coconut							
1	Pilavukkal periyar	Kansapuram	-	25	-	-	-
2	Pilavukkal Kovilar	Kansapuram	-	15	-	-	-
3	Viragasamudram	Watrap	-	5	-	-	-
4	Nathampatti	Nathampatti	-	5	-	-	-

Project Mode: Improved Production Techniques in Maize (ha)

Sl.No	Tank	Village	I	II	III	IV	V
1	Viragasamudram	Watrap	10	-	-	-	-
2	Thirumagalkulam kulam	Thulukkapatti	10	-	-	-	-
3	Nakkamangalamkul am	Malli	10	-	-	-	-
4	Pattakulam	S.Kodikulam	10	-	-	-	-
5	Sholankulam	Srivilliputhur	15	-	-	-	-
6	Koovalpuram	Koovalpuram	-	-	10	-	-
7	Thattaperumal kulam	Vettur	-	-	10	-	-
8	Muruganeri	Muruganeri	-	-	10	-	-
9	Anaikuttam	Vadi Kanniseri V.Muthulingapuram	-	10 10 10 35	-	-	-
10	Golwarpatti	Golwarpatti	-	-	-	-	-
Total			55	65	30	-	-

Mission Mode Activities

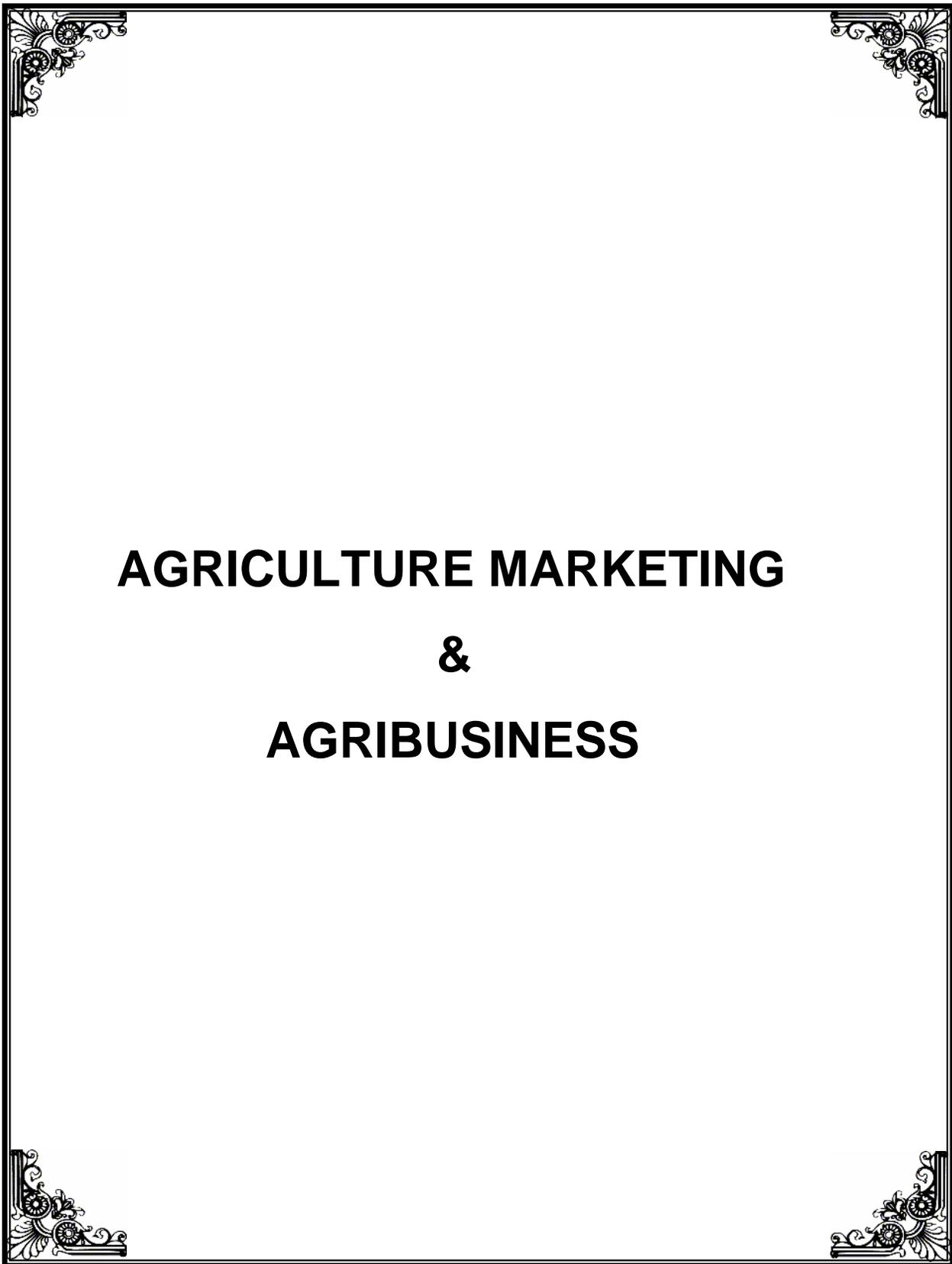
Activity chart

(i) System of Rice Intensification (SRI)

Tank	Village	I Year		II Year		III year		Total
		I Season Sep- Feb	II Season Feb- Jun	I season Sep- Feb	II Season Feb- Jun	I season Sep- Feb	II Season Feb- Jun	
Pilavukkal dam	Kansapuram	10	10	-	-	-	-	20
Sivaneri anicut	Kansapuram	5	10	5	15	-	-	35
Vannaparai	Kansapuram	5	5	5	10	-	-	25
Pethankulam	S.Kodikulam	5	5	-	-	-	-	10
Kodikulam	S.Kodikulam	5	5	-	-	-	-	10
Gunavandaneri	S.Kodikulam	-	-	10	15	-	-	25
Viragasamudram	Watrap	10	10	20	25			65
Alankulam	Watrap	5	5	20	20	-	-	50
Anuppankulam	W. Pudupatti	-	-	10	15	-	-	25
Nathampatti	Nathampatti	-	-	15	5	-	-	20
Anaithalalyar dividing dam	Valaikulam	-	-	30	5	-	-	35
Srivilliputhur Periyakulam	Srivilliputhur	10	-	25	-	-	-	35
Melamadai periyakulam	Nathampatti	10	-	25	-	-	-	35
Pudukottai periyakulam	Pudukottai	10	-	25	-	-	-	35
Thiruthangal periyakulam	Thiruthangal Keelathangal	-	-	20 15	-	-	-	35
Golwarpatti anicut	Golwarpatti	-	-	25	15			40
Total								500

(ii) Cotton Production Technology

Sl.No	Tank	Village	I	II	III	IV
1	Ayakulam	Watrap	10			
2	Viragasamudram tank and Watrap big tank	Watrap	80			
3	Mathur	Mathur	30			
Total			120			
4	Vannankulam	Maharajapuram		15		
5	Settikuruchikulam	--do--		10		
6	Nathampatti	Nathampatti Pattakulam sethupatti		50		
7	Srivilliputhur periyakulam	Srivilliputhur		15		
8	Sholankulam	Iyan Nachiarkulam		10		
Total				100		
9	Ilandaikulam	Ilandaikulam			15	
10	Thiruthangal kulam Sethukurichikulam	Thulukkapatti Maharajapuram			15 15	
11	Enjar Senkulam	Senkulam			10	
12	Mathiasenai	Mathiasenai			10	
13	Valaikulam	Valaikulam			45	
Total					110	
14	Golwarpatti	Golwarpatti				20
15	Thiruthangal Periyakulam	Thiruthangal keelathithangal				15 10
16	Ilanchikulam	V.Muthulingapuram Ilanchikulam				10 15
Total						70



**AGRICULTURE MARKETING
&
AGRIBUSINESS**

ARJUNANADHI SUB BASIN

Cropping Pattern

S.No	Crop	Without Project			S.No	Crop	WITH PROJECT						Total Production M.Ton/Ha				
		Fully irrigated	partially irrigated	Rain fed			Fully Irrigated			Partially Irrigated						Rain fed	
		Area in Ha	Area in Ha	Area in ha			Area in Ha	Productivity M.Ton/Ha	Production in M.ton	Area in Ha	Productivity M.Ton/Ha	Production in M.ton				Area in Ha	Production in M.ton
First Crop September to January					First Crop September to January												
1	Paddy-1	3803	596		1	Paddy-1	4400	5.5	24200						24200	70	16940
2	Cotton	185			2	Cotton	1431	9.2	13165						13165	100	13165
3	Vegetables	41			3	Vegetables	80	25	2000						2000	98	1960
4	Chillies	20			4	Chillies	180	2	360						360	90	324
5	Pulses	29			5	Pulses	1200	0.75	900						900	85	765
6	Gingelly	0		1000	6	Gingelly	0	3.25	3250	500	3.25	1625			4875	75	3650
7	Cholam	0		300	7	Maize	1700	3.4	5780						5780	98	5491
8	Cumbu	0		300	8	Coriander	40	6.29	251						251	100	251
9	Maize	0		900													
Annual crop-January to December					Annual Crop-January to December												
1	Coconut	439			1	Coconut	480	10000Nos.	4.8 Lakhs						4.8 lakhs		4.56
2	Sugarcane	436			2	Sugarcane	500	100	50000						50000	95	5000
3	Banana	78			3	Banana	300	42	12600						12600	100	11970
					4	Sapota	25	20	500						500	95	475
					5	Amla	25	8	200						200	98	196
					6	Guava	50	7	350						350	95	332
					7	Mango	25	15	375						375	95	356
					8	Fodder	250	0	0						0	0	0
IInd crop February to May					IInd crop February to May												
1	Paddy	872			1	Paddy-1	875	5.5	4812						4812	70	3368
2	Cotton	445			2	Cotton	980	9.2	9016						9016	100	9016
3	Vegetables	11			3	Vegetables	125	25	3125						3125	98	3062
4	Pulses	202			4	Pulses	1530	0.75	1147						1147	85	975
					5	Periwinkle	40	0	0						0	0	0
					6	Marigold	60	0	0						0	0	0
					7	Maize	1300	3.4	4420						4420	98	4331
					8	Celosia	10	0									
					9	Senna	40										

I Existing Scenario

Infrastructure: Cold storage

Sl.No.	Location	Capacity	Utilised for what
1	Virudhunagar	3000 M.T.(Cold storage)	For Storage of Dry chillies, Tamarind etc.
2	Virudhunagar	1500 M.T. (Storage only)	All Agricultural Commodities.

II. Markets - Specialised / General Markets.

Sl. No.	Location	Produces Deal	Size
1	Rajapalayam	Cotton, Paddy, Millets, Pulses, Oilseeds, etc.	Commission Mandies and Traders are functioning in all areas of the Towns with minimum infrastructure and facilities
2	Virudhunagar		
3	Sattur		

III. Regulated Markets:

Sl. No.	Location	Infrastructure available	Notified Crops	Receipts and Expenditure for last 2 years			
				2004-05		2005-06	
				Receipt	Exp	Receipt	Exp.
1	Rajapalayam	Godowns, Threshing, Floors.	Cotton, Groundnut, Chillies,Paddy, Cholam,	74.21	7.12	34.34	6.49
2	Srivilliputhur		Cumbu,	6.45	2.29	6.50	2.33
3	Watrap		Ragi,	15.95	2.39	12.22	2.69
4	Sattur		Sugarcane	4.71	2.86	5.93	2.74
5	Virudhunagar		Jaggery, Blackgram Coriander and Coconut	34.22	4.02	18.77	5.78

IV. GLUT / SCARCITY SEASONS

Sl. No.	Commodities	Glut Season	Scarcity Season
1	Cotton	May - Aug.	Jan. - April
2	Chillies	Feb - June	Jan. July - Dec.
3	Paddy	Jan. - March	April - Dec.
4	Cumbu	Jan. - March	April - Dec.
5	Maize	Jan - April	May - Dec.

I. EXISTING MARKETING SCENARIO

1. INFRASTRUCTURE: TYPE AND LOCATION

There is one cold storage facility in the sub-basin at Virudhunagar. With regard to drying yard few farmers are using traditional small size drying Yard and many are using conventional mud floors.

There is no proper drying yard or storage godown in the sub basin except the ones available at Agricultural Cooperative Marketing Societies and at Regulated Markets which are insufficient and inaccessible to the farmers far away from the regulated Markets. Few drying yards are constructed in the remote villages by the Ramanathapuram Market Committee and handed over to the respective village panchayats for usage and maintenance

2. MARKETS:

Regulated Markets are available at Watrap, Srivilliputhur and Rajapalayam Among the notified crops, major transactions are for Groundnut, Paddy and Cotton produce. There are big private wholesale markets at Virudhunagar, Rajapalayam, Srivilliputhur and Sattur for Paddy, Millets, Cotton, Chillies, Coriander, Pulses and Oilseeds. In Virudhunagar, Chilly oil is extracted by VPSA and Sons and it finds way to the European Countries by export. M/s VPSA and Sons are the leading chilly merchants group in the State and approximately 40,000 MT of chillies are needed by them annually and of this only 8,000 MT could be procured by them within our State and the rest of 32,000 MT of Chillies is imported from adjoining States i.e. Karnataka and Andhra Pradesh. Coriander polishing and processing units are available at Virudhunagar; Gingelly Oil

extraction mills are abundantly available in this sub-basin area. There is a well established and fully furnished sophisticated food park also available at Virudhunagar.

Dhal Mills are also in abundance which deals with Redgram, Blackgram and Greengram. The Dhal Mills are located in Virudhunagar which caters to the needs of the adjoining Sub Basins. The daily turnover of these mills is around 4, 00 MT of grams. There are four Uzhavar Sandhais which are located at Virudhunagar, Srivilliputhur, Sivakasi, Sattur which sell vegetables. Daily vegetable market is available in almost all small and big towns. The banana at present is being sent to Kerala markets and a portion is also being sent to Madurai. However with the proposed Terminal market at Madurai, other vegetables like bhendi and flowers like marigold will not be facing any problems in marketing. For millets, Virudhunagar, Rajapalayam and Srivilliputhur have a good network of private markets and commission mandies. During the harvest season, traders enter the village and purchase the produce from the drying yards.

In this area sugarcane is exclusively grown for edible purpose keeping in mind, the Pongal festival in which sugarcane is the part and parcel of rituals, Sugarcane grown in an area of around 430 ha. for supply to Tharani sugars Ltd. Vasudevanallur which is situated in Rajapalayam to Tenkasi Road. The sugarcane is sold on a contract basis.

3. LOCAL MANDIES :-

Farmers usually get crop / personal advances from commission mandies and are therefore forced to sell their produces to commission mandies . The commission mandies are charging interest for the advances and commission is also charged for the produce sold through them. Traders prefer to purchase agricultural commodities through commission mandies only as they are allowed credit facilities. Generally the price will not be competitive and the farmers will receive the sale proceeds after deduction of commission and other marketing charges.

4. COOPERATIVE MARKETING SOCIETY

The R.41 Srivilliputhur Co-operative Society Ltd., (mainly for cotton kapas). The rate of procurement is as per Cotton Corporation of India rates. Further many private mandies are functioning for marketing for almost all major agricultural products, especially Paddy, Cotton etc. The rate for these products is mainly based on supply and demand .

For Cotton there are around 100 Spinning mills in this area. About 85% of the Cotton for these mills is procured from other states. Long staple (>32 mm) cotton varieties MCU 5, Bunny, Suvin etc. are imported from Maharashtra while medium/ short staple (<24mm) cotton variety like MCU7 is being locally of possible tieup with firms for contract farming may be mentioned grown. Both are mixed and utilized in the mills. The annual turnover of these mills is around 80 Lakh bales. So the cotton grown in the area could easily be marketed within this basin area spinning mills.

5. MARKETING PRACTICES

a. GRADING

No scientific grading work is done at present. In the case of cotton, the good cotton Kapas and the Kottuparuthi (pest & disease attacked, discoloured) are heaped separately in the space available within the house. Likewise, in chillies the pest & disease attacked and imatured are separated manually and stored in heaps after sun drying them. In paddy, proper manual winnowing is done to segregate immatured defectful grains and foreign matters. It is properly dried and stored in the existing local storage bins available with the household.

b. TRANSPORTATION

No specific difficulty is experienced. The produce are transported generally by vans and lorries for paddy, groundnut etc. and by two wheelers for vegetables to the nearest marketing centers. For improving the transport, cargo autos are suggested from the interior localities to wholesale points.

c. CONTRACT FARMING

At present no contract farming practice is adopted. But in future it is suggested for crops like Cotton, Vegetables especially Tomato and Tapioca.

d. SOURCE OF MARKET INFORMATION

It is only through news papers, phone messages and mass media. It is to be improved by adopting latest IT methods.

II. CONSTRAINTS

a. LACK OF AVAILABLE MARKET

For improving the marketing of produces, local collection centers to be arranged in important places.

b. POOR POST HARVEST PRACTICES.

Generally farmers are storing their produce in their own houses which are facilitating the attack of stored product pests and rats etc. For over coming this problem, Village Godowns, may be constructed in various places. The Godowns are to be maintained by Farmers Associations at their own cost. Drying yards to be provided in all major villages.

c. GRADING/PACKING

It is being done informally for some crops like Cotton, Chillies and Mango etc (not based on Scientific Methods). At present visual grading is done by the staff of the commercial grading centers located at Rajapalayam, Sattur and Virudhunagar.

d. NO COLLECTIVE ACTION- INDIVIDUAL FARMERS GO TO MARKET/WHOLE SALER

Generally the farmers are selling their produce through Regulated Markets, Co-operative Societies and private mandies.

However for diversified crops collective selling is important, to get more bargaining power and towards this, formation of FIGs, / Commodity Groups, FAs, etc. are suggested.

e. Lack of Market Information

At present market trend is known through Newspapers, Radio, TV and Phones by progressive farmers. For improving further, internet facility / Computer facility need to be arranged. A separate proposal for this is being drawn.

III. DIVERSIFICATION / FURTHER VISION PROPOSED

About 10% area under paddy is proposed to be diversified to maize which is a light duty crop compared to Paddy which has good market potential with the poultry feed manufacturers, as poultry feed.

1. Suggested area : 1700 Ha under maize

2. Gap area : 3200 Ha will be covered by additional

Horticultural crops by 40% and another 250 Ha by fodder crops. The remaining area will be covered by agricultural crops like maize, groundnut and pulses which has assured market price. The area coverage will be done by respective Departments i.e. Agriculture, Horticulture and Animal Husbandry.

Agri. Business Centers (ABC)

The location are decided in consultation with Agriculture / Horticulture departments and based on tank wise / sluice wise details.

LOCATION ERICHANATHAM

Crop : Cotton :

It is proposed to set up one Agri Business centre at Erichanatham village of Arujunanadhi Sub basin where cotton is grown in an area of 400 ha. This village is situated in the centre of Arujunanadhi Sub basin and it is 15 kms from existing Srivilliputhur Regulated Market and (20Kms) from Rajapalayam Regulated Market.

The annual production of cotton is expected to be 700 MT. There are around 3 Water Users Associations which were already registered and these water users organization can be united together to form a federation. They can carry out the collective marketing of cotton.

M/s Perumalsamy Naidu and Sons, Rajapalayam are the leading cotton merchants in South India and could be engaged for purchases of cotton.

At present M/s Perumalsamy Naidu and Sons needs 10000 Quintals, annually. So the available produce in the sub basin area could be marketed easily at optimal prices.

IV. CHALLENGES THROWN UP BY DIVERSIFICATION / AREA EXPANSION

Identifying New Market for New Crop

For maize, contract farming need to be arranged between purchasers and WUAs of sub basins.

Maize crop is not grown in the sub basin at present. However as part of diversification, 1700 ha. of maize which is market driven and light water duty crop is proposed gravity. In adjoining area maize is procured by leading poultry feed manufacturers i.e. M/s. Suguna, M/s Shanty etc. based on market rate prevailing at the time of harvest. The market rate however fluctuates between Rs. 5 to Rs. 9 per Kg. A contractual arrangement between the cultivating farmers and purchasers at an economical price need to be arrived at and the same will be attempted with the implementation of the project.

For facilitating the farmers and for improving the market utilization in the interior places, the following infrastructure facilities are suggested.

Constructing Drying Yard in 10 localities as detailed below at the cost of Rs.2.20 lakhs each, 6 rural godowns at the cost of Rs. 5 lakhs each and one collection centre at the cost of Rs. 5 lakhs. Further providing One Mini Lorry and 2 Goods Autos for transporting produce from farm gate to collection centre at an estimated cost of Rs.2 lakhs for auto each and One Mini Lorry for transporting goods from collection centre to Market centre at a cost of Rs. 5 Lakhs.

Collection centre proposed here is necessitated due to the demand of farmers, who desired that the vegetables, flowers etc., cultivated in remote villages are to be collected through cargo -autos at a central place which is to be washed, cleaned, graded and sent through a mini -lorry to a wholesale market like Madurai all at a minimum time. Even through the produces at present are being transported through private transport sources, a more sustained and dependable transport system is needed especially for perishables. The amount needed for transport i.e. Rs.9 lakhs may be extended as loan and recoverable in a period of 10 years.

Information, Education and Communication (IEC):

Included under training components.

V SOLUTIONS AND RECOMMENDATIONS

1. Consultative process undertaken in the Sub Basin

MDPU at district level has been formed with WRO / PWD and Line Departments i.e. Agriculture, Horticulture, Agricultural Engineering, Agricultural University, Agricultural Marketing, Animal Husbandry and Fisheries.

Informal WUAs were formed based on farmer's membership. However, elections are to be conducted within a short period. These Associations are consulted by the MDPU and walk through surveys have also been made. The meetings were conducted along with walk through survey.

During the Walk through Survey the cross section of Sub Basin has been covered through walking and the farmer's demands were studied.

Along with this, the topography of the area, cropping, water availability, life style, transport etc were also observed. This background facilitated in understanding the stake-holders problems and the solutions suggested. For marketing, simple solutions like godowns, thrashing floors and collection centers were suggested repeatedly by which the farmers hope will go a long way in getting better prices.

STAKE HOLDERS DEMANDS (List)

The Stake holders in different parts of the Sub Basin repeatedly requested the following improvements.

- a. Storage Godowns
- b. Thrashing Floors / Drying Yards
- c. Collection Centers (including transport)
- d. Market Information
- e. More knowledge about pre & post harvest technologies.

Marketing interventions proposed with reference to identified constraints and challenges.

S.NO.	CONSTRAINT & CHALLENGES	COUNTER MEASURES
1	Want of assured market	Linkage with manufacturers on terms of (i.e. maize) contract farming.
2	Production glut / shortage	Food processing methods and staggered sowing and harvesting.
3	Lack of facilities market	For improving the marketing. collection centers and formation of marketing sub groups at WUA level are suggested.
4	Poor post harvest practices	Training to farmers on post-harvest practices. Rural go downs proposed for avoidance of storage loss IEC.
5	No collective action	For diversified crops, formation of FIGs / commodity groups
6	Lack of market information	Improving the market information system through IT Kiosks
7	Improving existing market utilization	Strengthening the existing market infrastructure like drying yards/threshing floors, collection centers etc.
8	Ensuring collective bargaining/ marketing	Sub group of WUA is to be formed for this purpose i.e, commodity group.
9	Improving access to market by better transport under collection center	Included in collection center item and also by encouraging private transport arrangements.
10	Processing and Agro Processing	One day interface workshop being arranged with CII and selected sub basins farmers to promote value addition.
11	New practices in quality control	Quality control is attended by Agmark lab, Virudhunagar and commercial grading at Rajapalayam.

Outcome indicators

1. Percentage of increase in farm gate sale price
2. Extent of use of Marketing Kiosk in liaison with Agribusiness cell of TNAU
3. Percentage of out put taken for agro processing
4. Percentage of diversified crops marketed.

PART II

ARJUNA NADHI Sub Basin is dependent on non system chain of tanks. The water use efficiency of the system is around 53% which is sub economic and being improved by WRO / PWD. The annual average weighted rainfall is around 847 mm. and below state average.

The cropping system is dominated by paddy, pulses, sugarcane, mango, cotton and vegetables.

The marketing infrastructure consist of 3 Regulated Markets, 2 Farmer's Market, 4 storage go downs and one thrashing floors besides number of private mandies. The transportation is through private channel. Grading and quality control and limited and one Agmark Lab is functions to cater the needs of private packers. Specialized storage godown, IT based market information system and agro based Industry are absent.

The Marketing strategy is based on the following items:

5. Survey of existing cropping / marketing scenario
6. Stake holder's consultation.
7. Deciding on suitable marketing components based on gap area cropping and diversification.

Thus the following components were decided and included in the project.

S.No	Particular	Nos.	Amount Rs. in lakhs
1	Threshing floor / (Drying Yard)	10	22.00
2	Storage godown	6	30.00
3	Collection Centre	1	5.00
4	Mini lorry	1	5.00
5	Goods Auto	1	4.00
6	ABC	1	11.00
	Total		77.00

Phasing of work

The work will be phased out as follows:

S.No		I	II	III	IV	V	Total	Amount in lakhs
1	Threshing Floor /		5	5			10	22.00
2	Storage shed		3	3			6	30.00
3	Collection Centre		1				1	14.00
4	ABC		1				1	11.00
	Total		10	8			18	77.00

Locations:

Based on the intensity of cropping and consequent availability of harvested produce based on tank-wise details, the following locations for marketing infrastructure were proposed.

Drying yard / Threshing floor

1. Sethunarayanapuram
2. Thambipatti
3. Kansapuram
4. Athikulam
5. Nachiarpatti
6. Mamsapuram
7. Edayankulam
8. Vellur
9. Golwarpatti
10. Nathampatti

Storage Sheds:

1. Koomapatti
2. Sunddrarpandiam
3. Maharajapuram
4. Malli
5. Mamsapuram
6. Poovani

Collection Centre

Krishnankoil

**ROUGH COST ESTIMATEE FOR CONSTRUCTION OF RURAL
GODOWN / COLLECTION CENTRE**

Size of the building : 15 M x 5 M
Plinth area of the building : 75 sq. M.

ESTIMATE ABSTRACT (RATE FOR THE YEAR 2005 -06)

Sl.No.	Description	Area	Rate/Sq.m.	Amount
1.	Load bearing wall foundation	75 sq.m	Rs.1105 / Sq.m.	Rs. 82875/-
2.	Super Structure cost	75 sq.m	Rs.2755 / Sq.m.	Rs.206625/-
3.	Cost of Roof (65% of Super Structure) (Steel Trusses with A.C. Sheet)	75 sq.m.	Rs.1790.75 / Sq.m	Rs.134306/-
4.	Internal Electrification	75 sq.m.	Rs.440 / Sq.m.	Rs. 33000/-
5.	Fluctuation of Current Rate 5%	L.S.		Rs. 22840/-
6.	Labour Welfare Fund 0.3%	L.S.		Rs. 1439/-
7.	Petty Supervision charges 2.5%	L.S.		Rs. 11991/-
8.	Unforseen items	L.S.		Rs. 6924/-
	Total Amount			Rs. 500000/-

**NAME OF THE WORK: CONSTRUCTION OF DRYING YARD
ABSTRACT ESTIMATE**

Sl. No	Qty.	Description	Rate	per	Amount
1	55.00Cu.M	Earth excavation for foundation in all soils and sub soils except in hard rock requiring blasting but including shoring, shuttering and balling out water wherever necessary, refilling the sides of the foundation with excavated sand/soil, etc.,as directed by the departmental officers.	44.22	Cu.M	2432
2	134.00 Cu.M	Supplying and filling in foundation of basement with filling sand in layers of not more than 15cm thick etc., complete	213.00	Cu.M	28542
3	53.00 Cu.M	Cement Concrete 1:5:10(one cement and five sand and ten aggregates)using 40MM Broken jelly for foundation and base concrete for	1079.50	Cu.M	57214

		flooring			
4	33.00 Cu.M	Random Rubble masonry in CM 1:5(One cement and five sand) using best rough stone for foundation and basement with simultaneous pointing including curing etc.,complete	1045.20	Cu.M	34492
5	4.50 Cu.M	Reinforcement concrete 1:2:4(One cement, two sand four HBS jelly) using 20mm gauge HBS jelly for all RCC works.	1979.00	Cu.M	8906
6	45.50 Sq.M	Providing Form work for centering shuttering with all cross bracings including strutting to the required height for plinth beam, column footing, stair case steps etc.,	173.46	Sq.M	7892
7	2.20 Qtl	Supplying fabricating and placing in position of steel rods for reinforcement for RCC works including cost of steel, binding wire and labour charges for straightening, cutting, bending, cranking and tying grills in position etc.,	3201.00	Qtl	7042
8	29.00 Cu.M	Plain Cement concrete 1:2:4:,using 20mm gauge HBS jelly for flooring including curing etc.,complete	1760.90	Cu.M	51066
9	55.00 Sq.M	Plastering withCM 1:3,10mm thick for exposed surface of RCC item.	50.60	Sq.M	2783
10	9.00 Sq.M	Supplying and fixing of Mastic pad for expansion joint of flooring etc.	332.30	Sq.M	2991
11	75.00 Sq.M	Colour washing two coats using best shell lime and colouring pigments etc.,complete	7.95	Sq.M	596
12	LS	Provisions for Labour Benefit fund @ 0.30%			203958 600
13	LS	Provisions for Unforeseen items and variation of quantities			5444
14	LS	Provisions for petty supervision charges and contingencies @ 2.5%			5000
15	LS	Provisions for variations of Rates			5000
				Total	220000

**NAME OF THE WORK: MODEL ESTIMATE FOR THE
CONSTRUCTION OF DRYING YARD
DETAILED ESTIMATE**

Sl.No	Description	Nos	L	B	D	Contents
1	Earth work excavation for foundation in all soils and sub soils except in hard rock requiring blasting etc., For Drying Yard Retaining Walls all -round Add Sundries	1 x 1	78.48	0.80	0.80	50.23 4.77
	Total					55.00
2	Supplying and filling in foundation of basement with filling sand in layers of not more than 15 cm. thick including well					

	rammed and consolidated etc. For Drying Yard Retaining Walls all-round Add Sundries	1x1	19.54	19.54	0.35	133.63 0.37
	Total					134.00
3	Cement Concrete 1:5:10 (One Cement 5 Sand and 10 Aggregates) using 40 mm broken jelly for foundation and base concrete for flooring etc. For Drying Yard retaining wall all-round For Drying Yard Basement Add Sundries	1x1 1x1	78.48 19.54	0.80 19.54	0.23 0.10	14.44 38.18 0.38
	Total					53.00
4	Random rubble masonry in cm 1:5 One cement and five sand using best rough stone for foundation and basement etc. For Drying Yard retaining walls Ist footing IIInd footing IIIrd footing Add sundries	1x1 1x1 1x1	78.48 78.48 78.48	0.60 0.45 0.38	0.23 0.23 0.46	10.83 8.12 13.72 0.33
	Total					33.00
5	Reinforcement concrete 1:2:4 (one cement two sand four HBS jelly) using 20 mm gauge HBS jelly for all RCC works For drying Yard Parapet Add Sundries	1x1	79.08	0.23	0.23	4.18 0.32
	Total					4.50
6	Providing Form work for centering shuttering with all cross bracing including for all RCC works etc. For drying yard parapet - inner all-round For drying yard parapet - outer all-round For expansion joints length wise and width wise Add Sundries	1x1 1x1 1x3x 2	78.16 80.00 19.54	-- -- --	0.23 0.23 0.075	17.98 18.40 8.79 0.33
	Total					46.60

	supplying fabricating and placing in position of steel rods upto 16mm dia including cost of binding wire and labour charges for straightening, cutting, bending and cranking etc. For Parapet wall 8mm RTS Top&Bottom Add Laps	2x2 1x30	79.08 0.32	-- --	--- ---	316.32 9.60
					Total	325.92
7	6mm stirrups	1x4x 133	0.72	--	--	383.04

	8mm RTS 6mm MS Rods Add Sundries		325.92m x 0.39 kg/m 383.04m x 0.22 kg/m			127.11 84.27 8.62
		Total			kgs.	220.00
		Total			---	Qty. 2.20
8	Supplying and fixing of Mastic pad for expansion joint of flooring etc. For Expansion joints Add Sundries	2x 3	19.54	---	0.075	8.79 0.21
	Total				Kgs.	9.00
9	plain cement concrete 1:2:4, using 20mm gauge HBS jelly for flooring including curing etc., complete For Drying Yard Basement Add Sundries	1x1	19.54	19.54	0.075	28.64 0.36
	Total					29.00
10	Finishing the exposed surfaces in CM 1:3 (one cement, three sand) 10mm thick etc., For Drying yard parapet – inner all-round For Drying Yard parapet – Top all-round For Drying Yard Parapet – Outer all-round Add Sundries	1x1 1x1 1x1	79.08 79.08 79.08	0.23 0.23 0.23	-- -- --	18.19 18.19 18.19 0.43
	Total					55.00
11	Colour washing two coats using best shell lime, including cost of gum,kanjee,water colouring pigments etc., Qty as per plastering For Drying Yard RR Masonry – Outer all-round Add Sundries	1x1	80.00	---	0.23	55.00 18.40 1.60
	Total					75.00
12	Provisions for Labour benefit fund @ 0.30%					LS
13	Provisions for unforeseen items					LS
14	Provisions for petty supervisions charges					LS

ARJUNANADHI SUB BASIN

Details of Reservoirs, Anicuts, Tanks and Canals.

River/stream/ Odal	Reservoirs/Anicuts/Dividing Dams/Bed Dams /Open off Takes		Tanks / Canal		Ayacut in Ha	Capacity in Mcft	Name of Village	Name of Taluk	No. of Wells Propose d	
Periyar	A	Pilavukkal Periyar Dam	a	Periyar Main Canal	249.470	192.00	Khansapuram	Srivilliputhur	3	
			b	Periyar Branch Canal	141.075		S.Kodikulam	Srivilliputhur	2	5
Kovilar	B	Pilavukkal Kovilar Dam	c	Kovilar Main canal	140.550	133.00	S.Kodikulam	Srivilliputhur	2	2
Chittar	I	Kuppankulam Anicut	1	Kuppankulam	58.280	8.30	Khansapuram	Srivilliputhur	1	1
	II	Thamaraikulam Anicut	2	Thamaraikulam	33.170	2.89	Khansapuram	Srivilliputhur	1	1
	III	Padarankulam Anicut	3	Padarankulam	97.130	8.47	Khansapuram	Srivilliputhur	1	1
	IV	Sivaneri Anicut	4	Sivaneri	204.830	39.90	Khansapuram	Srivilliputhur	2	0
Periyar	V	Vannaparai Anicut	5	Puri Paraikulam	131.050	13.52	Khansapuram	Srivilliputhur	1	3
	VI	Gunavandaneri Anicut	6	Gunavandanerikulam	155.300	35.10	S.Kodikulam	Srivilliputhur	1	1
	VII	Kodikulam Anicut	7	Kodikulam	68.420	14.09	S.Kodikulam	Srivilliputhur	1	1
	VIII	Pethankulam Open off take	8	Pethankulam	31.095	2.50	S.Kodikulam	Srivilliputhur	1	1
	IX	Pungankulam Open off take	9	Pungankulam	35.900	5.29	S.Kodikulam	Srivilliputhur	1	1
	X	Viragasamudram tank & Watrap big tank	10	Viragasamudram tank	174.080	24.00	Watrap	Srivilliputhur	2	
			11	Watrap Periakulam	367.210	81.00	Watrap	Srivilliputhur	3	
			12	Koonikulam	33.840	4.40	Watrap	Srivilliputhur	1	
			13	Stampede	40.210	1.20	Watrap	Srivilliputhur	1	
			14	Kosavankulam	26.790	2.17	Watrap	Srivilliputhur	1	8
	XI	Thiruthakal Anicut							0	0
Kallainaiyar	XII	Ayakulam Anicut	15	Ayakulam	66.900	9.07	Watrap	Srivilliputhur	1	1
	XIII	Mathur Anicut	16	Mathurkulam	102.790	23.80	Mathur	Srivilliputhur	1	1
	XIV	Alankulam Tank	17	Alankulam	128.260	18.90	Maharajapuram	Srivilliputhur	2	
			18	Medankulam	59.735	5.60	Maharajapuram	Srivilliputhur	1	
			19	Pannikulam	42.810	3.77	Maharajapuram	Srivilliputhur	1	
			20	Sundarapandiam Periyakulam	117.000	35.80	Sundarapandiam	Srivilliputhur	1.00	5
Kavariyar	XV	Vannankulam Anicut	21	Vannankulam	38.290	15.77	Maharajapuram	Srivilliputhur	1.00	
			22	Alaganerikulam	42.790	33.72	Maharajapuram	Srivilliputhur	1	
			23	Tambipattikulam	43.120	9.70	Tambipatti	Srivilliputhur	1	3

Odal	XVI	Thirumalaikulam Tank	24	Thirumalaikulam Tank	107.650	26.30	Kottaiyur	Srivilliputhur	1	1	
Jungle Stream	XVII	Settikuruchikulam	25	Settikuruchikulam	97.130	11.40	Kottaiyur	Srivilliputhur	1	1	
Jungle Stream	XVIII	Ilandaikulam Tank	26	Ilandaikulam(Sirukulam)Tank	61.160	17.60	Ilandaikulam	Srivilliputhur	1	1	
Odal	XIX	Thirumagalkulam	27	Thirumagalkulam	69.690	28.70	Thulukkapatti	Srivilliputhur	1	1	
Jungle Stream	XX	Ayartharmam tank	28	A yardharmam(Sirukulam)Tank	45.730	18.20	Ayartharmam	Srivilliputhur	1	1	
River/stream/Odal	Reservoirs/Anicuts/Dividing Dams/Bed Dams /Open off Takes		Tanks / Canal		Ayacut in Ha	Capacity in Mcft	Name of Village	Name of Taluk	No. of Wells Proposed		
Arjunanadhi	XXI	Madhavarayankulam Anicut	29	Madavarayankulam	31.450	6.48	W. Pudupatti	Srivilliputhur	1		
			30	Panikkankulam	38.340	7.89	W.pudupatti	Srivilliputhur	1	2	
	XXII	Anuppankulam Anicut	31	Anuppankulam	152.000	24.83	W.pudupatti	Srivilliputhur	2	2	
	XXIII	Vilvarayankulam Anicut	32	Vilvarayankulam	99.040	20.35	W.pudupatti	Srivilliputhur	1.00	1	
	XXIV	Unjankulam Bed dam	33	Unjankulam	46.380	13.60	Sundarapandiam	Srivilliputhur	1	1	
	XXV	Veppankulam Anicut	34	Veppankulam Tank	4.560	1.50	Veppankulam	Srivilliputhur	0	0	
	XXVI	Senkulam Anicut	35	Senkulam	88.055	16.00	Sundarapandiam	Srivilliputhur	1	1	
	XXVII	Vennikondan Anicut	36	Vennikondankulam	32.780	14.56	Kunnur	Srivilliputhur	1		
				37	Senkulam	32.380	7.25	Kunnur	Srivilliputhur	1	
				38	Nangurkulam	12.550	5.00	Kunnur	Srivilliputhur	1	3
	XXVIII	Kovaneri Anicut	39	Kovererikulam	121.200	26.91	Sundarapandiam	Srivilliputhur	1	1	
	XXIX	Nathampatti Anicut	40	Nathampatti Periya Kulam	159.195	85.00	Nathampatti	Srivilliputhur	2		
				41	Thondamankulam	36.550	17.70	Pattakulam Sallipatti	Srivilliputhur	1	
				42	Kondhavarayankulam	14.420	5.40	Pattakulam Sallipatti	Srivilliputhur	1	
				43	Thiralankulam	26.870	5.53	Semmandi karisalkulam	Srivilliputhur	1	
			44	Panankulam	29.510	6.07	Viluppanur	Srivilliputhur	1		
			45	Kalliputhurkulam	24.900	14.39	Pattakulam Sallipatti	Srivilliputhur	1		
			46	Thatchakudi Periya kulam	55.650	16.18	Thatchakudi	Sivakasi	1		
			47	Thatchakudi Pudhukulam	12.700	2.61	Thatchakudi	Sivakasi	1		

			48	Krishnaperikulam	30.560	11.30	Krishnaperi	Sivakasi	1	
			49	Semmanandi Karisalkulam	12.060	2.49	Semmandi karisalkulam	Srivilliputhur	1	
			50	Karisalpatti Pudhukulam	24.280	5.00	Semmandi karisalkulam	Srivilliputhur	1	
			51	Sathaneri Kulam	45.880	9.34	Moovaraiventran	Srivilliputhur	1	
			52	Mangalam Periyakulam	73.740	58.00	Sivakasi	Sivakasi	1	
			53	Nedunkulam	71.230	24.74	Nedunkulam	Sivakasi	1	15
	XXX	Thathankulam Anicut	54	Thathankulam Tank	35.260	14.52	Moovaraiventran	Srivilliputhur	1	1
Anaithalaiyar	XXXI	Anaithalayar Dividing Dam	55	Valaikulam Tank	228.650	50.60	Valaikulam	Srivilliputhur	2	2
Odal	XXXII	Velankulam Open off take	56	Velankulam	50.060	15.84	Padikkasuvaithan patti	Srivilliputhur	1	1
Peyanar	XXXIII	Athithundu Open off Take						Srivilliputhur	0	0
River/ stream/Odal	Reservoirs/Anicuts/Dividing Dams/Bed Dams /Open off Takes		Tanks / Canal		Ayacut in Ha	Capacity in Mcft	Name of Village	Name of Taluk	No. of Wells Proposed	
	XXXIV	Veeppankulam&Rengapanaickerkulam Anicut	57	Rengappanaickerkulam	51.490	9.53	Sivanthipatti	Srivilliputhur	1	
			58	Amudakulam	75.500	12.95	Sivanthipatti	Srivilliputhur	1	2
	XXXV	Amuthakulam Openoff	59	Amudakulam	46.830	3.80	Sivanthipatti	Srivilliputhur	1	1
	XXXVI	Maravankulam Dividing Dam	60	Maravankulam	58.680	8.51	EnamNachiyarkoil	Srivilliputhur	1	
			61	Kosavankulam	13.265	4.03	Ponnanganni	Srivilliputhur	1	
			62	Ponnangannikulam	50.960	8.86	Ponnanganni	Srivilliputhur	1	3
	XXXVII	M.Valankulam open off take	63	M.Valankulam Tank	45.580	6.32	Sivanthipatti	Srivilliputhur	1	1
Odal	XXXVIII	Srivilliputhur Periyakulam	64	Srivilliputhur Periya kulam	401.860	50.00	Sivanthipatti	Srivilliputhur	2	
			65	Velankulam	45.370	3.09	Padikkasuvaithan patti	Srivilliputhur	1	3
Odal	XXXIX	Athikulam-Senkulam Anicut	66	Rajakularamaperikulam	51.490	8.86	Srivilliputhur	Srivilliputhur	1	1
Jungle Stream	XL	Thiruvannamalai Anicut						Srivilliputhur	0	0

Jungle Stream	XLI	Rengatheertha Odal Dividing Dam						Srivilliputhur	0	0
Odal	XLII	Pottakulam Kurukkalkulam Tank	67	Pottakulam Kurukkalkulam Tank	41.950	3.55	Kurukkalkulam	Srivilliputhur	1	1
Odal	XLIII	vadamalai kuruchikulam	68	Vadamalaikuruchikulam	149.330	26.19	North Srivilliputhur	Srivilliputhur	1	1
Odal	XLIV	Athikulam Senkulam	69	Athikulam Senkulam	50.300	6.32	Athikulam Senkulam	Srivilliputhur	1	1
Odal	XLV	Nakkamangalamkulam	70	Nakkamangalamkulam	44.890	6.90	Malli	Srivilliputhur	1	
			71	Thailakulam	42.600	11.60	Enam Nachiyarkoil	Srivilliputhur	1	
			72	Malli Periyakulam	80.940	32.70	Malli	Srivilliputhur	1	
			73	Mullikulam	86.600	12.86	Mullikulam	Srivilliputhur	1	
	XLVI	Sholankulam anicut	74	Thadangannikulam	54.450	14.88	T.Managaseri	Srivilliputhur	1	5
			75	Sholankulam	118.580	18.87	Srivilliputhur	Srivilliputhur	1	
			76	Deivendry kulam	50.510	6.31	Deivendry	Srivilliputhur	1	
			77	Nochikulam	67.000	16.76	Ian Nachiyarkoil	Srivilliputhur	1	3
XLVII	Managaserikulam	78	Managaserikulam	57.160	11.86	T.Managaseri	Srivilliputhur	1	1	
		79	Pattakulam	50.180	17.37	Pattakulam	Srivilliputhur	1		
Jungle stream	XLVIII	Pattakulam	80	Viluppanur Periyakulam	69.200	10.37	Viluppanur	Srivilliputhur	1	2
			81	Viluppanur Periyakulam	129.320	36.60	Pudukottai	Sivakasi	1	
Arjunanadhi	XLIX	Pudukottai Anicut	82	Kandanerikulam	24.690	6.17	Sealur	Sivakasi	1	
			83	Nalliyankulam	29.150	7.28	Sealur	Sivakasi	1	
			84	Kottanerikulam	21.460	5.37	Kottaneri	Sivakasi	1	4
River/stream/Odal	Reservoirs/Anicuts/Dividing Dams/Bed Dams /Open off Takes		Tanks / Canal		Ayacut in Ha	Capacity in Mcft	Name of Village	Name of Taluk	No. of Wells Proposed	
Odal	L	Modagam Tank	85	Modagam tank	48.160	10.50	Modagam	Peraiyur	1	1
Odal	LI	Muruganeri Tank	86	Muruganeri kanmoyi	40.470	6.78	Gunnathur	Peraiyur	1	
			87	Senkulam	49.970	10.29	M.Senkulam	Peraiyur	1	2
Odal	LII	Koovalapuramkulam	88	Koovalapuramkulam	62.980	28.38	Koovalapuramkulam	Peraiyur	1	1
	LIII	Sittilotti Tank	89	Sittilotti kanmoy	43.440	18.60	Sittilotti	Peraiyur	1	1
Odal	LIV	Thathaperumalkulam	90	Thathaperumalkulam	43.560	25.93	Vellur	Virudhunagar	1	
			91	Servaikaranpatti Tank	36.420	7.50	Servaikaranpatti	Virudhunagar	1	2

Arjunanadhi	LV	Kalayarkuruchi Anicut	92	Periyakulam Tank of Kalaiyarkurichi	70.700	13.55	Kalaiyarkurichi	Virudhunagar	1	1
	LVI	Thiruthankal Anicut							0	0
	LVII	Enjar Senkulam Tank	93	Enjar Senkulam tank	45.770	19.38	Enjar	Sivakasi	1	1
	LVIII	Enjar Naduvapatti tank	94	Enjar Naduvapatti tank	102.470	11.32	Enjar	Sivakasi	1	1
	LIX	Tiruttangal periyakulam	95	Tiruttangal periyakulam	52.610	66.00	Tiruttangal	Sivakasi	1	
			96	Urinjikulam	29.000	7.03	Keela Tiruttangal	Sivakasi	1	
			97	Alamaruthupattikulam	14.780	2.46	Keela Tiruttangal	Sivakasi	1	
			98	Rengasamudram tank	30.990	7.74	V.Muthulingapuram	Virudhunagar	1	
			99	Vadikulam	79.870	33.55	Vadi	Virudhunagar	1	
			100	Kanniserikulam	71.920	21.77	Chinna Vadi	Virudhunagar	1	6
	c	Anaikuttam Reservoir	d	Anaikuttam Main canal	1214.00	125.75	Keela Tiruttangal		2	2
Odal	LX	Mathiyasenai	101	Mathiasenal	80.940	18.02	Mathiyasenai	Virudhunagar	1	
			102	Battarmangalam Tank	55.440	11.52	Nattamangalam	Virudhunagar	1	2
	LXI	Ondipulinakanur periyakulam	103	Ondipulinaikanur periyakulam	42.060	10.00	Ondipulinaikanur	Virudhunagar	1	1
	LXII	Veppilaiipatti Tank	104	Veppilaiipatti tank	48.120	35.20	Veppilaiipatti	Sattur	1	1
Arjunanadhi	LXIII	Golwarpatti Anicut	105	Golwarpatti kulam	273.380	174.62	Golwarpatti	Sattur	2	2
	D	Golwarpatti Reservoir	e	Golwarpatti Main canal	1821.00	178.00	Sirukulam		2	
			106	Onaipattikulam	8.370	1.10	N.Mettupatti	Sattur	1	
			107	Melamadai periyakulam	164.750	59.65	Nathathupatti	Sattur	2	
			108	Sirukulam	33.310	12.70	Sirukulam	Sattur	1	
			109	Sevalkulam	6.910	0.34	Nathathupatti	Sattur	1	
			110	Vannankulam	3.350	1.15	Sirukulam	Sattur	1	8
Total				11185.780	2601.98			131		

S.No	Name of the Place	Threshing floors / Drying Yards	Rural Godowns	Collection Centre
1	Sethunarayanapuram	1	-	-
2	Thambipatti	1	-	-
3	Kansapuram	1	-	-
4	Athikulam	1	-	-
5	Nachiarpatti	1	-	-
6	Mamsapuram	1	1	-
7	Edayankulam	1	-	-
8	Vellur	1	-	-
9	Golwarpatti	1	-	-
10	Nathampatti	1	-	-
11	Koomapatti	-	1	-
12	Sundarapandiam	-	1	-
13	Maharajapuram	-	1	-
14	Malli	-	1	-
15	Poovani	-	1	-
16	Krishnankovil	-	-	1
	TOTAL	10	6	1

COLLECTION CENTRE – COST DETAILS

1. Construction of godowns at Rs. 5 Lakhs each
2. Two autos for transport at the cost of Rs. 2 Lakhs each - 4 Lakhs
3. One Mini Lorry at a cost of Rs. 5 Lakhs
 - ❖ At present there is no IT based Multiple market information system to get the best prices by the farmers. This will be provided by a separate IT proposal
 - ❖ Ensuring collective bargaining / marketing by WUA sub groups. At present it is absent. But a sub group of WUA is to be formed for this purpose.
 - ❖ Improving access to market by better transport or collective transport included under collection centre item.
 - ❖ **Specialised Storage:** Storage godowns to cater the needs of Paddy, Cotton, Ground nut and Mango crops etc. are suggested in 5 places along with Threshing floors in 10 places as required by Stake holders.
 - ❖ **Processing / Agro Processing :** With regard to Mango processing factories which provides processing facilities have to be established. With regard to

other crops drying and storage are recommended with the help of storage godowns and threshing floors / drying yards.

4. New Practices – Product Handling, Grading, Packing, on farm process and Quality Control :

Collection Centers are suggested through which products like vegetables will be collected, cleaned, graded, packed and transported to wholesale points. Suggested place is at Krishnankoil. Quality Control aspect will be taken care by the existing Agmark Lab at Virudhunagar and Commercial Grading Center at Rajapalayam.

5. Information, Education and Communication (IEC)

Included under training components.

COLLECTION CENTER



DRYING YARD





DEPARTMENT OF
ANIMAL HUSBANDRY
AND
VETERINARY SERVICES

IAMWARM PROJECT

ANIMAL HUSBANDRY AND VETERINARY SERVICES

1. INTRODUCTION

1.1 Our State being an agricultural based economy with more than 60% of the people engaged in animal husbandry, agriculture and allied activities, it forms the backbone of the rural economy. Animal husbandry contributes significantly in supplementing the income of small, marginal farmers and landless labourers many of whom are women who play a major role in the care and management of livestock. Livestock is not only an important source of income to the rural poor but also helps them sustain their livelihood in times of drought and famine. Livestock provide a diverse range of output varying from draught power and organic manure for agriculture, self employment throughout the year especially for women as well as direct production of milk, meat and eggs for human consumption as preferred items of food.

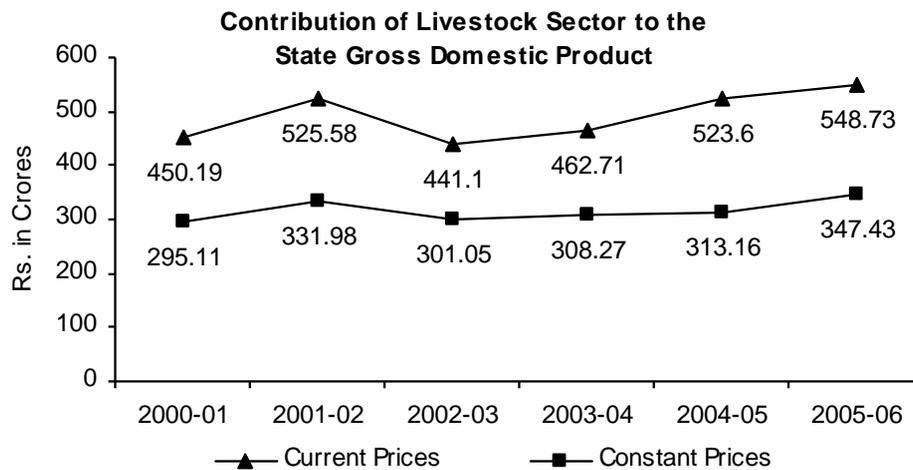
1.2 The contribution of livestock sector to the food basket in the form of milk, eggs and meat to the State has been impressive in fulfilling the animal protein requirement of ever growing human population. The estimated milk production which was 37.91 lakh tones during 1995-96 has increased to 54.74 lakh tones during 2005-06 which is an increase of 44 percent over 1995-96. Similarly the egg production during the same period has increased from 3,048 million numbers to 6,223 million numbers. Egg production showed an increase of 104 percent during 2005-06 over the base year figure of 1995-96. During the same period, the per capita availability of milk per day went up from 185 gms to 234 grms and eggs per annum from 54 numbers to 97 numbers respectively. The average growth rate of milk and egg during the last decade is 4.4% and 10.4% respectively. According to advance estimates (provisional), the contribution of livestock sector to the Gross State Domestic Product (GSDP) has increased from Rs.523.60 crores during 2004-05 to Rs.548.73 crores during 2005-06, an increase of 4.8%.

Year	Current Prices (In crores)						Constant Prices (In crores)					
	Gross State Domestic Product	GSDP for Agriculture & Allied Activities	GSDP for Livestock Sector	%age Share of Agriculture & Allied Activities to GSDP	%age Share of Livestock Sector to GSDP	%age Share of Livestock Sector to Agriculture	Gross State Domestic Product	GSDP for Agriculture & Allied Activities	GSDP for Livestock Sector	%age Share of Agriculture & Allied Activities to GSDP	%age Share of Livestock Sector to GSDP	%age Share of Livestock Sector to Agriculture
2000-01	14109.98	2042.56	450.19	14.48	3.19	22.04	9101.07	1457.73	295.11	16.02	3.24	20.24
2001-02	14355.54	2056.09	525.58	14.32	3.66	25.56	8901.06	1457.22	331.98	16.37	3.73	22.78
2002-03	15509.93	1646.51	441.10	10.62	2.84	26.79	9170.32	1111.75	301.05	12.12	3.28	27.08
2003-04	16845.72	1700.21	462.71	10.09	2.75	27.21	9495.10	1081.96	308.27	11.39	3.25	28.49
2004-05	18892.11	2025.73	523.60	10.72	2.77	25.85	10324.84	1252.74	313.16	12.13	3.03	25.00
2005-06	20750.28	2097.25	548.73	10.11	2.64	26.16	11198.15	1305.98	347.43	11.66	3.10	26.60

2003-04 : Quick estimates

2004-05 : Advance estimates

2005-06 : Advance estimates(provisional)



1.3 Animal husbandry having a high potential for growth, its hidden potential needs to be explored as this can provide the much needed gainful employment opportunities to the weaker sections of the society and can contribute significantly in regeneration of the rural economy. Animal husbandry can ensure a better quality of life for the rural farmer by not only providing sustainable employment at their location

itself but can also act as assets or rural currencies. Animal husbandry thus can act as a powerful instrument for the comprehensive socio-economic transformation of the rural people and can act as an engine for growth and trigger the economy by its multiplying effects.

2. PRESENT STATE SCENARIO

2.1 Tamil Nadu is home to 91.41 lakh heads of cattle, 16.58 lakh buffaloes, 55.93 lakh sheep, 81.77 lakh goats besides 3.21 lakh pigs and 865.91 lakh poultry as per the 17th livestock and poultry census. The livestock ownership is more evenly distributed among landless labourers, small and marginal farmers and livestock production systems are based on low cost agro-by-products as nutritional inputs.

2.2 Veterinary assistance, health cover and breeding support to the livestock and poultry in the State is provided by 1,323 Government graduate veterinary institutions. The National Commission on Agriculture has suggested one veterinarian for every 5000 cattle units by the year 2000 A.D. whereas the present scenario is one veterinarian for every 10,000 cattle units. In addition 1,799 subcenters provide first aid and breeding support. Feed and fodder are the major limiting factors in enhancing farm animal productivity. But in the State a huge gap of around 47% exists between the requirement and availability of green fodder. Though farmers are well aware of the artificial insemination programme, their awareness level on best and latest animal husbandry practices, know-how on emerging new diseases and their control are not up to the expected level. Moreover with changing global scenario, the knowledge level of the veterinarians and para-veterinarians needs to be updated frequently to take the technology instantaneously to the end users - the farmers.

2.3 Though the State is endowed with large livestock population, the breedable age females covered through artificial insemination is only 30-35%. The conception rate under field conditions ranges from 35-40%. This is due to a mixture of various factors like low nutritional status, improper time of insemination and stress due to walking the animals for long distances to the institutions for artificial insemination, shortage of feed and fodder, prevalence of endemic livestock diseases. In the State,

the per day average productivity of a non -descript and crossbred cattle is 2.73 kgs.. and 6.27 kgs. respectively and that of a buffalo is 4.16 kgs. which is much below the expected yield. The productivity can be enhanced by adopting good management practices, feeding practices, bio security measures, effective disease prevention measures, etc.

3. SCENARIO IN THE ARJUNA NADHI SUB BASIN

Livestock Population

Cattle	Buffalo	Sheep	Goat	Poultry
38,112	8,401	64,755	76,010	32,005

Breedable age Female Population

Crossbred Cattle	Non Descriptive cattle	Buffalo	Total
14,325	1246	3505	19,076

Infrastructure and Man power in Government Veterinary Institutions

No. of Veterinary Institutions		Veterinary institutions filled up	
Graduate Institutions	Subcenters	Graduate Institutions	Subcenters
14	15	14	2

Average Per Day Milk Yield per animal

Crossbred Cattle	Non Descriptive cattle	Buffalo
6.114	2.874	3.270

Milk Procurement

Milk cooperative societies	Present milk procurement (LPD)	Milk sent to Aavin (LPD)
101	30,700	10,000

4. Constraints, Challenges and Counter Measures Proposed:

S. No.	Constraints & Challenges	Countermeasures Proposed
1.	Remote villages and villages situated far away from the Government Veterinary Institutions are not getting sufficient veterinary services like veterinary health cover and artificial insemination facilities	The establishment of sub basin veterinary unit will ensure delivery of veterinary services at the farmer's door steps or nearest to the farmer's in remote villages and unserved villages of the sub basin area. Provision of veterinary health cover and artificial insemination are the main works at the farmer's door steps. The unemployed veterinary graduate will be given an entrepreneurship training to establish a Sub basin veterinary unit (details enclosed vide para 6.1) in the sub basin area and disseminate best animal husbandry practices for his earnings and to upgrade animal husbandry practices of farmers in the sub basin area.
2.	Lack of upgraded infrastructure at the Government Institutions leading to constraints in delivery of quality veterinary services.	The Government Veterinary Institutions in the sub basin will be provided with additional essential equipments (details enclosed vide para 6.2.a. & 6.2.b) to deliver quality veterinary services in the sub basin. In addition one veterinary dispensary (details enclosed vide para 6.2.c.) will be upgraded as referral institution for quick and accurate diagnosis of diseases and help in timely treatment thereby preventing economic loss to the farmers.
3.	There is a wide gap between the requirement and availability of green fodder needed for the livestock in the sub basin.	To reduce the gap between the requirement and availability of green fodder in the sub basin, it is proposed to cultivate CO3 fodder in 250 hectares of private lands, (details enclosed vide para 6.3.(d). as a part of cropping plan.
4.	Main problem affecting the fertility in cross bred cattle is infertility leading to loss of milk production days, ultimately leading to loss to the farmers.	To overcome the infertility problems, infertility cum total health cover camps (details enclosed vide para 6.4.(b) are proposed. The animals having infertility problems will be identified and treated. In addition, mineral mixture supplement (details enclosed vide para 6.4.(c) will be given to rectify the defects.

S. No.	Constraints & Challenges	Countermeasures Proposed
5.	Lack of adequate know-how about the livestock management practices like feeding, breeding, health care and deworming activities.	The farmers in the sub basin will be given training (details enclosed vide para 6.5.a.) on best livestock management practices in addition to livestock breeding activities like signs of oestrus, correct time of artificial insemination, deworming, feeding schedule and other health care measures. In addition, IEC materials will be distributed to farmers in the sub basin. More over hoardings and wall paintings depicting signs of commonly affecting diseases will be erected in places where people congregate in large numbers. Apart from this, quarterly night meetings will be conducted to disseminate information to the farmers in the sub basin. (details enclosed vide para 6.4.(d))
6.	Lack of update knowledge and skills of the veterinarians and para-veterinarians in the project area.	Veterinarians in the project area will be given trainers training (details enclosed vide para 6.5.(d)) at Veterinary Colleges to update and refresh their skills and knowledge. They will inturn train the para-veterinarians.

5. OBJECTIVES OF THE PROJECT

5.1 With this background, the main objective of the Animal Husbandry Department will be to intervene in all possible ways utilising the resources to the maximum to improve the production potentialities of the livestock in the sub basin through multi disciplinary approach.

The main interventions will be:

- Productivity enhancement by improving delivery of veterinary services in the project area at the Government and private level.
- Increasing availability of green fodder and other fodder for sustenance.
- Conducting various out reach programmes to enhance productivity.
- Enhancing the knowledge level of human resource in the project area.

5.2 With the above interventions, not only the crossbred population in the sub basin is expected to rise but also the disease outbreaks will be kept under control. Moreover systematic and periodical deworming will lead to a 10% increase in weight

gain, thereby increasing the total meat yield per animal. More over the various outreach programmes and enhancing the knowledge level in the sub basin area will lead to better animal husbandry practices. Thus ultimately, the per animal milk yield is expected to increase from 6.1 liters to 10 litres in crossbred, from 2.87 liters to 3.8 litres in indigenous and from 3.27 liters to 6 litres in buffaloes, leading to increased total farm income.

6. Productivity Enhancement by Improving Delivery of Veterinary Services

6.1 Establishment of Sub basin Veterinary Units.

6.1.(a) Though there are 14 graduate veterinary institutions and 15 subcenters operating in the project area, there is still large livestock populations uncovered which is mainly due to the geographical terrain and the distance of veterinary institutions from the villages. In this project, the main aim will be to provide effective veterinary cover and breeding support to these villages at their door steps by establishing Sub basin Veterinary Unit. The main criteria for establishing the unit will be livestock population in the unserved area. Hence to provide effective services in these unserved areas, it is planned to establish 3 Sub basin Veterinary Units in the Project area.

6.1.(b) The details of Sub basin Veterinary Unit to be established, their coverage area (villages) with distance and nearest Government Veterinary institution is furnished below.

Name of the Sub basin :			Arjuna Nadhi	
Total number of units in Arjuna Nadhi basin :			Four	
Name of the Sub basin Veterinary Unit :			1. Nathampatti	
Sl. No.	Name of Villages to be Covered	Distance from the Head Quarters (in Kms.)	Nearest Govt. Institution	Distance from the village to Govt. inst. (In Kms)
1.	Nathampatti	0	VD, Kunnur	8
2.	Koovalpuram	15	S/c., Silarpatti	10

3.	Chittulutti	16	S/c., Silarpatti	10
4.	Subbulapuram	20	S/c.Silarpatti	10
5.	Aknapuram	16	VD, Watrap	6
6.	Thilapuram	17	VD, Kottaiyur	6
7.	Ilaandaikulam	15	VD, Kottayur	7
8.	Meenachipuram	17	VD, Kottaiyur	8
9.	Kondayampatti	19	VD, Kottaiyur	7
10.	Ayatharmam	20	VD, Kottaiyur	8
11.	Mathur	18	VD, Kottaiyur	7

Villages 1 to 6	Mondays , Wednesdays & Fridays
Villages 7 to 11	Tuesdays , Thursdays & Saturdays
Sundays will be a reserve day in which IEC campaigns will be conducted. In addition if any villages are left out during the week, it will be covered on the reserve day.	

Nathampatti village is about 8 kms from the nearest Veterinary institution namely Veterinary Dispensary, Kunnur. There are about 10 villages situated in and around Nathampatti that are not covered by the Government Veterinary Institution. Further the breedable female population in and around Nathampatti which is untapped by the Government veterinary institution is around 2,000. Hence Nathampatti village is fixed as the headquarters of the Sub basin Veterinary Unit.

Name of the Sub basin Veterinary Unit :			2. Vellur	
Sl. No.	Name of Villages to be Covered	Distance from the Head Quarters (in Kms.)	Nearest Govt. Institution	Distance from the village to Govt. inst. (In Kms)
1.	Vellur	0	VD, Kumilankulam	12
2.	Goundanpatti	3	VD, Kumilankulam	8
3.	Sevalur	9	VD, Kumilankulam	6
4.	Pudukottai	12	VD, Kumilankulam	6
5.	Sithanaikanpatti	13	VD, Kumilankulam	6
6.	Mathiyaseni	12	VD, Kanniseripudur	9
7.	Anaikuttam	10	VD, Thiruthangal	6
8.	Servaikaranpatti	10	VD, Thiruthangal	6
9.	Muthulingapuram	10	VD, Kanniseripudur	7
10.	Vadi	13	VD, Kanniseripudur	6
11.	Chinnavadi	14	VD, Kanniseripudur	7

Villages 1 to 6	Mondays , Wednesdays & Fridays
Villages 7 to 11	Tuesdays , Thursdays & Saturdays

Sundays will be a reserve day in which IEC campaigns will be conducted. In addition if any villages are left out during the week, it will be covered on the reserve day.

Vellur village is about 12 kms from the nearest Veterinary institution namely Veterinary Dispensary, Kumilankulam. There are about 10 villages situated in and around Vellur that are not covered by the Government Veterinary Institution. Further the breedable female population in and around Vellur that is untapped by the Government veterinary institution is around 2,100. Hence Vellur village is fixed as the headquarters of the Sub basin Veterinary Unit.

Name of the Sub basin Veterinary Unit :			3. T.Managaseri	
Sl. No.	Name of Villages to be Covered	Distance from the Head Quarters (in Kms.)	Nearest Govt. Institution	Distance from the village to Govt. inst. (In Kms)
1.	T.Managaseri	0	VD, Srivilliputhur	12
2.	Krishnaperi	3	VD, Sithurajapuram	10
3.	Enjar	8	VD, Sithurajapuram	12
4.	Mullikulam	7	VD, Srivilliputhur	10
5.	Padikasuvaithanpatti	16	VD, Perumalthevanpatti	6
6.	vilupanur	10	VD, Srivilliputhur	8
7.	Pattakulam	6	VD, Srivilliputhur	9
8.	Sallipatti	7	VD, Srivilliputhur	8
9.	Sivandhipatti	10	VD, Srivilliputhur	9
10.	Nedunkulam	8	VD, Kumilangulam	15
11.	Thachakudi	9	VD, Thiruthangal	11

Villages 1 to 6	Mondays , Wednesdays & Fridays
Villages 7 to 11	Tuesdays , Thursdays & Saturdays
Sundays will be a reserve day in which IEC campaigns will be conducted. In addition if any villages are left out during the week, it will be covered on the reserve day.	

T.Managaseri village is about 12 kms from the nearest Veterinary institution namely Veterinary Dispensary, Srivilliputhur. There are about 10 villages situated in and around T.Managaseri that are not covered by the Government Veterinary Institution. Further the breedable female population in and around T.Managaseri that is untapped by the Government veterinary institution is around 2,000. Hence T.managaseri village is fixed as the head quarters of the Sub basin Veterinary Unit.

The Fourth Sub Basin Veterinary Unit will be established in the sub basin and the details will be incorporated at a later date

6.1.(c) An unemployed Veterinary Graduate who will be designated as Sub basin Veterinary Extension Officer will man each Unit. He will be given one month entrepreneurship training at renowned national institutions like IRMA / NDDDB. On completion of this training, the Animal Husbandry Department will give him 5 days orientation training in the nearest veterinary institution. The orientation training will be an over view of the departmental organisation and structure, duties and role of officers, disease endemicity and farmers know-how in the area.

6.1.(d) The unemployed graduate should have a two wheeler. If he doesn't have a two wheeler, he will be tied up with a bank for availing the loan. He will be located in the Water Users Association building, which will be his headquarters. He will prepare a weekly route map in consultation with Animal Husbandry Department, Water Users Association and local village panchayats for providing veterinary services. He will visit the villages as per the scheduled programme and provide veterinary services like vaccination, deworming, castration and treatment and breeding support like artificial insemination and pregnancy diagnosis. The route will be reviewed and assessed for intake of the veterinary services by the end users once in 3 months and suitable alterations if necessary will be made. Flexibility will be given to change the tour programme based on need. The unit will be under the technical control of the Animal Husbandry Department. The sub basin veterinary extension officer will computerize all records regarding information on artificial insemination like date of artificial insemination done, straw used, sire yield, date of follow up for conception, etc.

6.1.(e) To provide breeding support by artificial insemination necessary inputs like LN2 containers (35 lit. and 3 lit.), artificial insemination guns, thawing flasks and straw cutters (one set) will be provided. The funds for the above inputs (LN2 containers, artificial insemination guns, thawing flasks and straw cutters) will be sourced from Tamil Nadu Livestock Development Agency (TNLDA). The unit will also be provided with other equipments like microscope, centrifuge, etc. for carrying

out preliminary disease diagnosis. Other inputs for breeding like LN2 and frozen semen straws will also be provided for carrying out services at the farmers door step. The unit will also be provided with dewormers, essential surgical items like cotton, guage, catguts, intra-uterine infusions, etc., which will be procured from Tamil Nadu Medical Services Corporation (TNMSC) for providing veterinary services. In addition a one time revolving fund of Rs.10,000/- will be provided to the Water Users Association. The above fund will be utilised for stocking of medicines and injectables as per the requirement of the Sub basin Veterinary Extension Officer. The fund for the above will be sourced from the project. The Animal Husbandry Department will ensure supply of vaccines like Hemorrhagic septicemia, Black quarter, Anthrax, Enterotoxaemia and Sheep pox free of cost for carrying out vaccination in the unit's service area. The Regional Joint Director of Animal Husbandry will be the facilitator for purchase of the above items from TNMSC and will also ensure prompt supply of vaccines.

6.1.(f) The veterinarian will earn his remuneration by collecting a minimum of Rs.50/- per artificial insemination as professional charges for himself from the farmer. In addition, he can collect a nominal fee of Rs.50/- for minor treatments and Rs.100/- for major treatments as professional charges for himself. The cost of medicines utilised for treatment will be borne by the farmer. However if the farmer prefers, the sub basin veterinary extension officer can utilise the medicines and injectables available with the Water Users Association and collect additional charges for medicines utilised which will be remitted to the Water Users Association. The above amount remitted will be used as revolving fund for purchase of medicines. To ensure a wider coverage with increased conception rate, a performance linked incentive for every calf born out of inseminations done by the Unit will be factored, wherein a sum of Rs.50/- will be given during first year, Rs.40/- for second year, Rs.30/- for third year and Rs.20/- for fourth and fifth year. In addition, the veterinarian will be given an artificial insemination incentive of Rs.20/- for first year, Rs.15/- for second year and Rs.10/- from third year to fifth year. A proper proforma for checking the incentive to be given to the Sub basin Veterinary Extension Officer will be developed, which will contain all details like name of the farmer, address, date of artificial insemination, initials of the farmer, veterinarian, Water User's Association. A

5% check will be done by the Sub basin Animal Husbandry nodal officer before disbursement of incentives.

6.1.(g) Each unit will be established at a total cost of Rs. 7,83,700/- for 5 years in which Rs.0.49 lakhs will be non-recurring and Rs.7.35/- lakhs will be recurring cost. Totally Four units will be established in the river basin at a total cost of Rs 31.35 lakhs. The financial details and number of units to be established in each river basin is furnished below

**FINANCIAL COST FOR ESTABLISHMENT OF ONE SUB BASIN VETERINARY UNIT
(In Rs.)**

	NON-RECURRING EXPENDITURE/UNIT	1st yr. Rs.					
1	Cost of one 35 lts and 3 lts LN2 container Rs.18,000/- (will be sourced from TNLDA)	0					
2	Cost of A.I. Gun, thawing flask and straw cutter Rs.1000/- (will be sourced from TNLDA)	0					
3	Cost of other equipments like centrifuge, castrator, etc.	14000					
4	Binocular Microscope	15000					
5	Purchase of furniture, etc	10000					
6	One time revolving fund for purchase of medicines	10000					
	Total	49000					
	RECURRING EXPENDITURE/UNIT	I Year	II Year	III Year	IV Year	V Year	Total cost (In Rs.)

1	Cost of straws @ Rs.15/straw at the rate of 2400/1st yr, 2700/2nd yr, 3000/3rd yr, 3360/4th yr & 3840/5th yr.	36000	40500	45000	50400	57600	229500
2	LN2 @ 250 Lit/year @ Rs.26/lit	6500	6500	6500	6500	6500	32500
3	Cost of basic medicines, infusions and surgical items @ Rs.20,000/annum	20000	20000	20000	20000	20000	100000
4	Incentive for the veterinarian for each calf born @ Rs.50/- for 1st yr, Rs.40/- for 2nd yr, Rs.30/- for 3rd yr, Rs. 20/- for 4th & 5th yr.	8000	39200	33000	24480	27520	132200
5	Incentive for the veterinarian for each artificial insemination done @ Rs.20/- for 1st yr, Rs.15/- for 2nd yr, Rs.10/- for 3rd to 5th yr.	48000	40500	30000	33600	38400	190500
6	Miscellaneous Charges for chemicals, glasswares, etc.	10000	10000	10000	10000	10000	50000
	Total	128500	156700	144500	144980	160020	734700
	Recurring Expenditure for 5 years						734700
	Total (Recurring + Non-recurring)						783700

6.1.(g) The above endeavor will ensure that areas hitherto unserved are covered qualitatively by increased breeding cover via artificial insemination coverage, health cover by timely vaccination, deworming and treatment. This will ensure proper disease control and livestock with better genetic potentialities which will lead to increased productivity per animal thereby ultimately leading to better profits between farmers in the project area.

6.2 Improving the Essential Infrastructure in the Government Institutions in the Project Area.

6.2. (a).1 Graduate Institutions: A good and well-equipped infrastructure is the key to an all round growth and development. There are 14 graduate veterinary institutions and 15 subcenters functioning under the Government fold in the project area. The infrastructure in the graduate veterinary institutions are being

strengthened at a cost of Rs.33,000/- per Graduate Institution. The infrastructure that are to be added in each Graduate Institution are Mouth Gag, Dentist autoclave, mastitis detector, etc. The 14 institutions will be strengthened at a cost of Rs.4.62 Lakhs.

6.2.(a).2 Mouth gag will help in better diagnosis, dentist autoclave will be handy which can be carried to field for sterilization of equipments, instruments used in routine Veterinary practice while mastitis detector will be useful for detection of sub clinical and clinical mastitis – a disease that causes reduction in milk yield, loss of productive days and prolonged recovery time. The animal does not achieve the peak productivity after Mastitis, the early detection of which will prevent huge economic losses to the farmers. All these measures will help in effective delivery of Veterinary services and early diagnosis and facilitate quality and timely treatment of ailments for the livestock in the sub basin area.

6.2.(b) Sub-Centres: The infrastructure presently available to subcentres was provided 30 years back are old and needs replacement. It is proposed to provide essential equipments like castrators (large and small), dressing tray, scissors, forceps, wash basin, etc to each sub centre in the project area at a cost of Rs.20,000/- per sub centre. Totally 15 subcenters in the project area will be provided with essential equipments at a total cost of Rs.3.00 lakhs.

6.2.(c) Strengthening Diagnostic Facilities in Sub-Basin Referral Institution: Strengthening the diagnostic facilities in the sub basin by providing special diagnostic tools to one sub basin veterinary institution at a cost of Rs.3.00 lakhs, is also a part of the project. The institution will be designated as Referral Institution for the sub basin. The Veterinary Dispensary at Srivilliputhur is being identified and upgraded as the referral institution. In the identified referral institution, semi auto analyzer and accessories will be provided for ensuring complete timely blood analysis.

6.2.(d).1 Strengthening Storage Input Facilities for Breeding in the Sub-Basin: To ensure timely supply of frozen semen to all Sub basin Veterinary Units

functioning in the sub basin, it is imperative to have bulk storage facilities for frozen semen and LN2. Hence, jumbo 55 liters. frozen semen storage containers and 55 liters transport containers are essential. Frozen semen containers are needed for storage of frozen semen while transport containers are needed for transport of frozen semen from production centre to the end user i.e. the Sub basin Veterinary Unit. More over, as frozen semen is a highly fragile biological product, the transport container will be additionally utilised for not only topping LN2 whenever needed but will also be utilized for topping LN2 to the Sub Basin Veterinary Unit in case of shortfall in supply of LN2. Considering the total number of Sub basin Veterinary Units, one jumbo 55 liters. frozen semen storage container and one 55 liters transport container is essential in the above sub basin The above containers will be placed in the Cattle Breeding and Fodder Development Unit, Virudhunagar under the control of the Department. A set of jumbo 55 liters frozen semen storage container and 55 liters. transport container will be provided from the project at a cost of Rs.40,000/- per set.

6.2.(d).2 In addition a set of jumbo 55 liters. frozen semen storage container and 55 lts. transport container would require 2500 litres of LN2 per year for storage and transport of semen per year. The cost per litre of frozen semen would be Rs.26/-

6.2.(e) Infrastructure improvement in the project area will enhance the quality in delivery of veterinary services and diagnostic facilities contributing to reduction in the incidences of animal diseases, thereby increasing the overall productivity, which can contribute significantly in increasing the farm income of the farmers.

6.3. Increasing Availability of Green Fodder.

6.3.(a) Feed and fodder are the major limiting factors in enhancing farm animal productivity. In our country, fodder production is still deemed ancillary to agricultural production. The green fodder resources for livestock are mainly derived from grazing in grasslands and pastures, fodder crops from cropped lands, weeds, bund grasses, tree leaves and mixed forages. Crop residues mainly sorghum and paddy straws which are poor in nutritive value constitute the major fodder for livestock.

The economic viability of livestock husbandry depends on sources of feed and fodder, as feeding cost constitutes 65-70% of the total cost of livestock farming. The availability of green fodder is restricted to selected areas and seasons. Green fodder should be fed throughout the year not only to maintain milk production but also for improving the conception rate. Moreover adequate availability of green fodder will reduce the dependence of farmers on concentrates.

6.3.(b) Generally small ruminants like sheep and goats are not stall -fed. They are allowed for grazing. Hence for calculation of green fodder, only the bovines are taken into account. In the project area a considerable gap exists between requirement and availability of green fodder.

6.3.(c) The requirement, availability and shortage of green fodder for the bovine population in the project area is furnished below.

	Sub basin	Bovine Population	Requirement (In MT)	Availability (In MT)	Shortage (In MT)	%age of Shortage
1	Arjunanadhi	46513	1,43,882	28,500	115382	80%

Hence to reduce the green fodder shortage, around 250 hectares of additional land will be brought under CO3 cultivation in the sub basin area.

6.3.(d) Around 250 hectares of land earmarked for fodder cultivation in the private lands in the project area will be taken up for cultivation of Co3 as demo plots. The farmers will be supplied inputs like seeds and slips. The cost of cultivation will be borne by the farmer. The Animal Husbandry Department will ensure supply of quality slips. The yield rate and cost of inputs is furnished below .

Sl. No.	Name of fodder	Avg. Yield per ha per year (In tonnes)	Cost of inputs per Hectare (In Rs.)
1.	Co3	250	6,000

Village wise CO-3 Fodder Cultivation Area Proposed (In Ha.)

1. Kansapuram	20 ha
2. S.Kodikulam	5 ha
3. W.Pudupatti	20ha
4. Sundarapandiam	20ha
5. Nathampatti	30ha
6. Viluppanur	30ha
7. Thatchakudi	20ha
8. Keela Thiruthangal	25ha
9. Sirukulam	60ha
10. Kottaiyur	20ha

6.3.(e) The new area to be brought under fodder cultivation and the status of green fodder in the sub basin after implementation of the project is as follows.

Present Fodder Status :

Availability at present (in MT)		
Maize @ yield rate of 50 tonnes/ha for 300 ha	Fodder Cholam @ yield rate of 45 tonnes/ha for 300 ha	Total yield
15000	13500	28500

Fodder Availability Status after the end of project:

Year	Yield to be added	Total CO3 fodder cultivated during the end of the year.	Shortage of Fodder (in MT)	Cost of inputs for the cultivation of fodder in the proposed area	
	Co3 fodder @ yield rate of 250tonnes/ha for 250ha @ 90 ha for 2 / 3rd year, 50 ha for 4th yr & 20 ha for 5th yr. (in MT)			Co3 fodder @ Rs.6000	Total Cost of inputs for 5 years (In Rs.)
I Year	0	28500	115382	0	1500000
II Year	22500	51000	92882	540000	
III Year	22500	73500	70382	540000	
IV Year	12500	86000	57882	300000	
V Year	5000	91000	52882	120000	

6.3.(f) Even after increasing the green fodder availability from 28,500 MT to 91,000 MT at the end of the project period, there will be a shortfall of 52,882 MT. The above shortage will be met by allowing the animals to graze in the tank bunds, Common Property Resources, etc.

6.4 Improving the Knowledge Level of the Farmers by Various Out Reach Programmes.

6.4.(a) The success of the project depends on effective dissemination of information to the field in improving the knowledge level of the farmers on best and latest animal husbandry practices, emerging new diseases and their control and optimum utilisation of fodder resources by various out reach programmes.

The out reach programmes planned in the project area are:

1. Infertility cum Total Veterinary Health Care Camps.
2. Distribution of mineral mixture
3. Information, education and communication campaigns.

6.4.(b) *Infertility cum Total Veterinary Health Care Camps.*

6.4.(b).1. Under this programme, infertility cum total health cover both preventive and curative will be provided to all livestock and poultry by conducting special camps in each sub-basin Veterinary Unit service area at the rate of one camp per unit per month for 5 years. In these camps, various activities like health care, disease prevention vaccination against endemic diseases, deworming, castration, artificial insemination, pregnancy verification, infertility treatment, etc. will be carried out free of cost. An exhibition depicting various livestock diseases and preventive measures, fodder development measures, calf rally along with demonstration will also be conducted for creating awareness among the farmers.

6.4.(b).2. Prior wide publicity will be given regarding the village where the camp is to be conducted in the village and near by villages. In addition, the day and place where the camp is to be conducted will be displayed in the Water Users Association building. The services of the veterinarians and para-veterinarians working in the Animal Husbandry Department in the sub basin area will be utilised for conducting the camps. A calf rally will be organised in the camp and best calf / calves will be given prizes which will act as motivation

for other farmers. During the camps, pamphlets and leaflets on best and latest animal husbandry practices, emerging new diseases and their control and optimum utilisation of fodder will be distributed.

6.4.(b).3. Each camp will be conducted at a cost of Rs.6, 000/-.

<u>Sl. No.</u>	<u>Component</u>	<u>Cost in Rs.</u>
<u>1.</u>	<u>Medicines</u>	<u>3,500</u>
<u>2.</u>	<u>Cost of 50 straws for artificial insemination</u>	<u>750</u>
<u>3.</u>	<u>Publicity and Propaganda</u>	<u>500</u>
<u>4.</u>	<u>Distribution of prizes in calf rally</u>	<u>500</u>
<u>5.</u>	<u>Miscellaneous charges like erection of shamina, etc., for conducting the camp</u>	<u>750</u>
	<u>Total</u>	<u>6,000</u>

6.4.(b).4. Apart from total health cover the camp is expected to achieve, it will help in identifying animals affected by infertility due to mineral deficiency. The total financial cost for this component for 5 years is Rs.10.80/- lakhs.

6.4.(c). *Distribution of Mineral Mixture.*

6.4.(c).1. One of the major problems affecting conception is infertility. The major causative factor for infertility in the field is mineral deficiency. Hence to correct this deficiency, which is the vital factor affecting conception and calving, it is proposed to distribute mineral mixtures to needy animals in the project area.

6.4.(c).2. The sub basin veterinary extension officer visiting the villages on the scheduled programme will select the eligible animals during the visit. In addition animals will also be identified during the infertility cum total health cover camps. The eligible animals will be given mineral mixture @ 25 gms per day for 365 days. The sub basin veterinary extension officer will maintain the data of eligible animals covered under this programme and ensure examining the animals regularly for growth parameters. The sub basin wise cost required for distribution of 25 gms. of mineral mixture for 365 days to 100 animals at a cost of Rs.40/- kg per sub basin veterinary extension officer for 5 years is 1.825 lakhs. For 3 units, 5.48 lakhs would be required for this component.

6.4.(c).3. By this the animals will come to oestrus early and lead to better conception and calving rates. Moreover this will lead to reduction in inter-calving period there by increasing the productive life of the animal.

6.4.(d). Information, Education and Communications Campaigns

6.4.(d).1. *Printing of Pamphlets and Leaflets.*

Pamphlets and leaflets on best practices in animal husbandry, bio security measures to be taken to prevent diseases, economic diseases affecting livestock and their prevention and control measures, optimum utilisation of fodder resources with emphasis on inclusion level of non conventional feeds, etc. will be printed in Tamil for distribution to the farmers in the project area.

6.4.(d).2. *Erection of Hoardings and Wall Paintings.*

Posters, hoardings and banners carrying the activities undertaken in the project area will be displayed in all Sub basin Veterinary Units. The same will also be displayed in all Government institutions functioning in the project area. In addition wall paintings depicting signs of commonly affecting diseases will be painted on walls where people congregate in large numbers

6.4.(d).3. *Conducting Night Meetings*

6.4.(d).1.a. Night meetings will be conducted involving the Water Users Association, Animal Husbandry Department and Sub basin Veterinary Extension Officer at a common place in the sub basin on a suitable day in each Sub basin Veterinary Unit and Graduate institution area at the rate of one per quarter. The meeting not only enables participation of all the farmers in the sub basin but also acts as a source of information to other farmers.

6.4.(d).1.b. During the night meetings, village people will be enlightened on benefits of rearing livestock and will be motivated to take up livestock rearing. Pamphlets and

leaflets will be distributed to the farmers. A small exhibition and method demonstration will be organised for the benefit of the farmers. The services of link agencies like Tamil Nadu Veterinary and Animal Sciences University and Tamilnadu Milk Producers Cooperatives Union will be utilised where ever necessary. In the night meetings successful animal husbandry entrepreneurs in the village and neighboring villages will be requested to share their views on their methodology followed for their success.

6.4.(d).4. All the above Information, education and communications campaigns will be conducted in the sub basin at a total cost of Rs.9.35 lakhs.

6.5. Enhancing the Knowledge Level of Human Resource in the Project Area.

Continuing education is the touchstone of success. The p roject envisages capacity building at all levels like farmer, veterinarian, para -veterinarian operating in the sub basin to achieve the desired results of increased sustainable productivity at the end of the project.

6.5.(a). *Training of Farmers*

6.5.(a).1. Farmers generally have a traditional knowledge of breeding and management of livestock. The existing awareness, knowledge level and skill in profitable rearing of livestock with latest animal husbandry techniques among majority of farmers are minimum in the project area. Hence it is essential to impart training to upgrade the skills and knowledge level for profitable animal husbandry rearing.

6.5.(a).2. Under this programme, elite farmers interested in animal husbandry activities will be selected and given training on best practices in livestock rearing. They will also be enlightened on importance of feeding and cultivation of fodder crops. Emphasis will be given to enlighten the farmers on feeding of unconventional feeds and their inclusion level. Moreover they will be briefed about the diseases generally affecting the livestock in the basin and their symptoms and control

measures. In addition they will be enlightened on the importance of deworming, vaccination and clean milk production. The farmers trained will be utilised for dissemination of the above information to their counterparts in the villages.

6.5.(a).3. For the above purpose, progressive farmers @ 400 per year interested in animal husbandry activities in the sub basin will be selected for 3 day training. They will be divided into batches of 25 per batch. Training will be provided in the nearest veterinary institution. They will be given a training incentive of Rs.100/day as they will have to attend the training programme foregoing their normal daily earning. During the training, each trainee will be given study material worth Rs.50/- . To motivate the trainer, a trainer honorarium of Rs.250/- per day will be provided. In addition miscellaneous charges of Rs.500/- will be provided for each batch. A total cost of Rs.10,000/- will be required for training each batch. During the project period of 5 years, a total of 2000 farmers (80 batches of 25 farmers per batch) in the sub basin will be trained at a cost of Rs.8.00 lakhs.

6.5.(b). *Entrepreneurship Training to Unemployed Veterinary Graduate :*

4 Unemployed Veterinary Graduates are to be trained for the Arjunanadhi Sub basin. 3 Sub basin veterinary units are proposed in the sub basin . One unemployed Veterinary graduate is trained additionally for the future in case there is any drop out. The entrepreneurship training is given to the unemployed veterinary graduate for sustainable animal husbandry activities.

6.5.(c). *Orientation Training for Rural Veterinary Extension Officers*

6.5.(c).1. Though the sub basin veterinary extension officers are basically veterinarians who may possess a sound theoretical knowledge on animal husbandry and veterinary treatment, their field experiences and exposure may be minimum. To attain the desired field results in a short term, it is essential to know the terrain and problems faced by the farmers in the basin. Hence 5 days orientation training is proposed for the sub basin veterinary extension officer selected to work in the Sub basin Veterinary Unit.

6.5.(c).2. Training will be provided to each Sub basin Veterinary Extension Officer in the nearest veterinary institution in the sub basin which will be identified by the Regional Joint Director and Assistant Director of Animal Husbandry of the concerned jurisdiction. They will be given a training incentive of Rs.150/day. During the training, each will be given study material worth Rs.100/-. To motivate the trainer, a trainer honorarium of Rs.500/- will be provided. A total cost of Rs.1,350/- will be required for training each Sub basin Veterinary Extension Officer. Thus in the project area to train 3 Sub basin Veterinary Extension Officers, Rs.4050/- would be required.

6.5.(d). In-service Training for 14 Veterinarians

6.5.(d).1. Veterinarians have an overall knowledge of breeding, management, diagnosis and treatment of livestock. With advancing science and technology, the techniques followed may have become obsolete. Moreover, new and simple techniques have evolved in animal husbandry management, breeding, diagnosis and treatment. Hence it is essential to update the knowledge and skills of the veterinarians in Government institutions in the project area.

6.5.(d).2. The 14 veterinarians working in the Government institutions in the sub-basin will be given a trainers training at Madras Veterinary College / Namakkal Veterinary College at a cost of Rs.2000/- per individual. The total cost for training the 14 veterinarians in the sub-basin would be Rs.28000/-

7. Ensuring Marketing Tie up for the Products.

With the rapid urbanisation, changing life styles and increasing purchasing power of the people, the demand for livestock and livestock products is expected to rise steadily. Hence marketing the livestock and livestock products in the sub basin will not be a major problem.

ASSUMPTIONS:

The breedable age female population in the Arjunanadhi Sub Basin is 19,076 which include 14,325 crossbred, 1246 indigenous cattle and 3,505 buffaloes.

- 1) Available breedable female population in the basin after reducing for mortality, sterility etc., at the rate of 15% in crossbred, 5 % in indigenous and 5 % in buffaloes, there will be 12,176 crossbred, 1,184 indigenous and 3,330 buffaloes.
- 2) At present there are 14 Graduate Veterinary Institutions and 15 Sub centers functioning under Government fold doing artificial insemination work of which 13 subcenters are vacant.
- 3) The above Government Institutions have carried out an average artificial insemination of 15,124 in crossbred, 908 in indigenous and 1,523 in buffaloes.
- 4) Assuming 2.8 (35%) inseminations are required for conception in cattle and 3.3 (30%) inseminations are required for conception in buffaloes, the actual animals covered is 5,401 crossbred, 324 indigenous and 462 buffaloes.
- 5) Thus the breedable age female population unserved by the Government institutions is 6775 crossbred, 860 indigenous and 2868 buffaloes.
- 6) For of the above animals unserved, four sub basin veterinary units will be established in the sub basin each covering around 10 villages.
- 7) During the first year 2,400, second year 2,700, third year 3,000, 4th year 3,360, 5th year 3,840 and from then **on 3,840** artificial inseminations will be done by each sub basin veterinary unit.
- 8) It is assumed that since the basin has a high crossbred population 70% crossbred (6720), 20% indigenous (1100) and 10% (1780) buffaloes will be targeted by the above two units during the first year.

Year wise Number of Animals Targeted Through 4 AI Units

Year	AI done by the units			Total
	Crossbred	Indigenous	Buffalo	
I Year	6720	1100	1780	9600
II Year	7550	1240	2010	10800
III Year	8300	1460	2240	12000
IV Year	9380	1600	2460	13440
V Year	10600	1862	2898	15360
Average	8510	1452	2278	12240

9) The conception rate for the Sub basin veterinary unit is as follows:

Year	Conception Rate in Cow	Conception Rate in Buffalo
1st year	35% (2.8)	30% (3.3)
2nd year	40% (2.5)	35% (2.8)
3rd year	45% (2.2)	40% (2.5)
4th year	50% (2.0)	45% (2.2)
5th year	50% (2.0)	50% (2.0)

10) Taking a conception rate of 35% for cattle and 30% for buffalo during the first year, the actual animals covered by the unit will be 2400 crossbred, 393 indigenous and 540 buffaloes.

11) By the work done by these three units during the first year, out of the total 2057 cattle (1,800 crossbred, 257 indigenous) conceived, 50% (1029) heifer calves will be born. Similarly out of 436 buffaloes, 218 buffalo heifer calves will be born.

Year	Year wise Number of Heifer Calves Born	
	Crossbred	Buffalo
I Year	1029	218
II Year	1296	290
III Year	1637	360
IV Year	2016	458
V Year	2304	576

12) Now calf mortality is taken as 5% for crossbred and 10% for buffaloes. Therefore out of the 1029 crossbred heifer calves, 51 will be lost. Similarly out of 218 buffalo calves, 22 will be lost during the first year.

Year	Year wise Number of Heifer Calves Lost	
	Crossbred	Buffalo
I Year	51	22
II Year	65	29
III Year	82	36
IV Year	101	46
V Year	115	58

13) The actual crossbred animal in milk created in the sub basin by intervention by Three units (and the one unit details to be added) during first year will be 2057 (1800 Crossbred plus 257 Indigenous cattle). Similarly 437 buffaloes will be in milk.

Year	Year wise Number of Animals in Milk			Total
	Crossbred	Indigenous	Buffalo	
I Year	1800	257	437	2494
II Year	2268	324	579	3171
III Year	2864	409	720	3993
IV Year	3528	504	916	4948
V Year	4032	576	1152	5760
Average	2898	414	761	4073

14) The average milk yield in the project area will be increased to 7 litres in crossbred, 800 ml or maximum of 3.6 litres in indigenous and 4.5 litres for buffaloes.

15) During the first year, the total milk yield in the sub basin by intervention by these units will be 32.99 lakh litres by crossbred (assuming 6.11 lts. is the average yield), 2.01 lakh litres (assuming 2.8 lts. is the average yield) by indigenous and 4.19 lakh litres (assuming 3.2 lts. is the average yield) by buffalo.

Year	Average Milk Yield/day (In Lts.)			Total Milk Yield/ Lactation (In lakh Lts.)		
	Crossbred	Indigenous	Buffalo	Crossbred (300 days lactation)	Indigenous (280 days lactation)	Buffalo (300 days lactation)
I Year	6.11	2.8	3.2	32.99	2.01	4.19
II Year	6.3	3.0	3.4	42.87	2.72	5.91
III Year	6.5	3.2	3.8	55.85	3.66	8.21
IV Year	6.7	3.4	4.2	70.91	4.80	11.54
V Year	7.0	3.6	4.5	84.67	5.81	15.55

16) Thus the value of milk in the sub basin will be Rs.357 lakhs (cost of cow milk is Rs.9/- and buffalo milk is Rs.10/-).

Year	Value of Milk (In lakh Rs.)			
	Crossbred	Indigenous	Buffalo	Total
I Year	297	18	42	357
II Year	386	24	59	469
III Year	503	33	82	618
IV Year	638	43	115	796
V Year	762	52	156	970

17) Thus economic return at the end of the project by way of milk will be Rs.613 lakhs, an increase of Rs.394 lakhs.

18) The cattle heifer calves born during the first year is brought into breeding stock during the 3rd year. Similarly in buffalo 1st year heifer calves is brought into 4th year breeding stock.

Year	Year wise Female Breeding Stock Created		
	Crossbred	Indigenous	Buffalo
I Year	6775	860	2868
II Year	6775	860	2868
III Year	7753	860	2868
IV Year	8984	860	3064
V Year	10539	860	3325

19) The main advantages of the programme

- ☞ Provides service at the farmer's doorstep or nearest to the farmer's doorstep.
- ☞ Increased coverage
- ☞ Better conception rate
- ☞ Reduced stress to the animals
- ☞ Timely treatment
- ☞ Reduced recovery time from illness
- ☞ Ensuring coverage of animals with vaccination and deworming
- ☞ Saving the man hours of the farmers
- ☞ Genetic potential improvement (crossbred)
- ☞ Timely artificial insemination, thereby not only increasing conception and calving rate, but also reducing the inter-calving period.
- ☞ Timely artificial insemination and calving, leads to more production days during the productive life cycle of the animal.
- ☞ Reducing scrub bulls born out of natural service.
- ☞ Avoiding diseases like Trichomonosis, brucellosis, etc., affecting the urogenital tract of females, leading to abortion, sterility, etc., when the animals are put into natural service.
- ☞ For natural service, the chance of the same bull serving the mother and dam is higher which may lead to inbreeding, but if frozen semen is used, the semen can be rotated nullifying the chances of inbreeding.
- ☞ Increasing the per animal milk production potential, leading to a substantial increase in milk production
- ☞ Increasing the farmers' income through animal husbandry.

OUTCOMES EXPECTED

Sl. No.	Project Year	I Year	II Year	III Year	IV Year	V Year	Total
1	Artificial Insemination Done (In Nos.)	7200	8100	9000	10080	11520	45,900
2	Calves Born (In Nos.)	2494	3172	3994	4954	5760	20374
3	Heifer calves born (In Nos.)	1247	1586	1997	2477	2880	10187

4	Milk Yield (In lakh Lts.)	39.19	51.50	67.72	87.25	106.03	351.69
5	Value of Milk (In Lakh Rs.)	357	469	618	796	970	3210

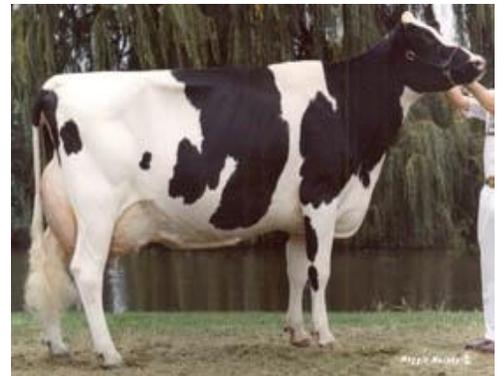
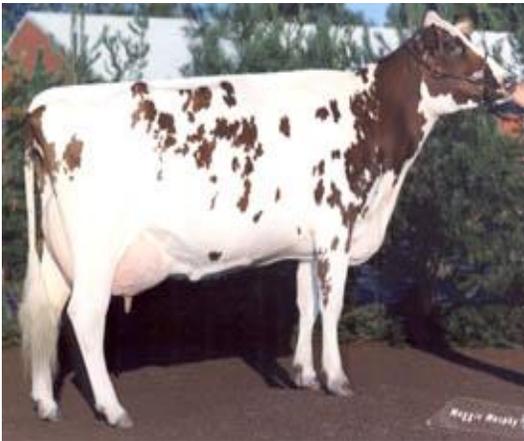
Note: Out the total value of milk, around 70 - 75% will be cost of inputs like feed, fodder, health care, etc.

**ESTIMATE FOR ANIMAL HUSBANDRY COMPONENT TO BE INCLUDED IN
IAMWARM PROJECT REPORT
ARJUNA NADHI SUB BASIN**

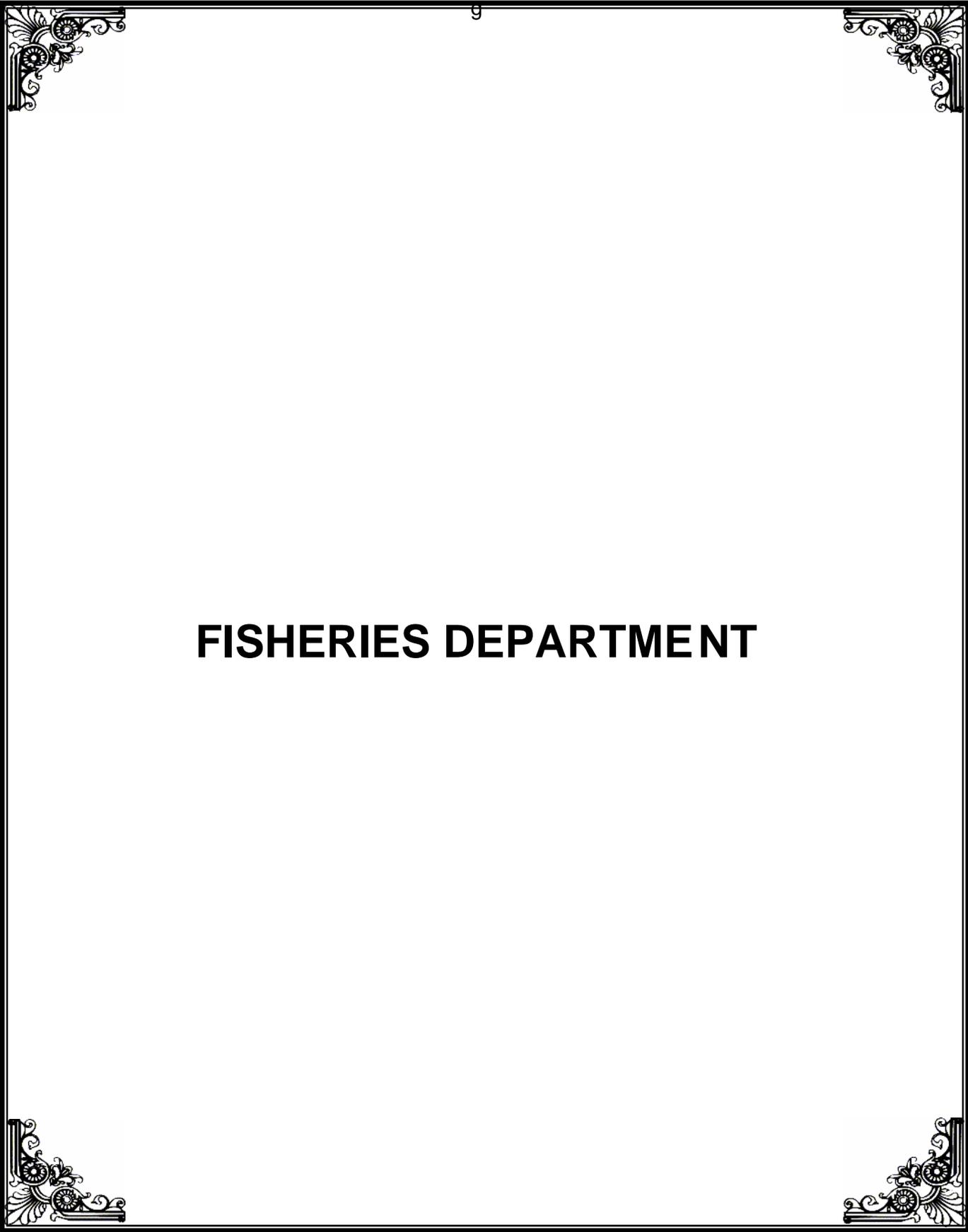
	Components	Physical	Financial (Rs. In Lakhs)
1	Productivity enhancement by improving delivery of veterinary services		
	<i>a. Establishment of Sub basin Veterinary Units (SBVU) @ Rs.7,83,700/- per unit</i>	3 + 1*	23.51
	<i>b. Improving the essential infrastructure in the Government institutions (graduate institutions) @ Rs.33,000/-unit</i>	14	4.62
	<i>c. Improving the essential infrastructure in the Government institutions (sub centers) @ Rs.20,000/-unit</i>	15	3.00
	<i>d. Strengthening the diagnostic facilities in the sub basin by providing special diagnostic tools to sub basin referral institutions @ Rs.3,00,000/- per unit</i>	1	3.00
	<i>e. Strengthening Storage Input Facilities for Breeding in the Sub-basin @ Rs.40,000/- per two jumbo containers & 2,500 lts. Of LN2 @ Rs.26/- ltr. (Total Rs.3,65,000/-)</i>	1	3.65
2	Increasing availability of green fodder in private lands (in hac) - C03 - 250 hac.		15.00
3	Out reach programmes.		0
	<i>a. Infertility cum Total Veterinary Health Care camps @ Rs.6,000 per camp per month for each SBVU</i>	180	10.80
	<i>b. Distribution of mineral mixture @ Rs.1,82,500 per SBVU</i>	3	5.48
	<i>c. Information, education and communications campaigns</i>	17	9.35
4	Enhancing the knowledge level of human resource		0
	<i>a. Training of Farmers</i>	2000	8.00
	<i>b. Entrepreneurship training to unemployed veterinary graduates to be placed as Sub basin Veterinary Extension Officer @ Rs.50,000/- per person</i>	4	2.00
	<i>b. Orientation Training for Sub basin Veterinary Extension Officers @ Rs.1,350/- trainee</i>	3	0.04
	<i>c. In-service Training for Veterinarians @ Rs.2,000/- per person</i>	14	0.28
	TOTAL		88.73

*** One Sub basin Veterinary Unit will be established at a later date.**

HYBRID COWS







FISHERIES DEPARTMENT

ARJUNANADHI SUB BASIN

FISHERIES DEPARTMENT

The basin has 110 (45 system and 65 Non-system tanks) tanks located in the Sub basin in the registered ayacut of 11186 ha. Total water spread area of 110 tanks Together is 5000 ha. Potential Water Spread Area for the purpose of fisheries development is taken at 50% of the WSA, which is 2500 ha. Out of this, 1080 ha covering about 50 tanks are identified for focusing on sustainable aquaculture development in the project. However, about 100 tanks will be covered under the project for one time demo and out of this atleast 50 tanks with a total Water Spread Area (WSA) of 1300 ha are expected to be under sustainable aquaculture activity after the project period. Currently there are no private Fish seed farms. Government farm output shall cover about 90 tanks in 3 years and seed bank about 13 tanks in the 1st year of operation .The strategy is to stimulate private investment through the following strategies

Current productivity in 50 tanks are @ 100 kg/ha of WSA	108.8 tonnes
Gross Value of 130 tonnes @ Rs. 10000/t	13.00 lakhs
Net Returns	6.50 lakhs
Projected productivity in 50 tanks are @ 400 kg/ha of WSA	520 tonnes
Gross Value of 520 tones @ Rs. 35000/t	182 lakhs
Production costs @ 6000/ha	64.8 lakhs
Net Returns	114 Lakhs
Incremental net returns per year after full development	97.50 lakhs

Renovation of Govt. Fish Seed Farm at Pizhavukkal

To support 50 tanks or 1080 ha of effective WSA 108 lakhs of advanced fish fingerlings are required. Currently, one fish farm of the Fisheries Department is located in the Sub basin (Pilavukkal). It produces about 5 lakh fish fingerlings, which are used up for the four reservoirs located within the Sub basin. Hence, it

is proposed to strengthen the infrastructure of the existing fish farm to produce the required fish fingerlings for 780 ha of effective WSA (30 tanks)

Existing two breeder ponds (remaining unused) will be converted to 28 rearing ponds.

Rearing ponds will have 2800 sq.m. of water spread area. 3.36 lakh fingerlings will be produced from one crop. Two crops are possible (50+50 days) to produce about 7.7 lakh fingerlings needed for the (30 tanks) 780 ha targeted under the project. The fingerlings will be sold @ Rs. 40000 per lakh generating an income of Rs.3 lakh per year, which can cover the recurring cost.

Investments:

For fish farm infrastructure	=	Rs.39.0 lakhs
Recurring cost per year	=	2.8 lakhs

Fish Seed Bank

Another activity is establishment of fish seed bank which is proposed under the project with an output of 3 lakh advanced fingerlings per year in three cycles. This will cater to the need of another 300 ha of WSA (about 13 tanks). The seed bank will be owned and operated by progressive WUA and will have a WSA of 600m². The cost of production of 3 lakh fingerling and will be Rs. 58000/- and the advanced fingerlings worth will be Rs. 80000/- per lakh. The association of command of Watrap Periyakanmai is been tentatively identified as a suitable location for the seed bank.

Fixed investment cost	=	14.50 lakhs
Annual recurring cost for 2 years	=	1.16 lakhs

From second year onwards, WUA will be able to generate net incremental benefits of Rs 60000 per cycle of advanced fingerlings produced and sold.

On the first year of operation the fish seed output will support the aquaculture activities in about 13 tanks or 300 ha of effective WSA. From the 2nd

year of operation the Association shall sell the seeds and make profit as well support the Sub basin seed demand.

Aquaculture in Farm Ponds

Agricultural Engineering Department has proposed excavation of 50 Farm ponds. Out of these, 30 Farm ponds shall be identified for aquaculture, which are likely to retain water for more than four months. Availability of bore well will be preferred since the culture period can be extended to get better fish production. Stock size fish seedlings will be stocked and the expected fish production is 600Kg/Pond/0.1ha. A net revenue of about Rs.10,000/ - per crop is envisaged.

Aquaculture input for one farm pond/crop	Rs. 16,500/-
Therefore for 30 Farm Ponds	Rs. 4.95 Lakh.
Net return 30 x 10,000	Rs. 3 Lakh

TRAINING AND CAPACITY BUILDING

IAMWARM Project's target groups are mainly the WUA who are agriculturist with little knowledge on aquaculture. Hence training and capacity building on fish seed rearing, culture etc. is highly essential. The IAMWARM project training component shall lay emphasis on planning the aquaculture training.

- As a supporting activity, fishing implements (Coracle +Net) 10 unit and Drag net will be given to Fishermen Co-operative Societies to effectively harvest the fishes in the sub basin.
- For monitoring the aquaculture activities vehicle hire charges/Transport charges of 2.00 lakhs and documentation; charges of 0.5 lakh is provided.

Conclusion

- The total fish fingerlings estimated to be produced from the government farm and one seed bank is about 17 lakhs
- This will be the stocking material for 1300 ha of effective WSA of the sub basin. In two year fish culture shall be demonstrated in about 2500 ha covering about 100 ponds
- Agriculture farmer shall get an additional income of about Rs 10000 from aquaculture in farm ponds

Vision:

1. Increase in overall fish production and unit production.
2. Seed requirement of the Sub basin to be met locally.
3. Additional livelihood and income to agricultural farmer from farm ponds.
4. Increase in per capita consumption of fish.
5. Reduced % of mal-nutrition especially among rural children.

Abstract

Sl.No.	Particulars	No. of Unit	Total (Rs. In Lakh)
1	Renovation of Govt. fish seed farm at Pilavukkal		39.00
	Operational cost		13.00
2	Aquaculture in farm ponds	30	4.95
3	Fish seed Bank	1	14.50
	Operational cost		1.16
4	Supply of fishing implement		
	a) Coracle +Net	10	1.40
	b) Drag Net.	5	1.00
5	Vehicles Hire charges		2.00
6	Documentation		0.50
	Total	46	77.60

FISH CULTURE IN FARM POND



FISH SEED FARM @ PERIYAR DAM – Requires Improvements



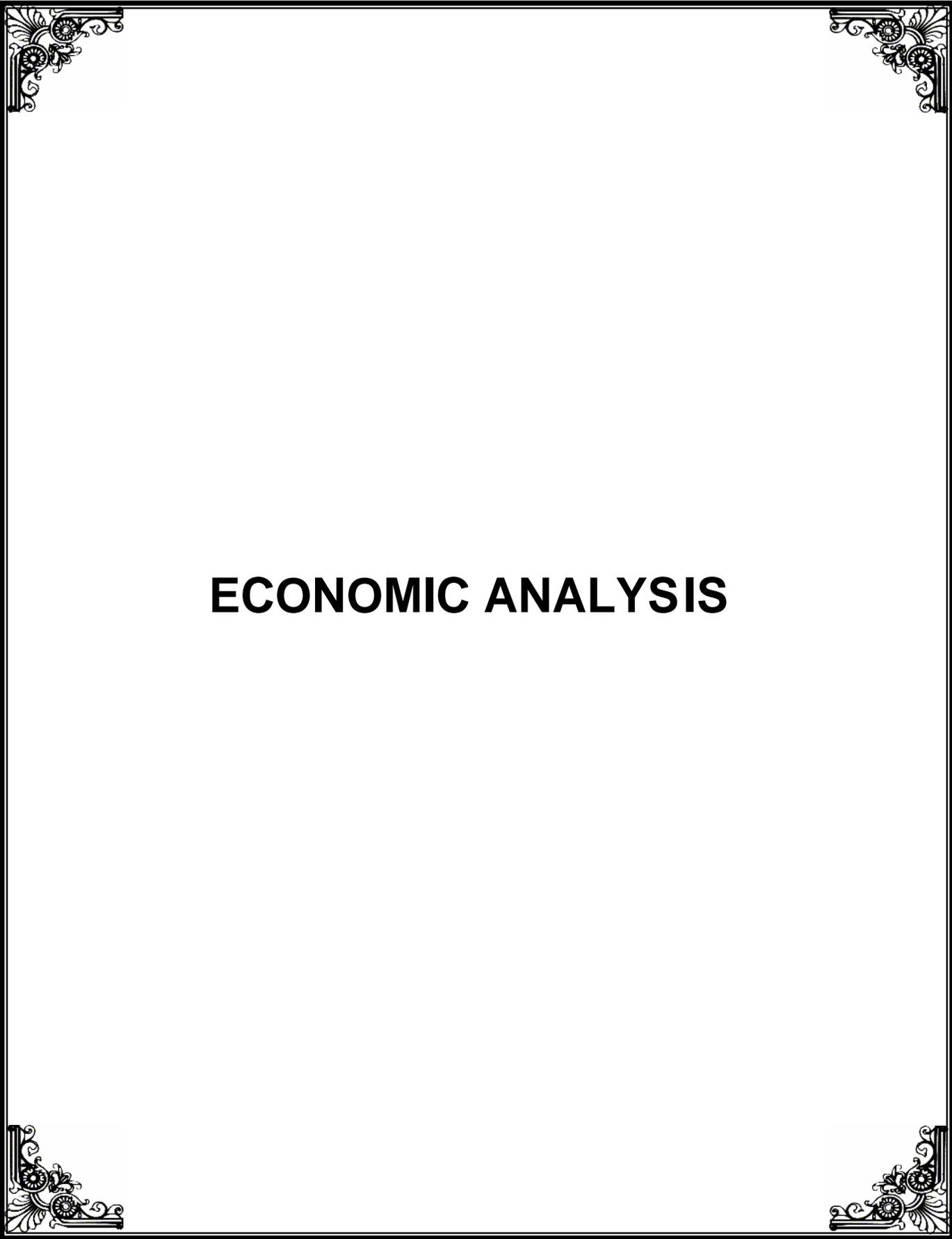


PROJECT COST

TN IAM WARM PROJECT
ARJUNANADHI SUB BASIN

Sl. No.	Name of the Line Department	Estimate Amount in Lakhs
1	Water Resources Organisation	
	a) Rehabilitation of Infrastructures of the Sub-Basin	4557.10
	b) Environmental Cell	29.00
	c) Ground Water	85.00
2	Agricultural Department	129.46
3	Horticultural Department	273.42
4	Agricultural Engineering Department	800.47
5	Tamilnadu Agriculture University	211.32
6	Agriculture Marketing & Agricultural Business Department	77.00
7	Animal Husbandry Department & Veterinary Department	88.73
8	Fisheries Department	77.60
	Total Rs in lakhs	6329.1

(or) 6329.1 Million



ECONOMIC ANALYSIS

ECONOMIC ANALYSIS

The TN-IAMWARM project focuses on improving the productivity of irrigated agriculture in 11186 ha of registered ayacut in Arjunanadhi sub-basin, out of which only 45% area gets fully irrigated now. Out of 11186 ha, around **110** tanks account for **7371** ha and canals/distributaries account for 3815 ha of registered ayacut. 90% of the 12300 farmers in the project area are small farmers with an average farm holding size of 0.55 ha to support an average family size of five. At current levels of irrigation coverage and productivity, this can support only one -fifth of the family to be above poverty line. Project interventions are designed to modernize the irrigation service delivery and improve irrigated agriculture productivity with effective integrated water resources management in a river sub-basin framework. Improved service delivery is expected to close the gap and stabilize the partially irrigated area, together accounting for about 55% of the registered ayacut in Arjunanadhi sub-basin.

The project investment was appraised for the major investment activities in the Arjunanadhi sub-basin, which is agro climatically classified in southern zone. This sample sub -basin represents 25 sub-basins spread over seven basins. Detailed hydrologic database covering registered ayacut, water balance, area irrigated was compiled for the sample sub -basin. Detailed investment costs for the irrigation system modernization and agriculture intensification and diversification are estimated for the sample sub-basin. Economic and financial analysis was conducted for assessing the viability of the project investments in Arjunanadhi sub-basin.

The analysis is based on sample data for 2003/05 on farm size, land use, cropping intensity, irrigation source and cost of cultivation for 11 major crops, collected from sample farm households in Southern agro-climatic zone of Tamil Nadu. Representative small farm models (less than 2 ha) were developed. Crop budgets were prepared for paddy, bajra, blackgram, cotton, ground nut, jowar, maize, sesamum, sugarcane, fruits (sapota, mango, amla and banana), plantation crops (coconut, arecanut), spices (onion, chillies) and vegetables (bhendi, tomato and brinjal). Activity budgets for livestock and fisheries were formulated based on the census data and ongoing schemes in the respective departments. The with/without project assumptions are guided by data collected and studies conducted under TNWRCP. Project costs and benefits are estimated at 2006 prices over a period of 25 years with 12% as the opportunity cost of capital.

Project Benefits

Irrigated Agriculture Irrigation system modernization for improved service delivery improvement and modernized irrigated agriculture, together accounting for 74% of project costs is targeted to cover 11186 ha of land area, out of which, under WOP scenario, 45% gets adequately irrigated and 5% gets partially irrigated while 50% remains as gap ayacut. Since agriculture impacts are strongly influenced by irrigation service improvements, these two activities are clubbed together while considering their costs and benefits. Major sources of irrigated agriculture benefits (T -1) is expected from (i) *area expansion*-shifts in cropped area from gap ayacut and partially irrigated to fully irrigated coverage due to the project interventions; (ii) *diversification*-increased share of area under oilseeds, maize, fruits, vegetables and green fodder following the modernization of irrigated agriculture and livestock and fisheries development in project sub-basins; and (iii) *technology impacts*-increased yield and/or reduced production costs following the resource efficient technology interventions like SRI in paddy and micro -irrigation in major crops like coconut, sugarcane and maize.

T-1 Arjunanadhi Sub-basin project related incremental impacts in a summary

Impacts	Unit	Impacts
Increased irrigated area		5593
Fully irrigated	ha	5033
Partially irrigated	ha	560
Agriculture Intensification		
<i>Increased cropping intensity</i>	%	43%
<i>Increased crop area</i>	Ha	
Paddy (SRI)	Ha	1500
Coconut/Sugarcane/Fruits (Drip with fertigation)	Ha	955
Cotton (Micro irrigation)	Ha	400
Agriculture Diversification		
<i>Increased crop area</i>	Ha	
Maize		800
Fruits and Vegetables		387
Sugarcane		64
Cotton		1246
Pulses		1170
Green Fodder		250
Coconut		40
<i>Improved cross bred lactating cows</i>	Number/year	4840
<i>Improved aquaculture under WSA</i>	Ha	1300
Increased Crop Productivity		
Paddy/Cotton/Sugarcane	%	30%
Maize	%	100%
Coconut/Vegetables/Fruits/Pulses	%	40%
Increased Production	tonnes/yr	
Food grains		16600
Oilseeds		3200
Sugarcane		15500
Fruits/Vegetables		16400
Fodder		43600
Milk		7041
Fish		390
Increased Income		
Directly benefiting farm households	Number	12300
Increased Rural Farm employment	Jobs/year	1290
Incremental farm income	Rs/year	14400
Farm households to go above poverty line	Number	1010
Value of Incremental production at project completion	Million Rs/year	177

Following the physical improvements in the sub-basins, 90% of the registered ayacut will get adequately irrigated and 10% partially irrigated. Incremental land area to be brought under fully irrigated condition is 5033 ha; and irrigated area to be stabilized is 560 ha at the end of the project period (T-2). This includes 3669 ha of gap ayacut under the tanks to be brought under full irrigation coverage and 393 ha of partially irrigated area under the tanks to be stabilized by the project. Diversified area would account for 35% of the land area; an increase of 1/3rd over the WOP situation. Cropping intensity would increase from 100% under WOP to 140% when full project development takes place.

T-2: Weighted average crop yields, Arjunanadhi sub-basin (tons/ha)

Crops	Without project	With project
Paddy	4.2	5.4
Sugarcane	96.5	128
Coconut (nuts)	15420	21760
Maize	2.0	3.9
Fruits	7.6	10.7
Vegetables	8.8	12.4
Pulses	0.49	0.69

Crop diversification in the project area would increase the area under fodder, cotton, pulse, fruits and vegetables. Area under technological interventions would increase the overall weighted average crop productivity (T-2) by 30 to 100% and/or reduce the cost of production by 5 to 10% in major focus crops at the end of the project period. At full project development, SRI techniques

in paddy would cover 36% of the paddy area in the sub-basin; micro irrigation like drip or sprinkler would cover 50% of the area under coconut, cotton, sugarcane, fruits and vegetable crops.

6. Fisheries Fish productivity improvement activities, accounting for 1% of the project cost, are targeted through aquaculture in farm ponds, stock and harvest in short seasonal irrigation tanks and ornamental fish culture. Seed banks and cage units are

T-3: Weighted average productivity, Arjunanadhi Sub basin (t/ha of WSA)

Models	Unit	WOP	WP
Farm Pond Aquaculture	t/ha of WSA	NA	6.0
Seasonal Irrigation Tanks	t/ha of WSA	0.1	0.4
Cross bred cows	l/day/cow	3.0	9.0

proposed in the sub-basins to meet the incremental demand of 17 lakh fish fingerlings. The main benefit considered is increase in per hectare fish productivity following investments in farm ponds and irrigation tanks (T-3). Separate model short seasonal tanks (1300 ha of WSA proposed) and fish seed banks (600 sq.m of WSA proposed) were prepared to capture the incremental benefits of the proposed interventions. Productivity levels for with and without project situations are based on data from sample surveys of ongoing state fisheries department schemes and other published sources (T-3). The project would incrementally produce 390 tonnes of inland fish valued at Rs 10 million after the full implementation of the fisheries related activities by project-ending period.

7. Livestock: Livestock development activities, accounting for 1.40 % of the project cost, are focused on improving breed, feed and health care management in the project sub -basin areas. For breed improvement and health care services, 4 mobile units are proposed to be located in the project sub-basins. At full development, annually 15360 AIs would be incrementally performed in the project sub-basins, resulting in 4840 lactating cross bred cattle in the project sub -basin area. To supplement the incremental demand for green fodder, 250 ha area is allocated for green fodder crops in the sub-basin model cropping pattern. Based on the existing cross bred cattle composition and milk productivity and potentials for enhancing the productivity, annual gross Incremental milk production in the project area is assessed at 7041 tonnes annually at full project development stage to be reached in year.10. Introduction of one cross bred cattle in one farm family would generate an incremental financial income of Rs 5300 which in itself is adequate to take one member of the farm family above poverty line threshold level of per capita income. Other parameters relevant for the project analysis are; conception rate to improve from 40% (WOP) to 50% (WP), calf mortality at 10% and hybrid sterility at 5%, adult mortality at 5%, lactation period at 300 days and milk price at Rs 9 per litre. The overall incremental milk production growth would ensure an annual growth of 10% in the project sub -basin while the trend growth in milk production in the state is over 4% now.

Project Costs

8. **All project costs, including contingencies, of the main project components namely; irrigated agriculture modernization and water resources management are included for estimation of the project's internal rate of return. In estimating rates of return on individual activities, capital costs as well as all O&M costs are included. For irrigated agriculture, livestock and fisheries all project related costs are included in the analysis. Incremental maintenance costs are provided for after the project period based on the**

provision made for the last year of the project. For the analysis of the project as a whole, total project costs (including for project management, etc.) were included.

Economic Analysis

9. Economic and Financial Rate of Return. For traded commodities (e.g., rice, maize, sugar, fertilizers), economic prices were estimated based on import/export parity levels. For all non-tradable commodities, including labor, a standard conversion factor (SCF) of 0.9 was used to estimate economic costs and

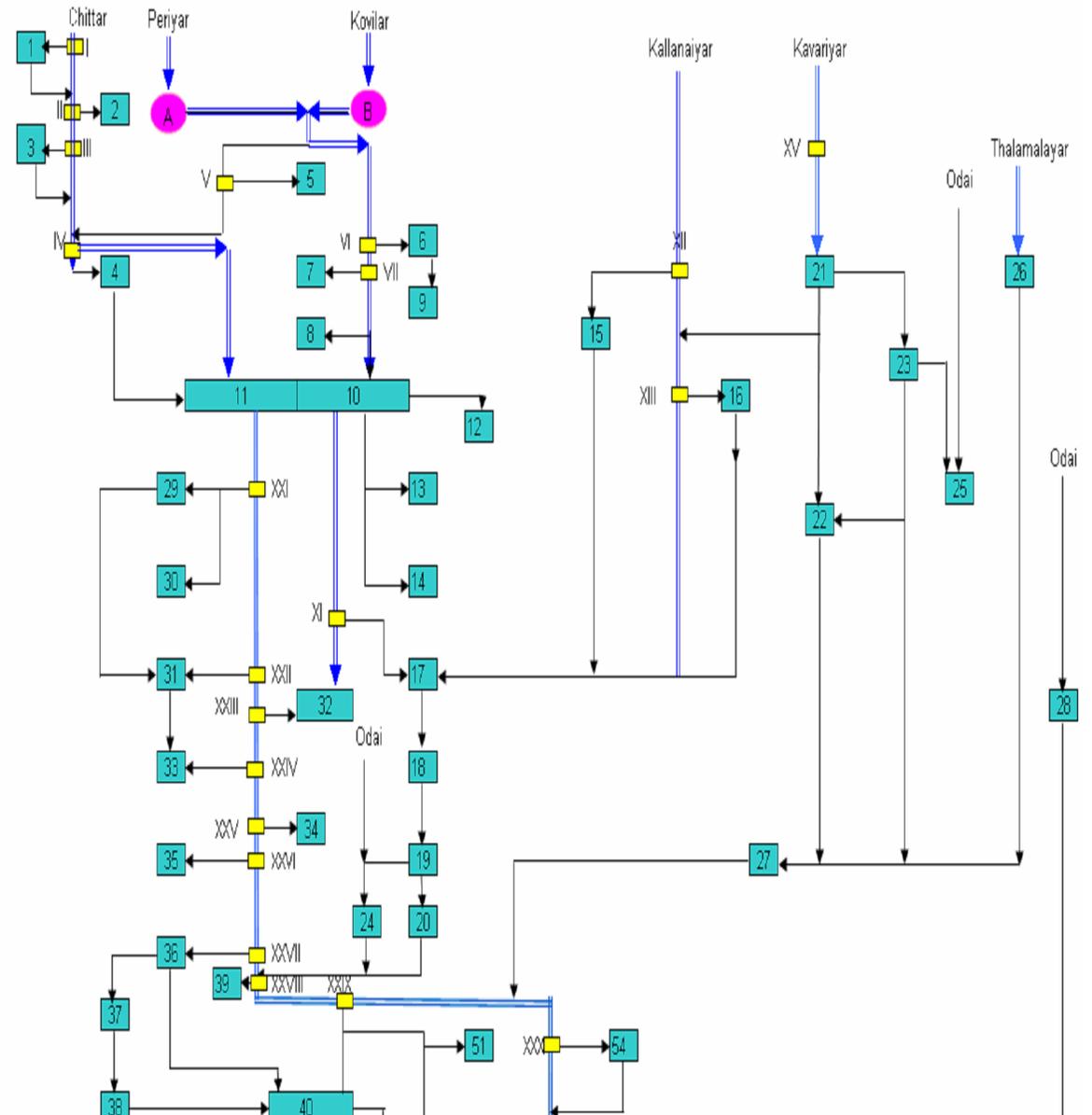
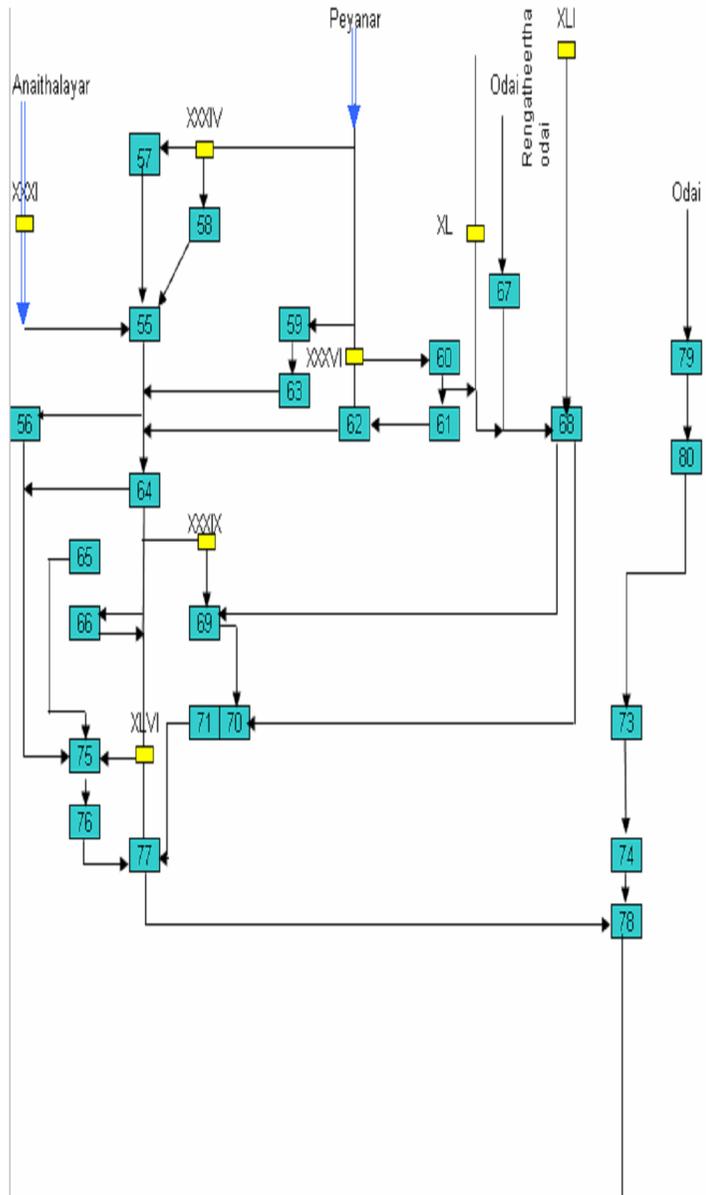
benefits. In the case of rice, since India is neither a consistent exporter nor importer but keeps varying between the two, the economic price used was the average of the export

T-4 Summary of Project Analysis, Arjunanadhi Sub-basin (Rs Million)

Sub-basins	PVC	PVB	NPV	ERR/FRR
Economic Analysis	359	624	266	23.2%
Financial Analysis	398	784	386	26.6%

parity and import parity levels. For all other crops like fruits and vegetables, which are produced in limited quantities in the project area, world market reference prices were not available and hence these crops were treated as non-tradable and their economic prices were derived using the SCF. For Arjunanadhi sub-basin, the ERR is estimated at 23.2% (T-4). The project is expected to yield net present value of Rs. 266 million in 2006 prices over a 25 year project cycle. The estimated FRR for the project is 26.6% with NPV of Rs. 386 million at 2006 prices over a project cycle of 25 years (T-5). The main difference between the project FRR and the ERR is due largely to the difference between the financial and economic prices of internationally tradable commodities and inputs. Sensitivity analysis is performed for ERR for different scenarios. A 50% increase in costs, or a 33% decrease in benefits, or a combined 20% increase in costs together with 20% decrease in benefits, reduces the project ERR to 12%. Even when a combined scenario of reduced benefits levels and increased cost levels are considered to simultaneously occur, ERR declined to the lowest level but still remained above the opportunity cost of capital

ARJUNANADHI SUB BASIN - FLOW DIAGRAM



Cont.

