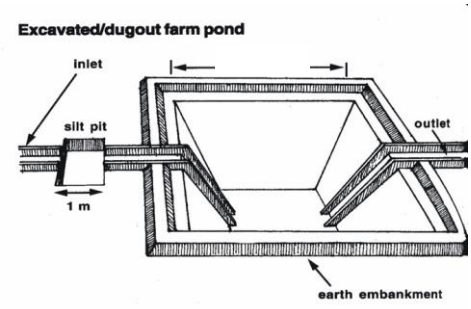
Plan on Artificial Recharge to Groundwater and Water Conservation in Cheyur Firka, Avinashi Taluk, Tirupur District, Tamil Nadu



By

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AT A GLANCE	
Name of Firka	Cheyur
Taluk	Avinashi
District	Tirupur
State	Tamil Nadu
Total area	162.48 Sq.Km.
Total area suitable for Recharge	134 Sq.Km
Lat. & Lon.	11° 13’ 42 “ to 11° 21’ 05” and 77° 07’ 14” to 77° 18’ 43”
Rainfall	738 mm
Monsoon	579 mm
Non- Mon soon	159 mm
Geology	Weathered & Fractured Gneiss, Granites and Charnockites
WATER LEVEL	
Pre – Monsoon(May 2015)	1.65 to 14.90
Post - Monsoon (Jan 2016)	1.58 and 13.45
GROUND WATER RESOURCES ESTIMATION	
Replenish able ground water resources	17.2124
Net ground water available	15.4911 MCM
Ground water draft for irrigation	17.0225 MCM
Groundwater draft for domestic & industrial water supply	83.3068 MCM
Total ground water draft	17.8556 MCM
Stage of ground water development (%)	115.263 %
Uncommitted surface runoff available for the Firka	14.111MCM
Total volume of weathered zone	19.498 MCM
Total aquifer volume available for recharge	10.736 MCM
ARTIFICIAL RECHARGE /CONSERVATION MEASURES	
Structures Proposed (tentative) Masonry Check dam Nalla Bund Revival, repair of pond, tanks Recharge shaft inside the ponds Farm Pond	 10 31 38 38 100 Unit
Improving Water Efficiency /Saving Micro irrigation system for 100 ha	0.70 MCM
Excepted groundwater recharge	3.89 MCM
Excepted groundwater recharge / saving	4.59 MCM
Tentative total cost of the project	14.75 Cr
Expected raise in water level by recharge	2.25 m

Plan on Artificial Recharge to Groundwater and Water Conservation in Cheyur firka , Avinashi Taluk, Tirupur district, Tamil Nadu

1. Introduction

India is the largest user of groundwater in the world. Food grain security of the country is largely dependent on water resources and groundwater resources play major role in irrigation sector. Imprints of Over-Exploitation on groundwater resources are being observed as steep deepening of water levels, drying of shallow groundwater abstraction structures, ingress of salinity in fresh aquifers etc. which signal towards taking necessity of emergent action for artificial recharge and rainwater harvesting by utilizing surplus runoff and maintaining groundwater resources at sustainable stage.

In Tamil Nadu dependency on groundwater has increased many folds during the recent years and the groundwater extraction for irrigation, domestic and industries have resulted in lowering of water levels, long-term water level declining trend and even drying up of wells. In order to regulate the groundwater development, Central Ground Water Board in association with State Ground Water Departments has computed Dynamic Groundwater Resources and categorized blocks as Over Exploited, Critical, Semi Critical and Safe.

Out of 1129 firkas (assessment units) in Tamil Nadu the groundwater situation in 374 firkasoverexploited, 48 firkas critical, 235firkassemi-critical, 437 firkas safe and 35 firkas are saline. Various measures such as rainwater harvesting, artificial recharge and water use efficiency are successfully practiced by some NGOs, Central and State govts., which need replication at larger scale in close coordination with State govt. agencies and stakeholders so that capacity building of state implementing agencies and awareness of stakeholders towards artificial recharge and rainwater harvesting can be made.

2. Objectives of the scheme

Objectives of the proposed scheme are

- To upscale recharge activities, supplement additional groundwater resources by harvesting surplus runoff, sustainability of groundwater resources at shallow depths
- Recovery of over-exploited groundwater areas by implementing artificial recharge measures in groundwater stress areas.
- Conservation, development and sustainable management of natural resources including their use.

3. Study area details

3.1 Location

The total area of Cheyur firka is 162.4868 sq.km and Cheyur firka lies between North latitudes 11° 13’ 42 “to 11° 21’ 05” and east longitudes 77° 07’ 14”to 77° 18’ 43”. Location map of Cheyur firka is given in Figure 1.

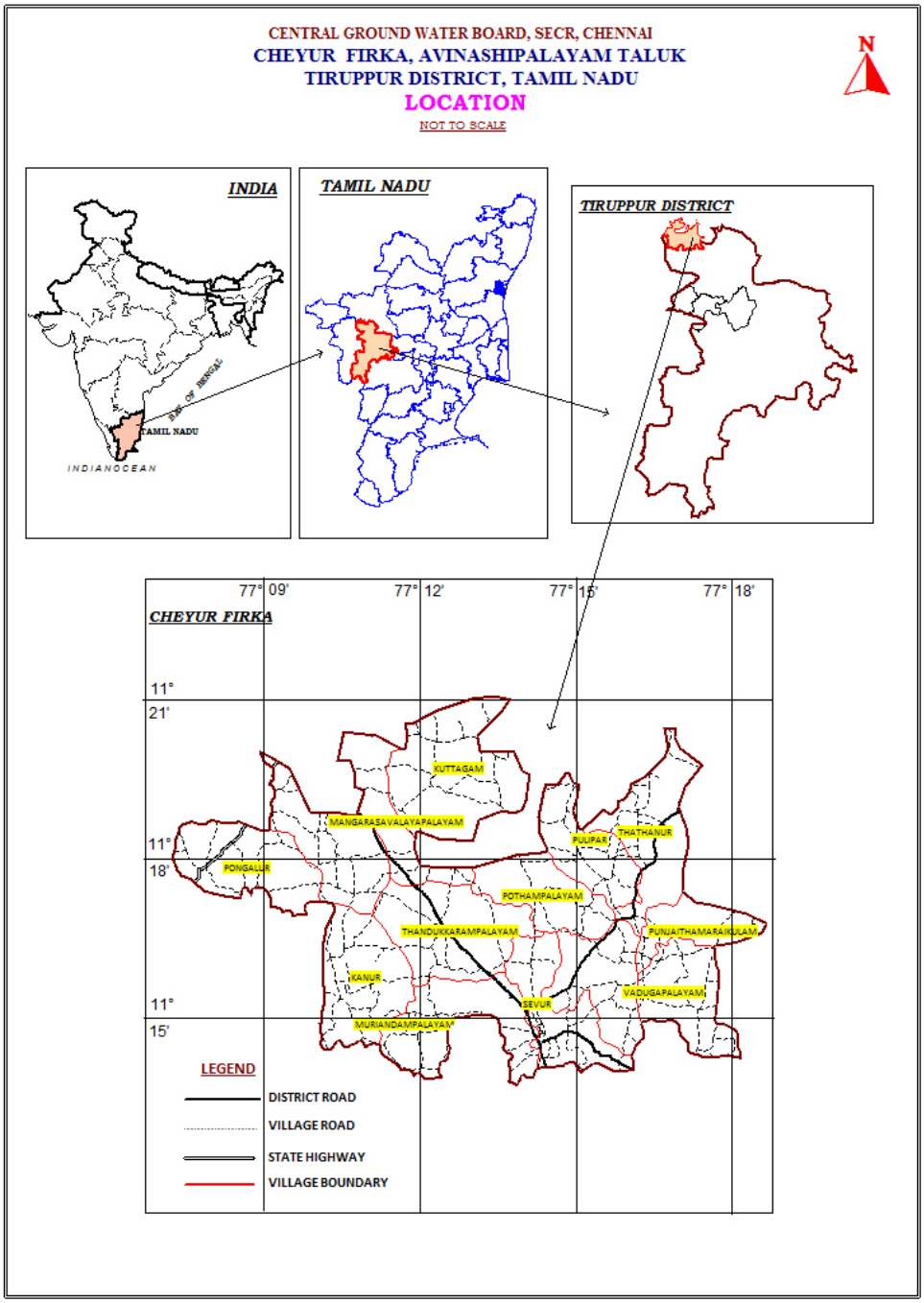


Figure 1. Location map of Cheyur firka

3.2 Geomorphological Set up

In the Cheyur firka area is seen with weathered shallow Pediplain is spread over an area of 55% of total area of the firka. Dissected/Undissected land forms occupy about 36% of the area. Moderate Pediplain and Inselberg complex covers the rest of the area. The various geomorphological units with its % of coverage area are given in table 1. and shown in figure 2.

Table 1. Various geomorphological units with its % of coverage area in Cheyur firka

LANDFORMS	Area in Sq.Km	% of Area
PEDIMENT-INSELBERG COMPLEX	3.84	2.55
PEDIPLAIN (WEATHERED) MODERATE	7.13	4.73
DISSECTED/UNDISSECTED	55.48	36.86
PEDIPLAIN (WEATHERED) SHALLOW	84.09	55.86

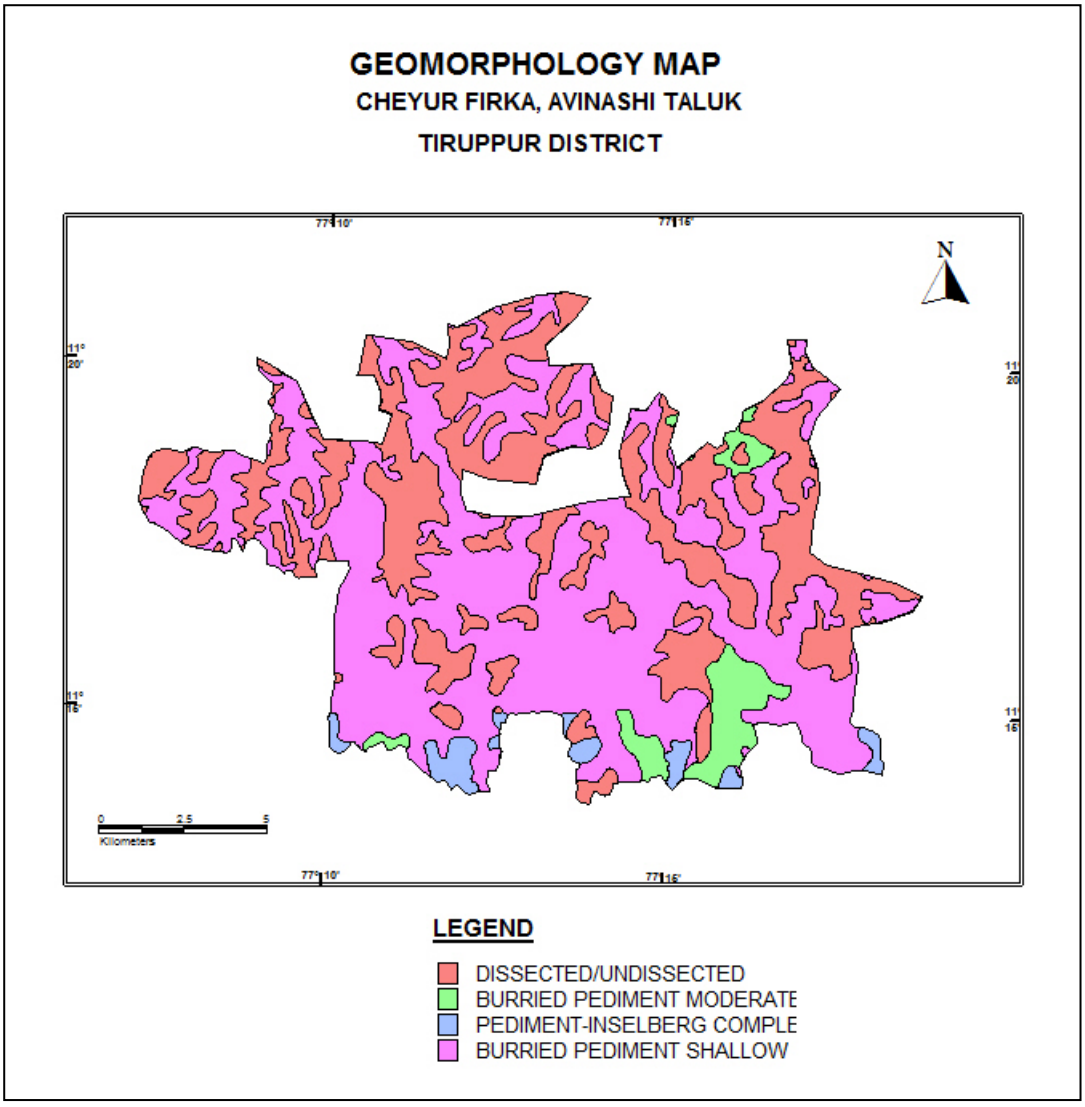


Figure 2 showing Geomorphology of Cheyur Firka

3.3 Land use and soil

The soil of the Cheyur firka is gravely loam soil calcareous, which is followed by gravely loam soil. Mostly sand to loamy sand and characterized by a hard and compact layer of lime. The texture varies from sandy loam to loamy sand with occurrence of quartz fragments on the surface.Due to the presence of montmorillonite type of clay minerals, the soil exhibit high cracking and swelling properties.

Table 3: Showing the details of Land Use in Cheyur firka

Type of Land Use	% of Area
LAND WITH SCRUB	0.04
RIVER / STREAM	0.05
SANDY AREA	0.09
BARREN ROCKY / STONY WASTE	0.21
RESERVOIR / LAKE / TANK	1.50
RURAL SETTLEMENTS VILLAGES	3.43
PLANTATION	7.02
FALLOW	7.70
DRY CROP	32.43
WET CROP	47.53
	100.00

The land use pattern of the Cheyur firka is given in figure 3. Predominantly the most of the area is characterised by the wet crop, dry crop and fallow land (i.,e agricultural field)and accounts for79 % of the total area of the firka(Source: IRS, Anna university, Chennai, Tamil Nadu). This area is highly suitable for water conservation and recharge. The plantation area accounts for about 7% of the Firkas. Rest of the area is occupied by rural settlements and rocky stony waste.

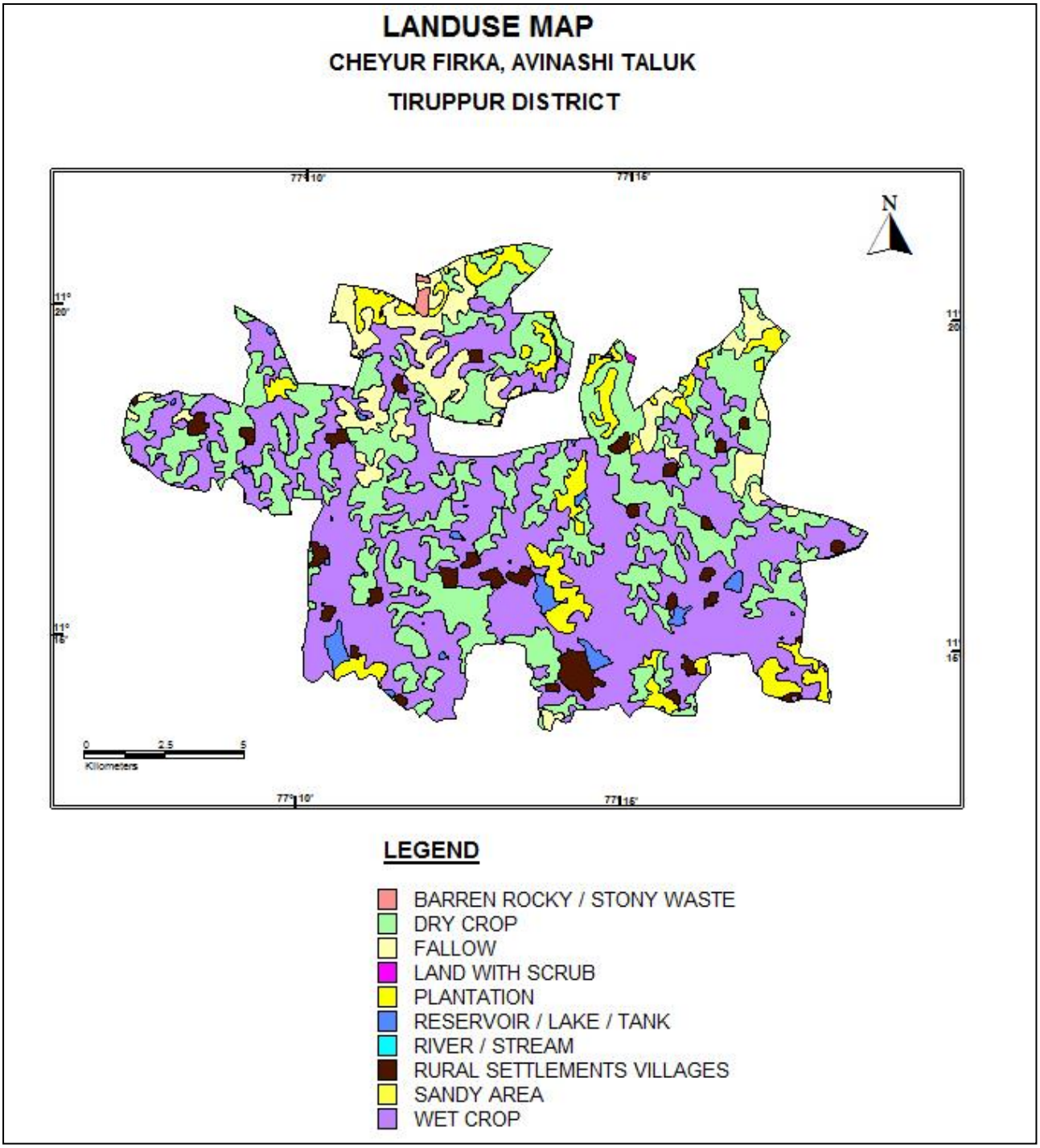


Figure 3 a : Landuse map of Cheyur Firka

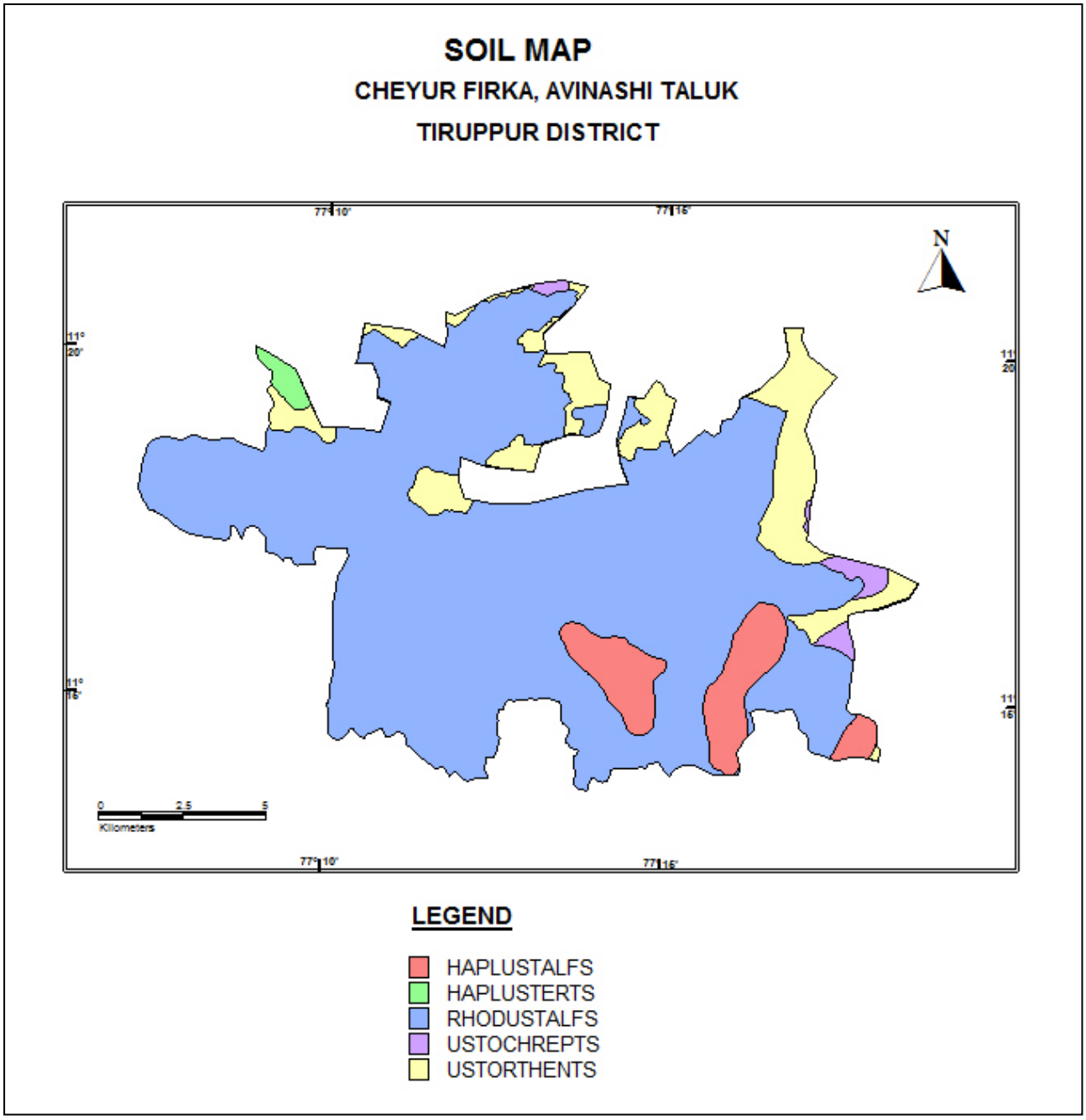


Figure 3 b: Soil distribution of Cheyur firka

3.4 Drainage

Cheyur firka is drained by Noyil river and forms the part of Kaveri Basin. The major drainage patterns observed is i) Parallel and ii) Dendritic to sub -dendritic.Only seasonal floods inundate lower parts of the basins. Basin sub soil water is used to irrigate the lands. Tanks and surface water bodies are spread over the southern part of firka. The drainage map of Cheyur firka is given in Fig 4.

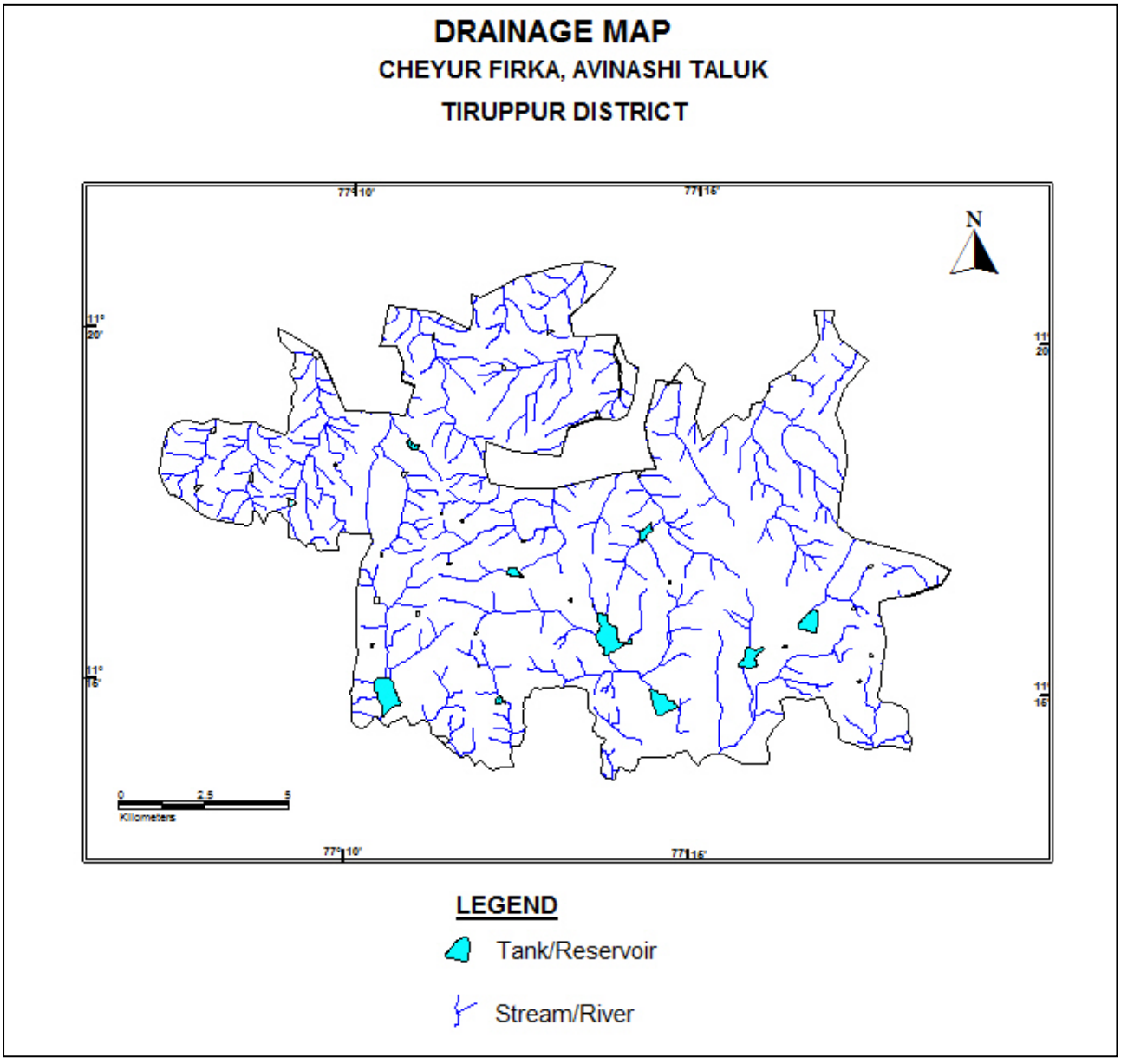


Figure 4 showing the Drainage map of Cheyur Firka

3.5 Rainfall

The northeast monsoon is active between October and December, which forms the principal source for the recharge of groundwater. The southwest monsoon stretches from June to September. During the winter and hot seasons, the rainfall is scantyCheyurarea falls under tropical climate with temperature in the summer months of March to May. The average temperature varies from 26 to 40°C.The area has a hot tropical climate. Highest temperatures were recorded during the months of April and May with temperatures reaching 40°C. The weather in the plains during the summer i.e., from April to June is generally dry and hot. Mornings in general are more humid than the afternoons, with the humidity exceeding 78% on an average. In the period between June to November the afternoon humidity exceeds 66% on an average. In the rest of the year the afternoons are drier, the summer afternoons being the driest.

Taluk	Name of Firkas	Area in sq.km	Monsoon rainfall (Jun to Dec) In m	Non monsoon rainfall (Jan – May) In m	Total Rainfall In m
Avinashi	Cheyur	162.4868	0.579	0.159	0.738

3.6 Hydrogeology

Groundwater occurs in all the crystalline formations of oldest Achaeans and Recent Alluvium. The occurrence and behaviour of groundwater are controlled by rainfall, topography, geomorphology, geology, structures etc.

Ground water is occurring in phreatic conditions in weathered and fractured gneiss rock formation. The weathering is controlled by the intensity of weathering and fracturing. Dug wells as wells as bore wells are more common ground water abstraction structures in the area. The diameter of the dug well is in the range of 7 to 10 m and depth of dug wells range from 15 to 18 m bgl. The dug wells yield up to 1 lps in summer months and few wells remains dry. The yield is adequate for irrigation for one or two crops in monsoon period.

The depth of wells varies from 6.64 to 17 m bgl. The present water levels in the firka is in the range of 2.7 to 9.7 mbgl during pre- monsoon (May 2015) and from 1.2to 5.6 m mbgl during post monsoon (January 2016). The hydrogeological map of Cheyur firka is given in Figure 5.Decadal mean water level of pre-monsoon and post monsoon are given in fig 6 a & b.

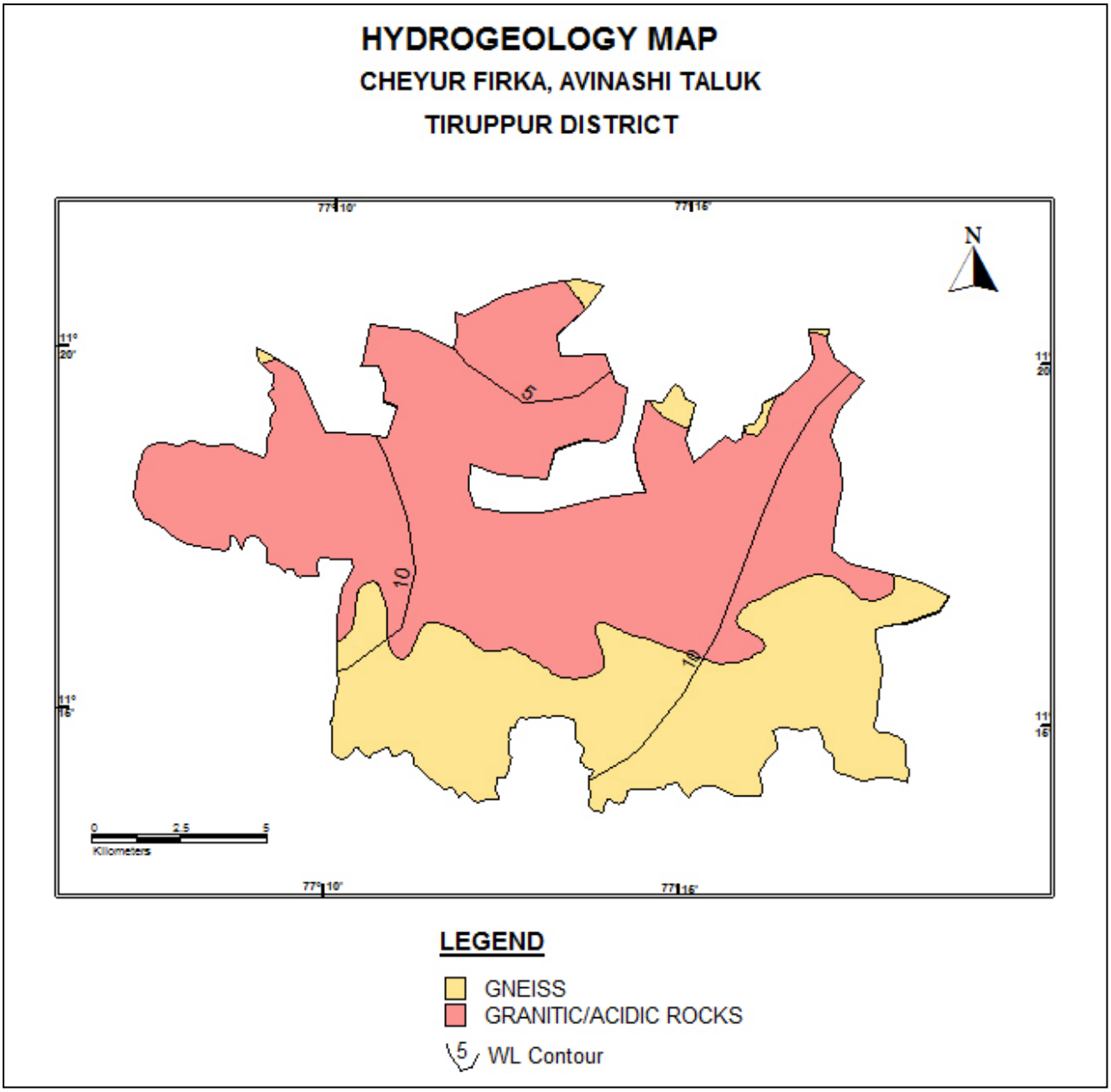


Figure 5 : Hydrogeological Map of Cheyur Firka

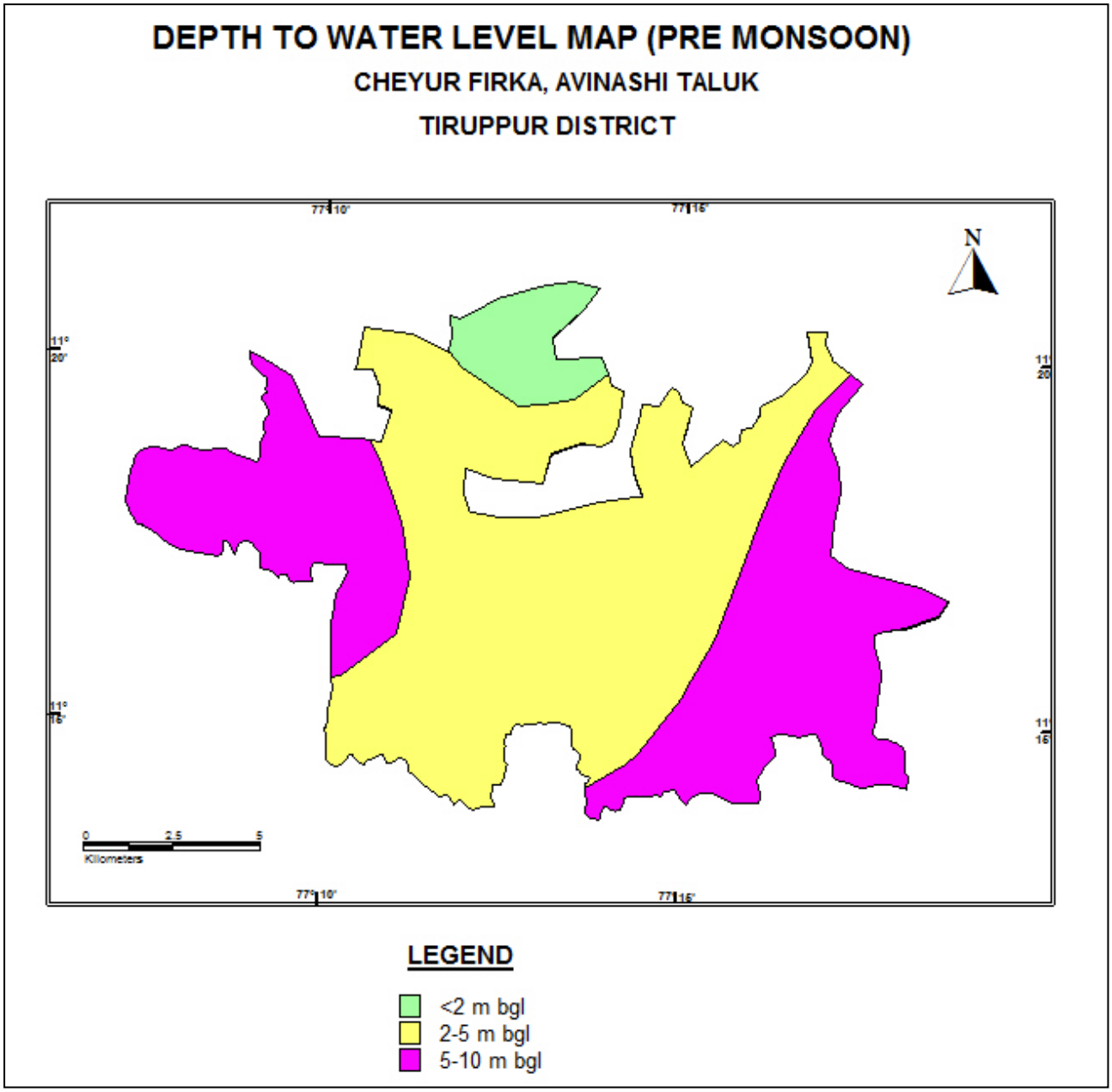
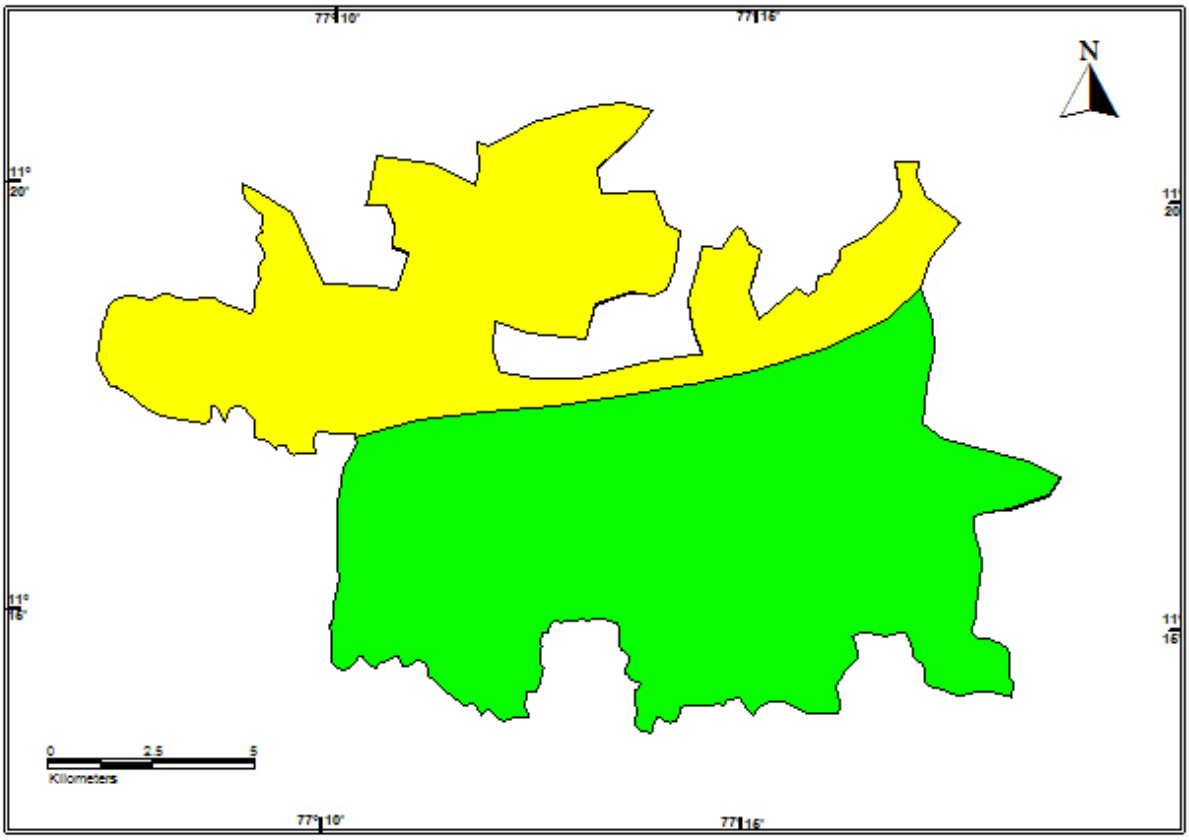


Figure 6a : Pre -monsoon Decadal water level in Cheyur firka

DEPTH TO WATER LEVEL MAP (POST MONSOON)

CHEYUR FIRKA, AVINASHI TALUK

TIRUPPUR DISTRICT



LEGEND

< 2 m bgl

2-5 m bgl

Figure 6 b : Post-monsoon Decadal water level in Cheyur firka

3.7 Dynamic Ground water Resources

The ground water resources have been computed jointly by Central Ground Water Board and State Ground Water Resources Data Centre (PWD, WRO, Govt. of Tamil Nadu) as on 31st March 2011. The computation has been done using GEC1997 methodology. The salient features of the computations are furnished in table 2.

Table 2. Dynamic Ground water resources estimation of Cheyur firka

Firka	Geogrphical Area/GW WORTHY AREA	REPLENISHABLE GROUND WATER RESOURCES	NET GROUND WATER AVAILABLE	GROUND WATER DRAFT FOR IRRIGATION	GROUNDWATER DRAFT FOR DOMESTIC & INDUSTRIAL WATER SUPPLY	TOTAL GROUND WATER DRAFT	STAGE OF GROUND WATER DEVELOPMENT (%)	CATEGORY
	(Sq.Km)	(In MCM)					%	
Cheyur	162.4868/ 127.4223	17.2124	15.4911	17.0225	83.3068	17.8556	115.263	OVER EXPLOITED

4. Spatial Data Integration

The potential area for groundwater recharge is highly influenced by Geology, Geomorphology, Land use /land cover, Drainage, Surface Water Body, Weathered Thickness and first fractured Depth in the area. In order to ascertain the suitable area for groundwater recharge in firka, spatial data integration of have been attempted using index overlay model in GIS environ. In this model, above seven layers have been integrated by assigning weightage for the theme having scale of 1-100 and sub-classes of the theme between 1 to 10 scales. The resultant map has been reclassified into four classes(High-low integrated values) indicating the suitable area for artificial recharge and given in fig-7 and described below.

ZONE	% OF AREA COVERAGE	SIGNIFICANCE*
Very high	1.15	Suitable for all major recharge structures like Percolation pond and stop dam, check dam etc.,
High	21.92	Suitable for all major recharge structures like stop dam, check dam etc.,
Moderate	52.94	Suitable for all major recharge structures like earthen check dam, Boulder check dam and Nala bund etc.,
Poor	23.97	Hilly/Forest /Catchment area

*However, the filed verification is required to confirm above potential area for groundwater recharge.

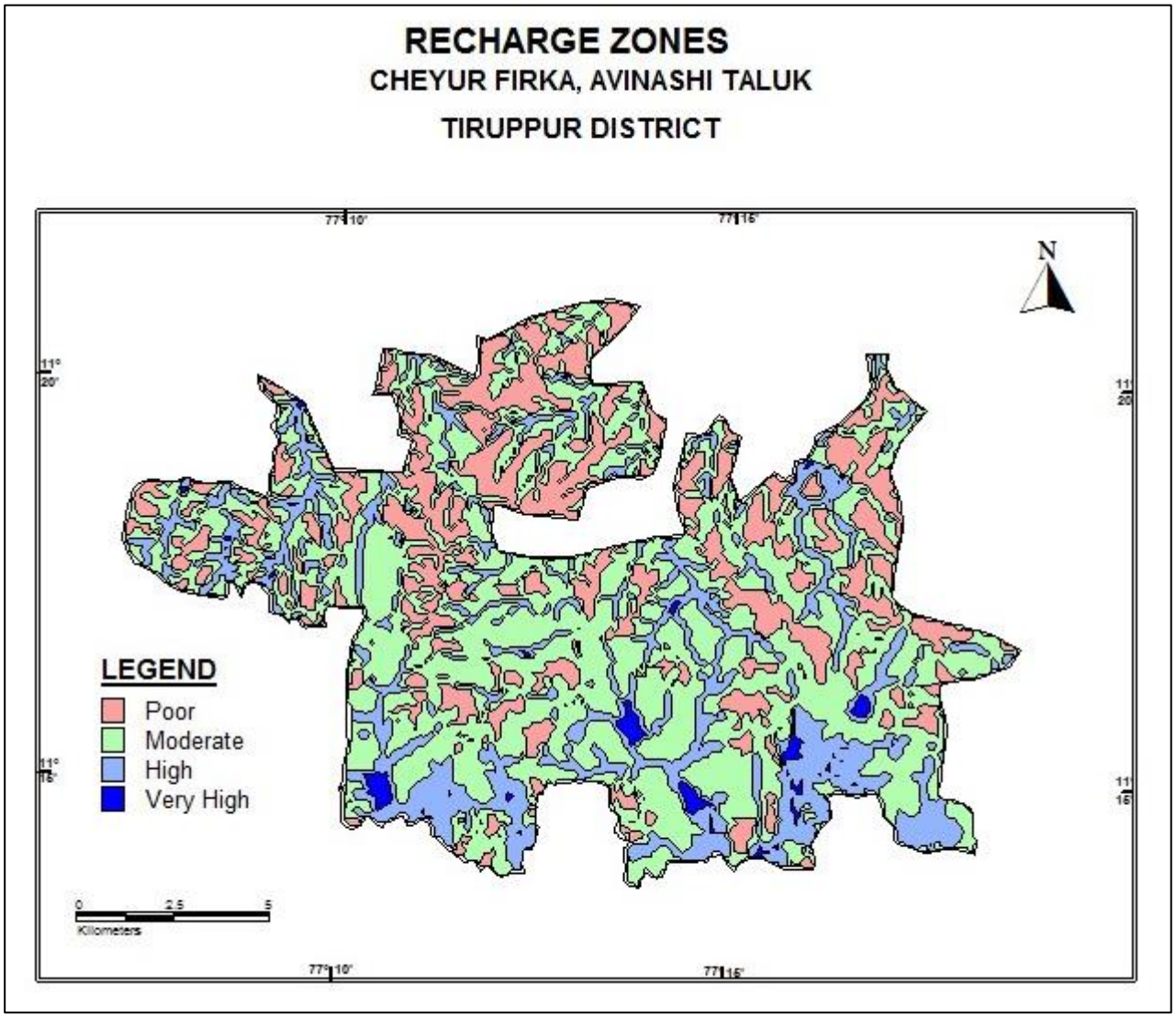


Figure 7 : Recharge worthy area Cheyur firka

5. Planning for groundwater recharge /conservation

5.1 Justification of the artificial recharge & conservation measures

- The Cheyur Firkas is with high stage of groundwater development i.e, **115** % and with sufficient amount of uncommitted surface runoff/flow of **14.11198** MCM.
- The total weathered zone available beneath the ground in the firka is **19.49842** MCM. Out of these total volume available for recharge is **10.73632** MCM.
- The Cheyur Firka consists of 38 surface water bodies /lakes which are well connected by the drainage. Revival and Recharge of these ponds will enhance the sustainability of the ground water abstraction structures.
- However, most of the ground water developments for agricultural purposes are met through dug-cum bore well and bore wells only. Hence, there is sufficient scope of recharge.

- ❖ Model generated in the Cheyur areas reveals that more than **75** % of areas are suitable for recharge, including moderate area.
- ❖ In Cheyur firka more than 80 % area is characterised by the agricultural activities, there is sufficient scope for the water conservation measures for enhance the crop production and better ground water development.

5.2 Availability of surplus surface water for artificial recharge or conservation

The uncommitted surface flow for Cheyur Firka is estimated as per the norms followed by State Ground & Surface Water Resources data centre, PWD, Taramani, Chennai (Aug 2015). The available of surplus surface water for Cheyur Firka is **14.11 MCM.**

5.3 Proposed interventions including tentative location of artificial recharge /conservation measures

On basis of above description the following three type of approach have been made to propose artificial recharge or conservation structures.

a. Artificial recharge
b. Water conservation measure
c. Water Efficiency

5.3.1 Artificial recharge

The details of artificial recharge structure proposed along with justification are given below.

5.3.1.1 Check dam/Nala bund

Cheyure firka area is covered by the seasonal nallahs/drains which carry heavy discharge during monsoon period. It is proposed that such seasonal rivers will be identified and the rain water will be harnessed through construction of series of check dams, nallaha bund and gabion structures so as to harness this water thereby increasing the resident period of the water in these channels and to increase the soil moisture content. As per the integrated model prediction around 30 % of the firkas areas are suitable for these structures. It is proposed to construct 10 Check dam and 31 Nallaha bunds. The tentative location of these 41 ARs are given below and shown in Plate 1. The size and location of these structures are tentative and details field survey is essential to ascertain the exact size and location.

Tentative location of proposed 10 Check dam **in Cheyur** firka

S. NO.	LONGITUDE	LATITUDE	TYPE OF ARS
1	77.202753	11.324973	Check Dam
2	77.215978	11.343627	Check Dam
3	77.187893	11.327888	Check Dam

4	77.217167	11.253274	Check Dam
5	77.227569	11.291747	Check Dam
6	77.274526	11.258374	Check Dam
7	77.294438	11.240887	Check Dam
8	77.189386	11.251574	Check Dam
9	77.198219	11.255685	Check Dam
10	77.193728	11.285342	Check Dam

Tentative location of proposed 31 Nalla bund in Cheyur firka

SL.NO	LONGITUDE(DD)	LATITUDE (DD)	TYPE OF ARS
1	77.125630	11.296847	Nala Bund
2	77.155498	11.324536	Nala Bund
3	77.152080	11.290144	Nala Bund
4	77.156390	11.312440	Nala Bund
5	77.166346	11.307194	Nala Bund
6	77.165009	11.288686	Nala Bund
7	77.161293	11.299033	Nala Bund
8	77.213155	11.341149	Nala Bund
9	77.193688	11.306903	Nala Bund
10	77.201712	11.316667	Nala Bund
11	77.205725	11.312440	Nala Bund
12	77.217315	11.318270	Nala Bund
13	77.191905	11.324245	Nala Bund
14	77.190865	11.334592	Nala Bund
15	77.283591	11.306320	Nala Bund
16	77.273783	11.281108	Nala Bund
17	77.266502	11.287666	Nala Bund
18	77.260409	11.306611	Nala Bund
19	77.283442	11.324099	Nala Bund

20	77.303057	11.279651	Nala Bund
21	77.284928	11.278922	Nala Bund
22	77.284333	11.260852	Nala Bund
23	77.292210	11.248027	Nala Bund
24	77.269176	11.244967	Nala Bund
25	77.248521	11.264349	Nala Bund
26	77.256991	11.280234	Nala Bund
27	77.240645	11.281254	Nala Bund
28	77.236485	11.292330	Nala Bund
29	77.224894	11.274988	Nala Bund
30	77.225786	11.287520	Nala Bund
31	77.211966	11.254731	Nala Bund

5.3.1.2. Revival, repair of water bodies

The existing ponds and tanks in loose their storage capacity as well as the natural ground water recharge through these water bodies has also become negligible due to siltation and encroachment by farmers for agriculture purposes. There are several such villages where ponds/ tanks are in dilapidated condition. These existing village tanks which are normally silted and damaged can be modified to serve as recharge structure in case these are suitably located to serve as percolation tanks. Through desilting, coupled with providing proper waste weir, the village tanks can be converted into recharge structure. Several such tanks are available in the area which can be modified for enhancing ground water recharge. Studies, however, are needed to ascertain whether the village tanks are suitably located to serve as recharge structures. The locations of about **38** existing ponds/tanks have been identified with latitude and longitude given below and marked on Plate 1.The above 38 tanks/ponds could be taken up for the renovation with recharge shaft on priority.

Tentative location of proposed de-siltation of pond/tanks with recharge shaft in Cheyur firka.

Sl.NO	LONGITUDE	LATITUDE	STRUCTURE	ACTION
1	77.213752	11.334357	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
2	77.185968	11.332664	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
3	77.203223	11.325721	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
4	77.273095	11.324710	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
5	77.244229	11.323099	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT

6	77.225796	11.314504	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
7	77.133372	11.309646	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
8	77.163082	11.301923	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
9	77.236103	11.301426	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
10	77.179707	11.299954	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
11	77.142784	11.298443	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
12	77.130108	11.295580	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
13	77.188924	11.290912	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
14	77.193840	11.289102	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
15	77.208726	11.284620	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
16	77.174608	11.280848	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
17	77.292420	11.280235	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
18	77.191002	11.278914	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
19	77.244155	11.275474	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
20	77.220420	11.270903	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
21	77.168678	11.270745	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
22	77.173656	11.269943	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
23	77.225766	11.269814	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
24	77.288622	11.270059	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
25	77.183726	11.266894	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
26	77.197784	11.262674	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
27	77.272196	11.260690	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
28	77.172743	11.259085	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
29	77.293087	11.259105	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
30	77.198556	11.254691	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
31	77.290272	11.252710	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
32	77.226102	11.314775	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
33	77.133378	11.309302	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT

34	77.236335	11.301091	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
35	77.179895	11.299874	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
36	77.142992	11.297745	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
37	77.130277	11.295617	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT
38	77.292465	11.280107	TANK / RESERVOIR	DESILTTAION AND RECHARGE SHAFT

5.3.2 Water conservation measure

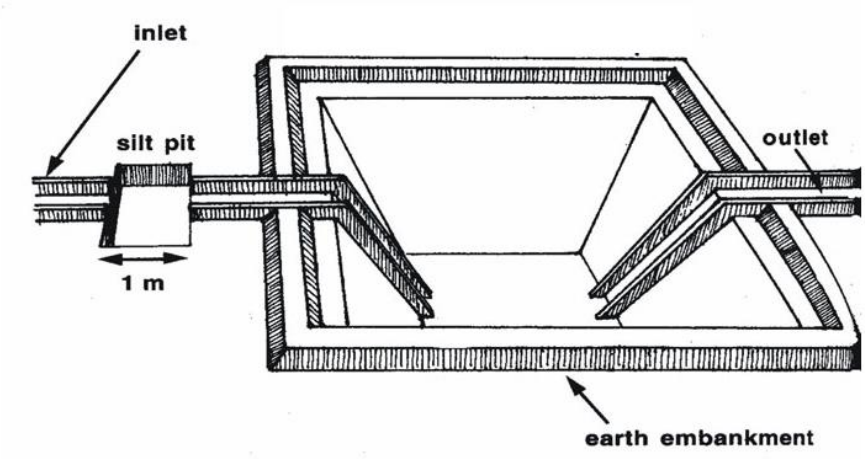
5.3.2.1 Farm Pond

A farm pond is a large dug out in the earth, usually square or rectangular in shape, which harvests rainwater and stores it for future use. It has an inlet to regulate inflow and an outlet to discharge excess water. The pond is surrounded by a small bund, which prevents erosion on the banks of the pond. The size and depth depend on the amount of land available, the type of soil, the farmer's water requirements, the cost of excavation, and the possible uses of the excavated earth. Water from the farm pond is conveyed to the fields manually, by pumping, or by both methods.

Advantages of Farm Ponds

- They provide water to start growing crops, without waiting for rain to fall.
- They provide irrigation water during dry spells between rainfalls. This increases the yield, the number of crops in one year, and the diversity of crops that can be grown.
- Bunds can be used to raise vegetables and fruit trees,thus supplying the farm household with an additional source of income and of nutritious food.
- Farmers are able to apply adequate farm inputs and perform farming operations at the appropriate time, thus increasing their productivity and their confidence in farming.
- They check soil erosion and minimize siltation of waterways and reservoirs.
- They supplies water for domestic purposes and livestock
- They promote fish rearing.
- They recharge the ground water.
- They improve drainage.
- The excavated earth has a very high value and can be used to enrich soil in the fields, levelling land, and constructing farm roads

As per the Landuse classification of the firka, majority of the area is covered by the agricultural field. Hence it is proposed to construct **100** farm ponds as per the specification of AED, Govt. of Tamil Nadu (**30 x 30 x 1.5 m**).



5.3.2.2. Micro Irrigation System (Sprinkler/ drip/ HDPE pipes)

Micro irrigation is defined as the frequent application of small quantities of water directly above and below the soil surface; usually as discrete drops, continuous drops or tiny streams through emitters placed along a water delivery line

In flood/furrow irrigation method more than 50% of applied water is wasted through seepage to deeper level, localized inundation causes loss through evaporation and it leaches out the nutrients from the plant. While through drip & sprinkler irrigation wastage of irrigational water could be minimized. The studies on different crops, has revealed that irrigation water is saved drastically. The conveyance losses (mainly seepage & evaporation) can be saved up to 25 to 40% through utilization of HDPE pipes. Initially the scheme is proposed to be implemented in worst affected areas showing deepest water levels and significant declining trends.

It is proposed to take up micro irrigation system in 100 ha. The cost estimation for this component has been taken from SOR of Agricultural Engineering Department (AED), Govt. of Tamil Nadu. Tentative locations of proposed micro irrigation are shown in Plate 1.

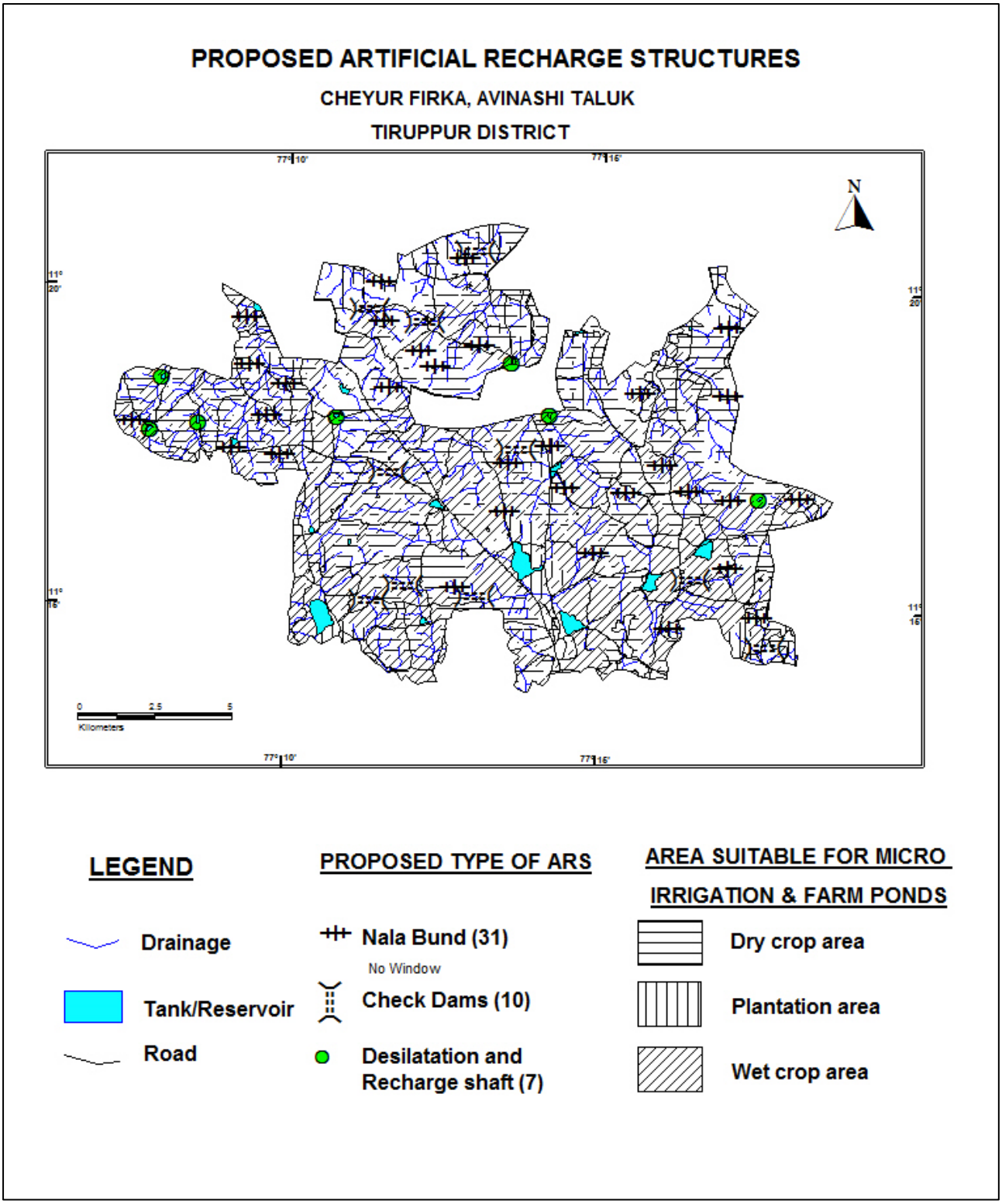


Plate 1. :Location map showing the proposed AR Structures in Cheyur firka

6. Tentative Cost Estimation

The tentative number of feasible structures, its cost and expected annual groundwater recharge/water saving is given in the table 7. The unit rates are as followed by the PWD, Govt. of Tamilnadu (Sources: Scheduled rates, Govt. of Tamilnadu 2015).

Table 7. Showing the Cost Estimation of proposed Artificial Recharge Structures

Feasible Artificial Recharge & Water Conservation structures/ activities	Tentative Design	quantity (in nos. or area in sq. m)	Total volume (cu.m)	Tentative unit cost (in Rs lakh)	Total tentative cost (in Rs lakh)	Expected Annual GW recharge/Saving (cu.m)
Recharge Structures/ Activities						
Masonry Check dams (5 Fillings)	Crest- 10 -15 m; Height- 1.0 m to 1 .5 m	10	3400 (80%)	9.0	90	136000
Nala bunds/ Gabion (4 Fillings)	Width: 5 to 15 m	31	750 (80%)	2.0	62	74400
Revival, repair of water bodies (3 fillings)	(~150 m x150 m x1.5m)	38	33750 (80%)	25.0	950	3078000
Recharge shaft within the pond /tanks	Shaft = 1.5 m dia x 2m depth with filter media in lower 1 m . Bore dia =10", Casing = 6" Depth = 30 m)	38		2.0	76	
Farm Pond (in ha) (5 filling)	(30 m x 30m x 1.5 m)	100 unit	1200(85%)	1	100	600000
			Sub Total		**1278**	**3888400**
Water Conservation Activities						
Sprinkler/ drip/ HDPE pipes	For 1 ha with 5 m interval HDPE pipe	100 ha		0.6 /ha	60	700000
			Total		**1338**	**4588400**
Impact assessment and O & M						
Piezometers Up to 50 mbgl – 5 nos. @ 0.6 lakh (Impact assessment to be carried out by the implementing agencies)					**3.0**	
Total cost of the Project					**1341**	
Add 5% for O & M on total cost of the scheme					**67.05**	
Impact assessment to be carried out by the implementing agencies @ 5% of Total cost					**67.05**	
				TOTAL	**1475.10**	

Note:

- The type, number and cost of structure may vary according to site, after the ground truth verification.
- CD, PC- the storage of Check-dams and percolation ponds is also proposed for irrigating the surrounding areas for enhancing the groundwater recharge as well as effective utilization of the artificial recharge structures.

7. Implication modalities

The implementation of the scheme will be done by the line department of the state selected by the respective State authority. Further, it is to add that more than 50 % MGNREGA works related to water conservation/sustainable management,accordingly a convergence guideline has been madebetween National Rural Employment Guarantee Act (NREGA) (Ministry of Rural Development) & Programmes of Water Resources (MoWR , RD & GR). The district Tirpur is one among the list of districts identified for Convergence between NREGS and schemes of MoWR. The details of permissible works under convergence are envisaged in the Joint Convergence Guideline.

a.) Time schedule

Steps	1st Quarter	2th Quarter	3rd Quarter	4th Quarter	5th Quarter	6th Quarter	7th Quarter	8th Quarter
❖ Identification of line department /implementing agency and preparation of DPR								
❖ Approval of scheme and release of sanction of funds								
❖ Implementation of ARS								

Phase = one quarter or 3 months or equivalent to financial quarter

b.) Operation and maintenance

In all projects Impact assessment has to be carried out to ensure that projects is economically viable, socially equitable and environmentally sustainable by inter-related socio-economic, cultural and human-health impacts, both beneficial and adverse. Accordingly it is proposed a have impact assessment at rate of 5 % of the total cost of the project for 5 years from the completion of recharge structures.