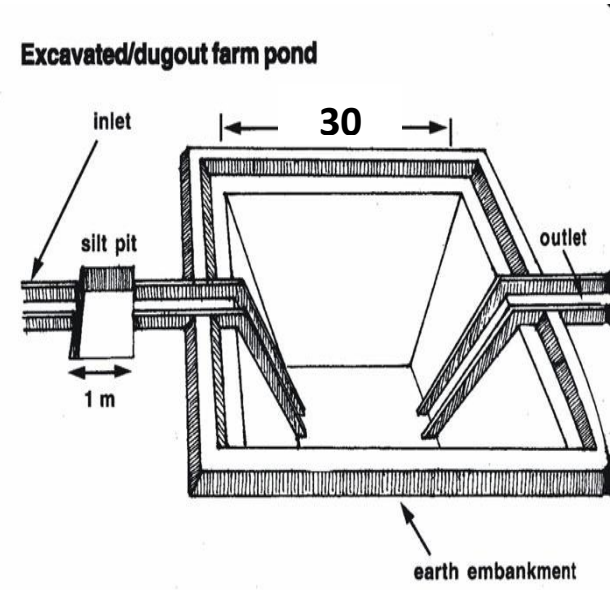
Plan on Artificial Recharge to Groundwater and Water Conservation in Samalapuram firka, Palladam Taluk,

Tirupur District, Tamil Nadu



By

Central Ground Water Board
South Eastern Coastal Region
RajajiBhawan, Besant Nagar
Chennai

Content

AT GLANCE	
Name of Firka	Samalapuram
Taluk	Palladam
District	Tirupur
State	Tamil Nadu
Total area Sq.km	104.59
Total Area Suitable for Recharge in Sq.Km	104.59
Lat. & Lon.	10° 59' 29"to 11° 06' 26" & 77° 09' 48"to 77° 16' 51".
Rainfall	546 mm
Monsoon	413 mm
Non- Mon soon	133 mm
Geology	Weathered & Fractured Gneiss, Granites and Charnockites
WATER LEVEL	
Pre – Monsoon (May -2015)	1.6 to 22.00
Post - Monsoon (Jan_2016)	1.2 and 5.6
GROUND WATER RESOURCES ESTIMATION	
Replenish able ground water resources	7.3657
Net ground water available	6.6291
Ground water draft for irrigation	13.9068 MCM
Groundwater draft for domestic & industrial water supply	0.7561 MCM
Total ground water draft	14.6629 MCM
Stage of ground water development (%)	221.188 %
Uncommitted surface runoff available for the Firka	6.479 MCM
Total volume of weathered zone	12.55 MCM
Total volume available for recharge	6.910MCM
ARTIFICIAL RECHARGE /CONSERVATION MEASURES	
Structures Proposed (tentative) Masonry Check dam Nalla Bund Revival, repair of pond, tanks with recharge shaft Only shafts in tanks Farm Pond	 6 17 46 46 100 Unit
Improving Water Efficiency/ Saving (Micro irrigation system for 100 ha)	0.70 MCM
Expected recharge	4.45 MCM
Excepted total groundwater recharge/ saving	5.14 MCM
Tentative total cost of the project	Rs.16.42 Cr
Expected raise in water level by recharging/saving.	3.24 m

Plan on Artificial Recharge to Groundwater and Water Conservation in Samalapuram Firka, Palladam Taluk, Tirupur taluk 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 firkas overexploited, 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 Samalapuram Firka is 104.5864 sq.km and Samalapuram Firka lies between North latitudes 10° 59’ 29 “ to 11° 06’ 26” and East longitudes 77° 09’ 48” to 77° 16’ 51”.Location map of Samalapuram Firka is given in Figure 1.

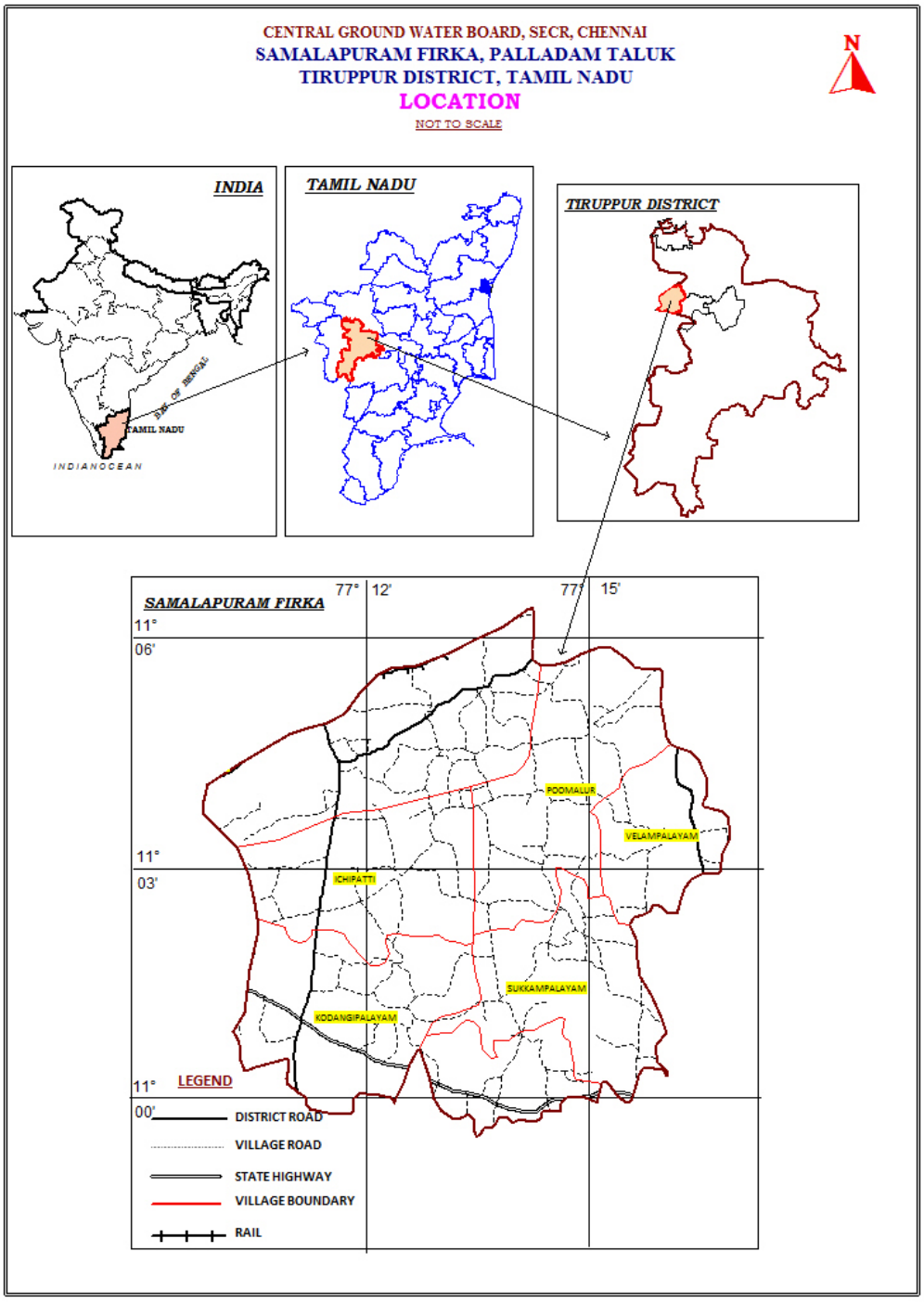


Figure 1. Location map of Samalapuram Firka

3.2 Geomorphological Set up

In the Samalapuram Firka area it is seen that Dissected/Undissected land forms occupies the major part, with 52% of the total geographical area. Shallow weathered Pediplain is spread to an extent of 40.97 % of the area. Moderate Pediplain forms 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 Samalapuram Firka

LANDFORMS	Area in Sq.km	% of Area
PEDIPLAIN (WEATHERED) MODERATE	7.57	6.97
PEDIPLAIN (WEATHERED) SHALLOW	44.54	40.97
DISSECTED/UNDISSECTED	56.58	52.06

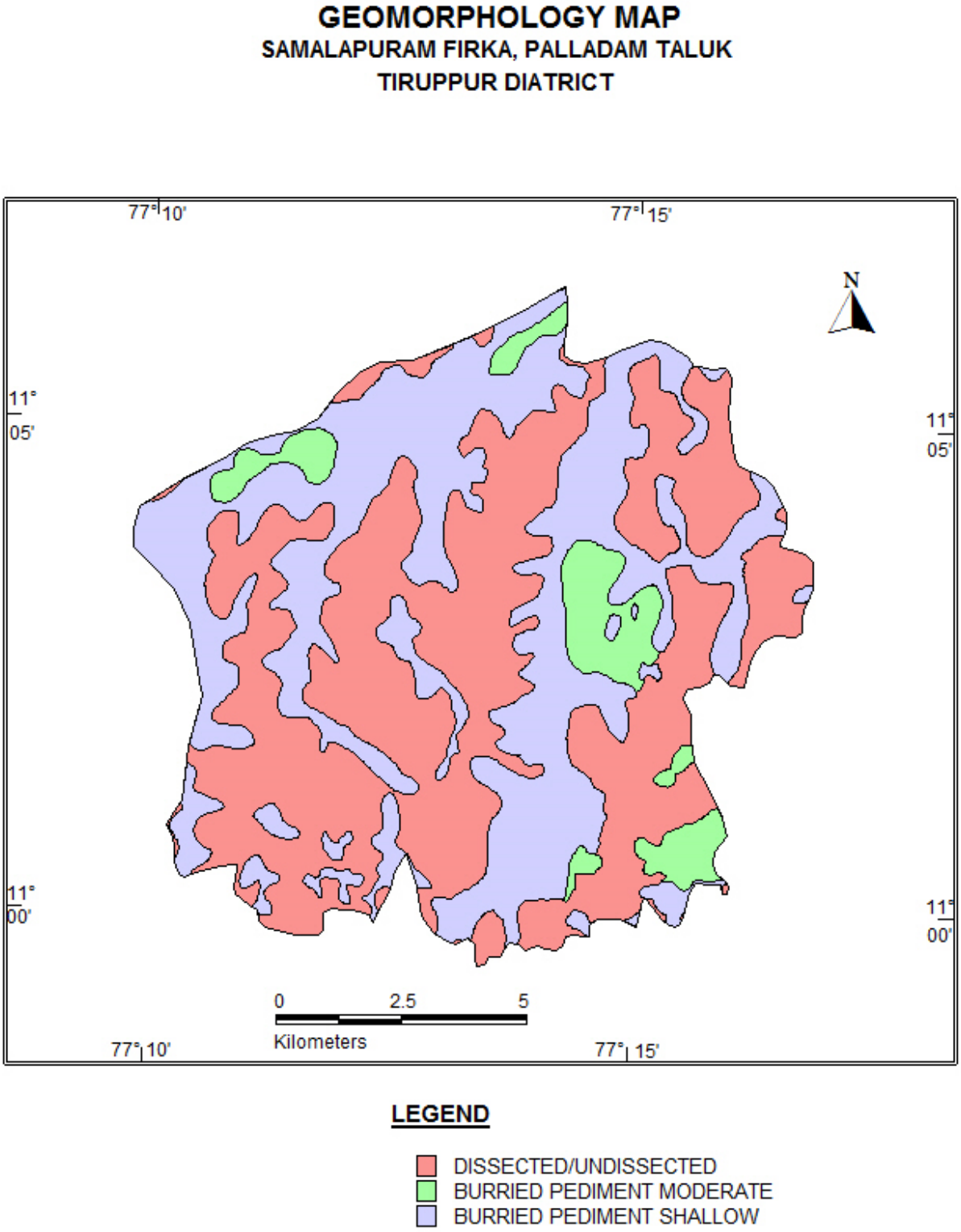


Figure 2: showing Geomorphology of Samalapuram Firka

3.3 Land use and soil

The soil of the Samalapuram Firka is gravely loam soil calcareous, which is followed by gravely loam soil. Mostly Red soil and 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

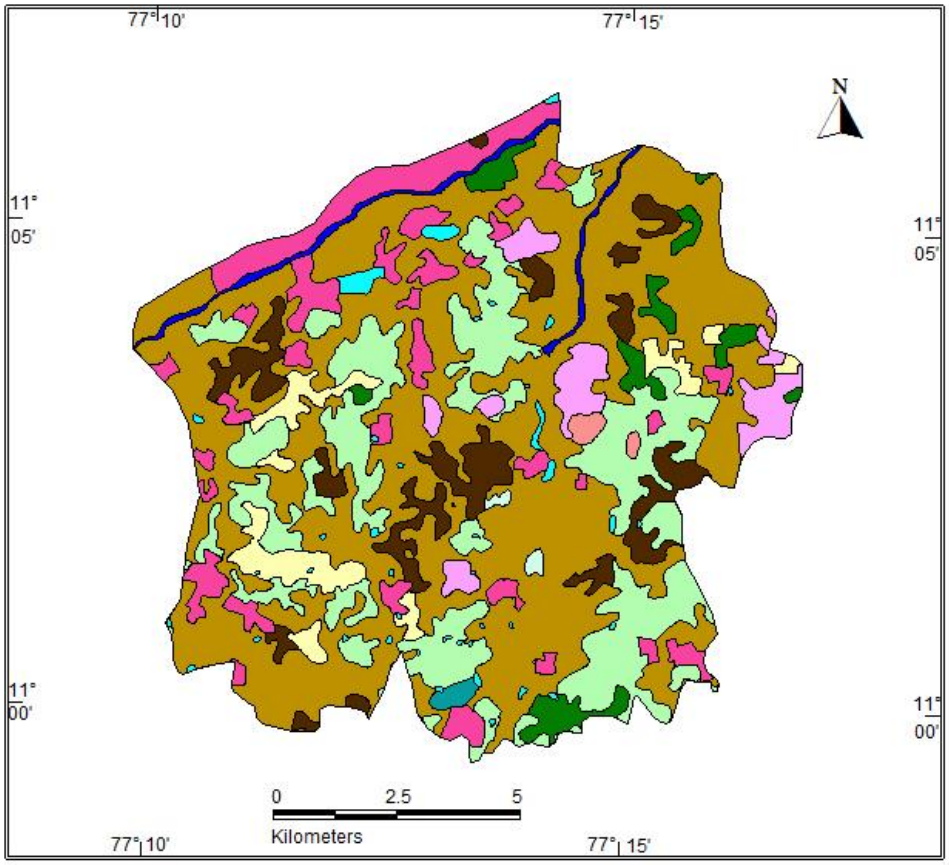
the surface.Due to the presence of montmorillonite type of clay minerals, the soil exhibit high cracking and swelling properties.

Table 3: Showing the details of Land Use pattern in Samalapuram Firka

TYPE OF LAND USE	% Area
SALT AFFECTED	0.22
TOWN AND CITIES	0.32
BARREN ROCKY / STONY WASTE	0.40
RESERVOIR / LAKE / TANK	1.02
RIVER / STREAM	1.13
PLANTATION	2.88
LAND WITH SCRUB	3.53
OTHERS	3.77
FALLOW	6.77
RURAL SETTLEMENTS VILLAGES	9.38
DRY CROP	19.27
WET CROP	51.30

The land use pattern of the Samalapuram Firka is given in figure 3 and details are given in Table-3. Predominantly the most of the area is characterised by the Wet cropand Dry crop. Plantation occupies about 2.88% of the area. (i.,e agricultural field). Total agricultural activity account for >72% of the total area. (Source: IRS, Anna university, Chennai Tamil Nadu). This area is highly suitable for water conservation and recharge.Other than the above fallow land, land with scrub and stony waste also occupies a considerable area.

LANDUSE MAP
SAMALAPURAM FIRKA, PALLADAM TALUK
TIRUPPUR DIATRICT



LEGEND

- BARREN ROCKY / STONY WASTE
- DRY CROP
- FALLOW
- LAND WITH SCRUB
- OTHERS
- PLANTATION
- RESERVOIR / LAKE / TANK
- RIVER / STREAM
- RURAL SETTLEMENTS VILLAGES
- SALT AFFECTED
- TOWN AND CITIES
- WET CROP

Figure 3 a: showing Landuse map of Samalapuram Firka

SOIL MAP
SAMALAPURAM FIRKA, PALLADAM TALUK
TIRUPPUR DIATRICT

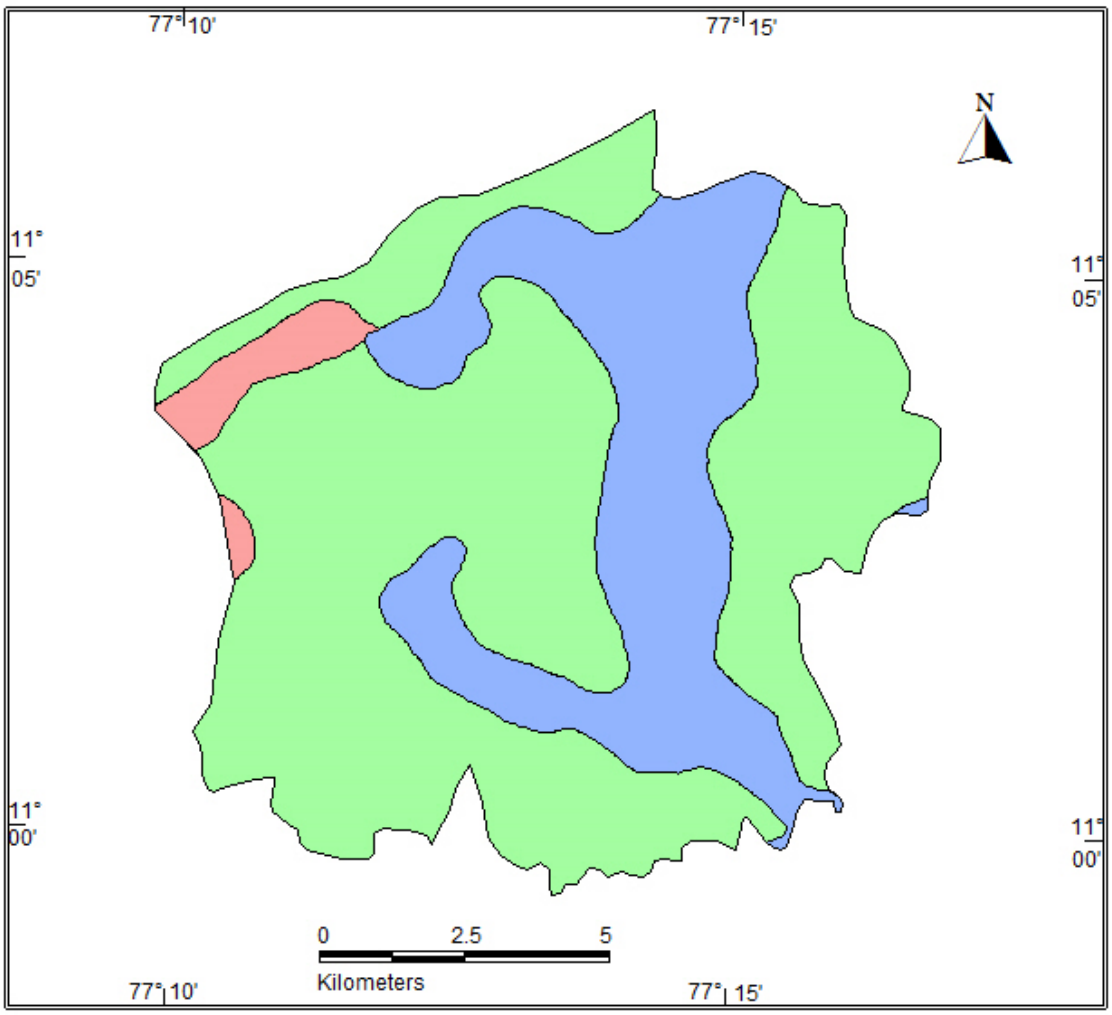


Figure 3b: showing soil map of Samalapuram Firka

3.4 Drainage

The major drainage patterns observed isi) Parallel and ii) Dendritic to sub -dendritic.The area is drained by Noyil reiver and forms the part of Cauvery basin. 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 entire firka. The drainage pattern is the dendritic and sub- dendritic. The drainage map of Samalapuram Firka is given in Fig 4.

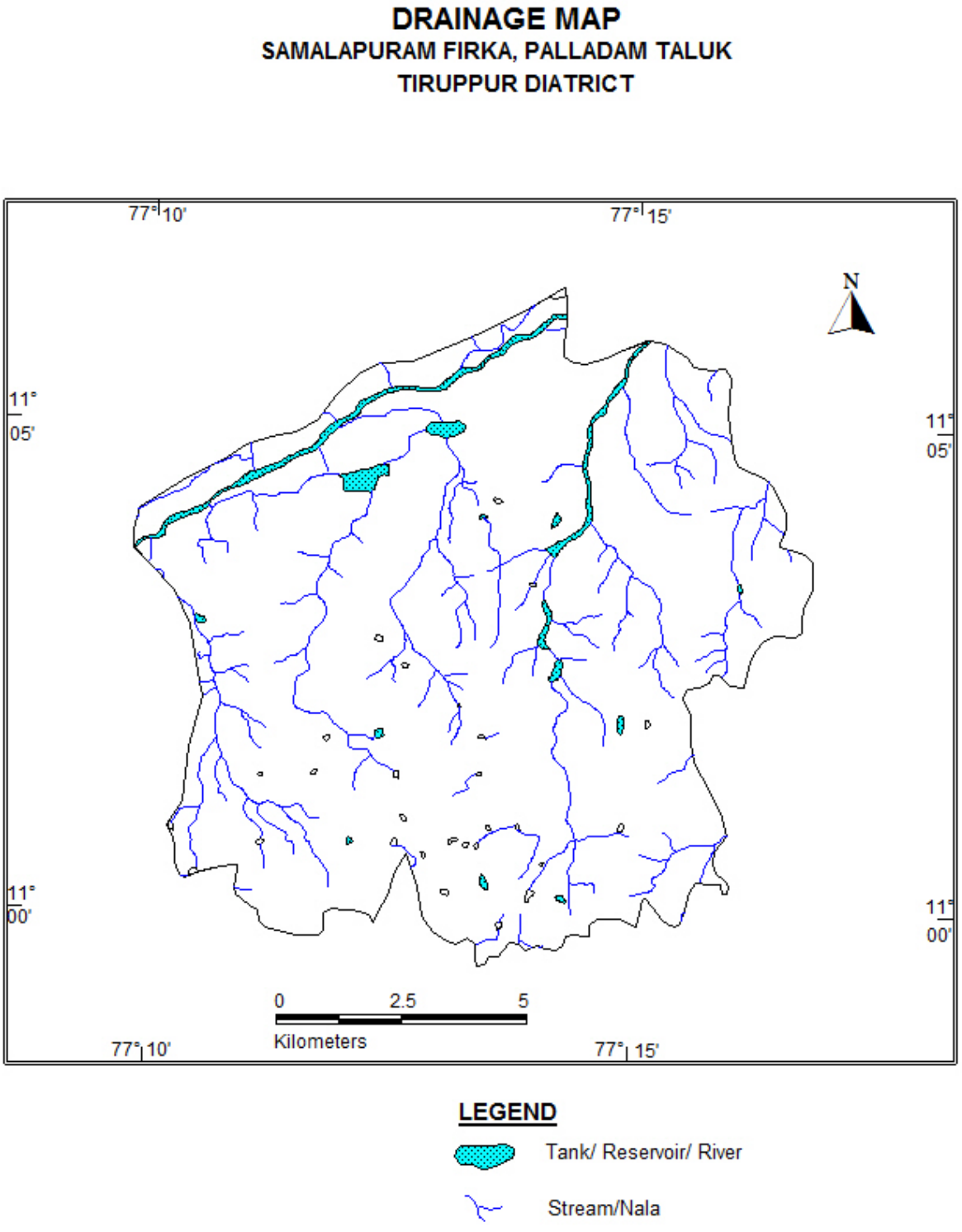


Figure 4 : showing Drainage map of Samalapuram Firka

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 scanty Samalapuram area 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
Palladam	Samalapuram	104.5864	0.413	0.133	0.546

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 pheratic 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 23 m bgl. The present water levels in the firka is in the range of 1.6 to 22 m bgl during pre- monsoon (May 2015) and from 1.2 to 5.6 m m bgl during post monsoon (January 2016). The hydrogeological map of Samalapuram Firka is given in Figure 5.

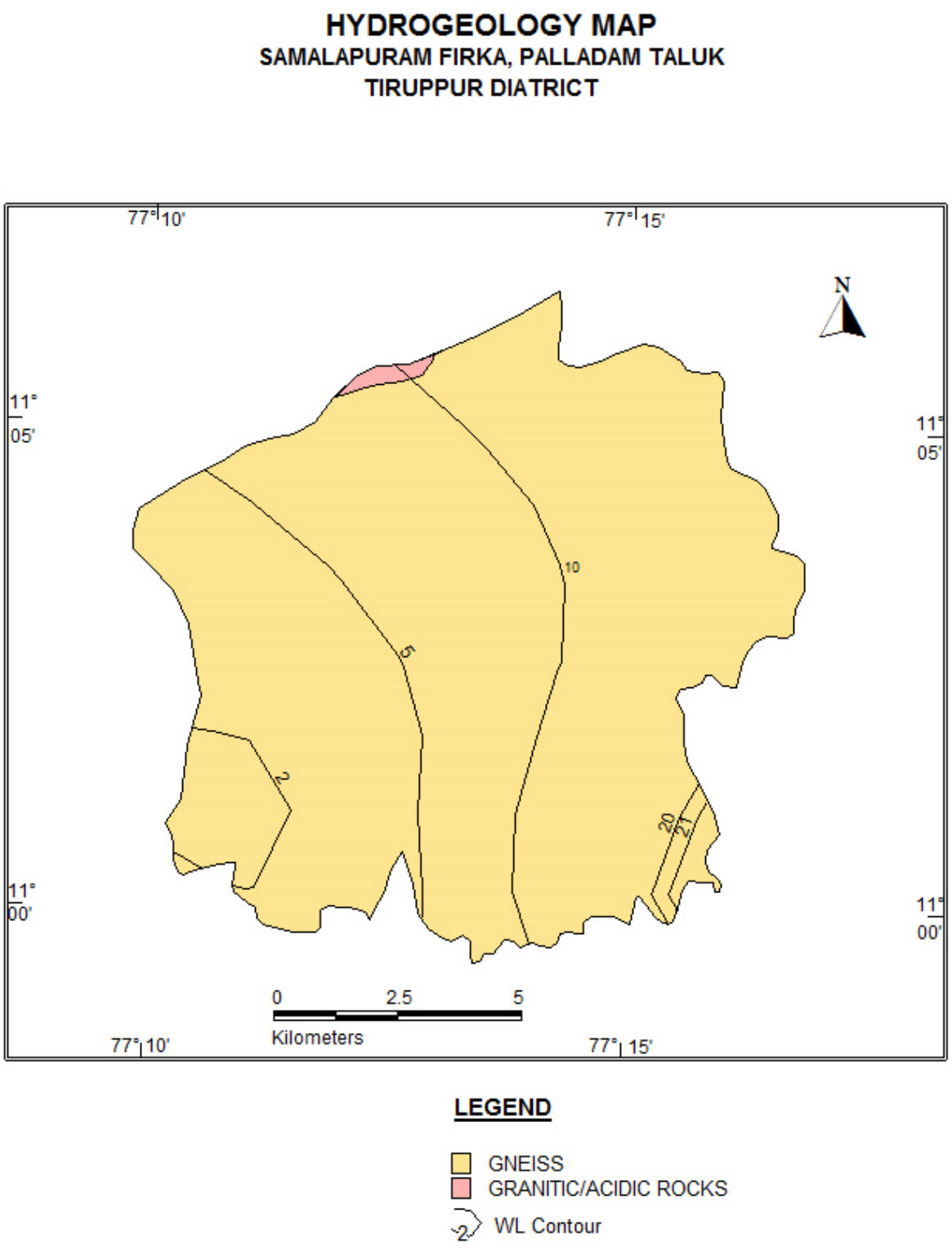


Figure 5: Showing Hydrogeological Map of Samalapuram Firka

DEPTH TO WATER LEVEL MAP (PRE MONSOON)
SAMALAPURAM FIRKA, PALLADAM TALUK
TIRUPPUR DIATRICT

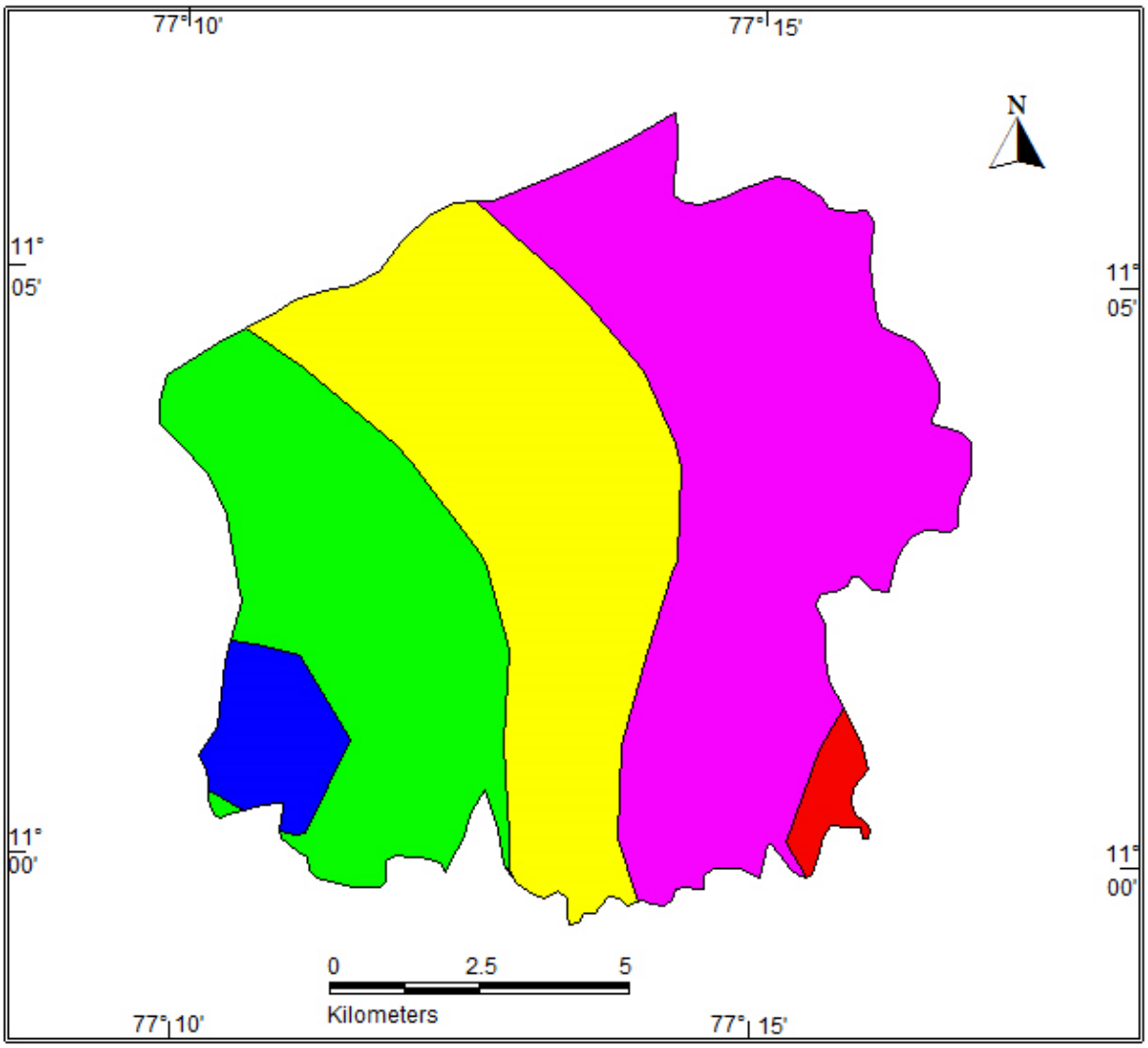


Figure 6a: Showing Pre -monsoon (Decadal) water level in Samalapuram Firka

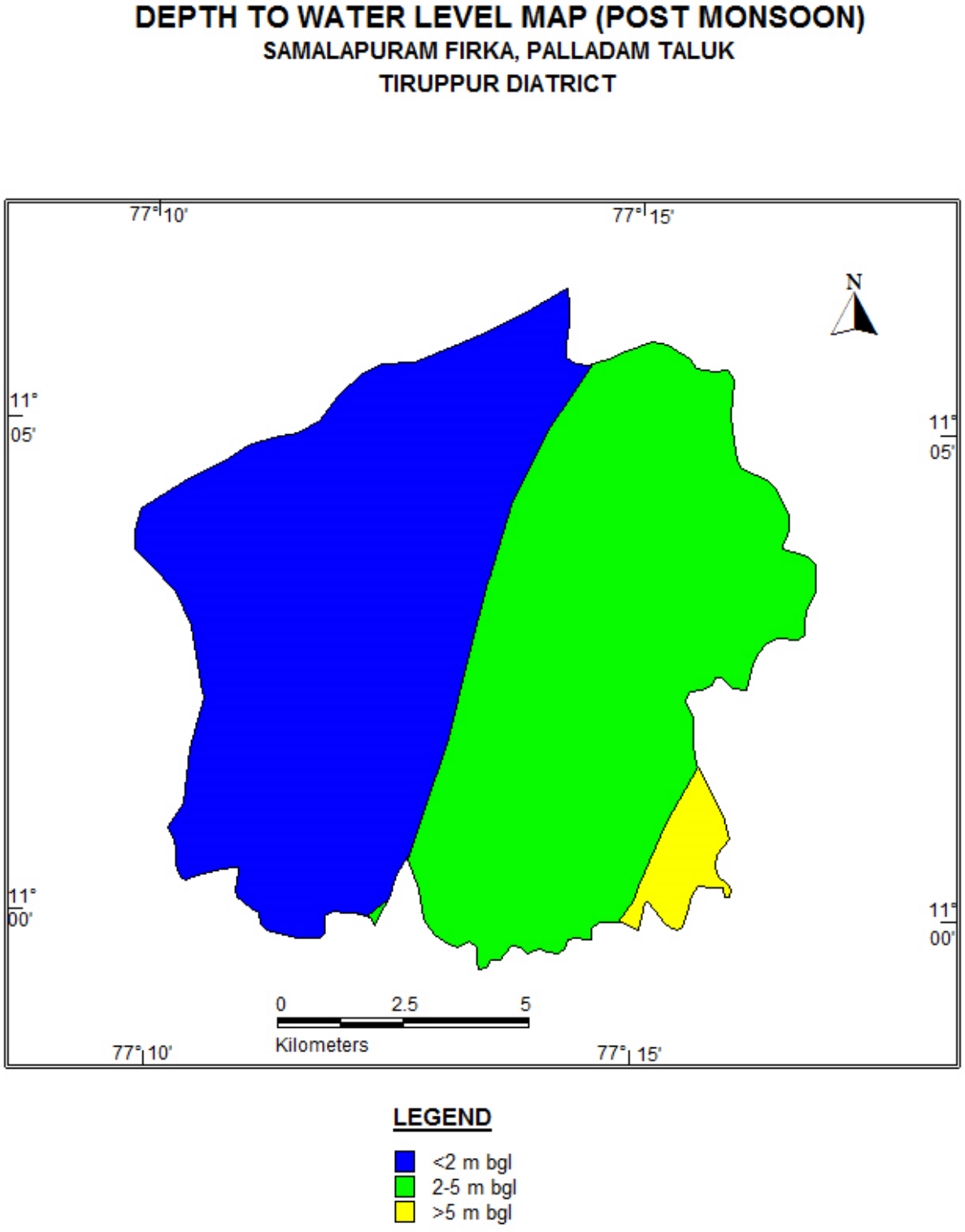


Figure 6 b: Showing Post-monsoon (Decadal) water level in Samalapuram Firka

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 Samalapuram Firka

Firka	Ground Water Worthy Area	Replenish Able 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)					%	
Samalapuram	104.5864	7.3657	6.6291	13.9068	0.7561	14.6629	221.188	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 byassigning 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	6	Suitable for all major recharge structures like Percolation pond and stop dam, check dam etc.,
High	10	Suitable for all major recharge structures like stop dam, check dam etc.,
Moderate	40	Suitable for all major recharge structures like earthen check dam, Boulder check dam and Nala bund etc.,
Poor	44	Hilly/Forest /Catchment area

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

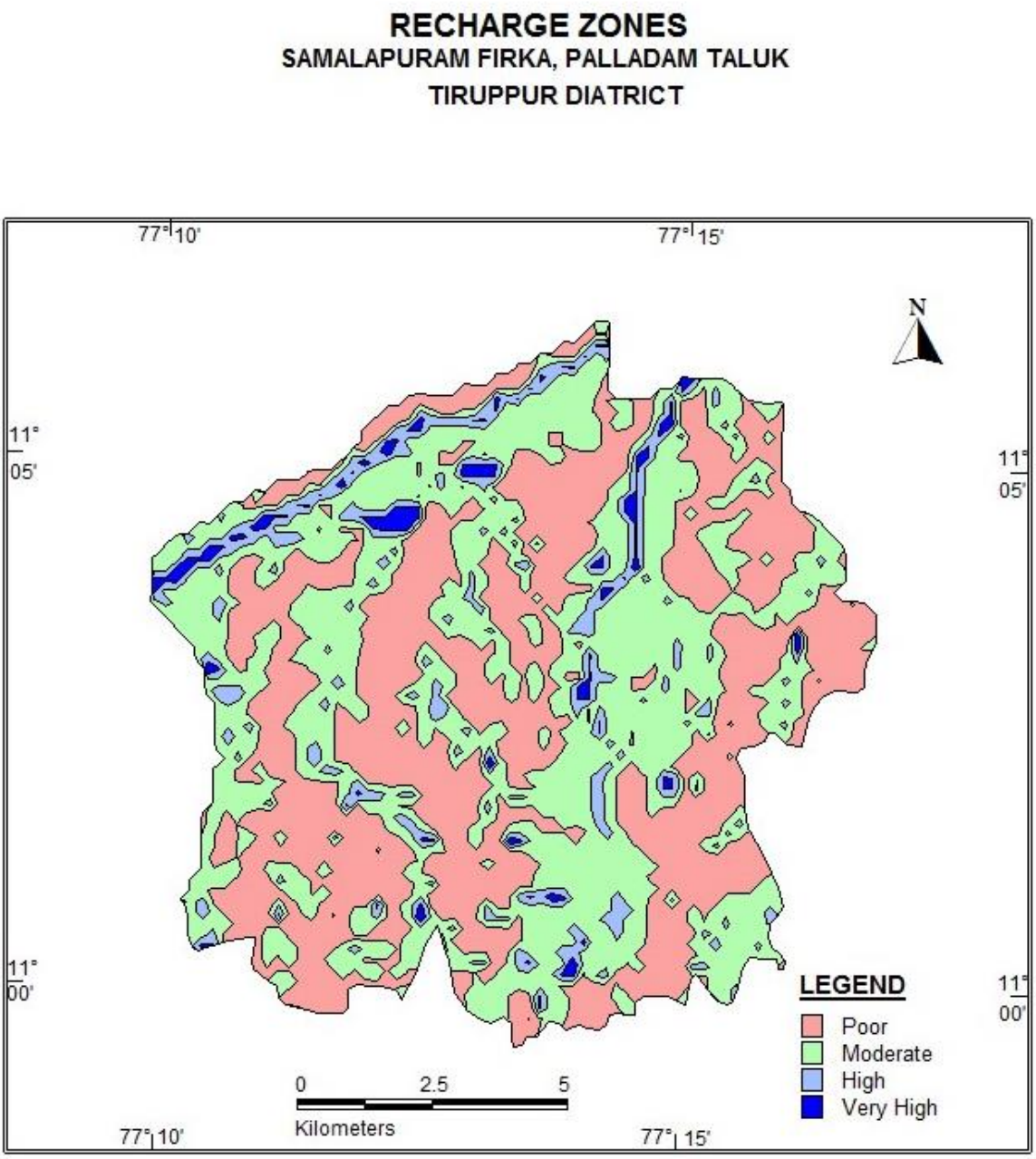


Figure 7: showing the recharge worthy area Samalapuram Firka

5. Planning for groundwater recharge /conservation

5.1 Justification of the artificial recharge & conservation measures

- The Samalapuram Firka is with high stage of groundwater development i.e, **221.18** % and with sufficient amount of uncommitted surface runoff/flow of **6.479** MCM.

- The total weathered zone available beneath the ground in the firka is **12.550 MCM**. Out of these total volume available for recharge considering **7.405** m bgl of water level is **6.910** MCM.
- The Samalapuram Firka consists of **46** surface water bodies /lakes (cover almost 10 % of the total area of the firka) 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 Samalapuram area reveals that more than **56** % of areas are suitable for recharge.
- In Samalapuram Firka more than **72** % 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 Samalapuram 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 Samalapuram Firka is **6.479 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

Samalapuram Firka area is covered by the seasonal nallahs/drains which carry heavy discharge during monsoon. As per the integrated model prediction around **56** % of the firkas areas are suitable for these structures. It is proposed to construct **6** Check dam and **17** Nallahs bunds. The tentative location of these **23** 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 6 Check dam in Samalapuram Firka

S. NO.	LONGITUDE	LATITUDE	TYPE OF ARS
1	77.1762	11.0183	Check Dam
2	77.2574	11.0106	Check Dam
3	77.2545	11.0465	Check Dam
4	77.2717	11.0710	Check Dam
5	77.2357	11.0501	Check Dam
6	77.2187	11.0378	Check Dam

Tentative location of proposed 17Nalla bund in Samalapuram Firka

SL.NO	LONGITUDE(DD)	LATITUDE (DD)	TYPE OF ARS
1	77.2361	11.0098	Nala Bund
2	77.2554	11.0076	Nala Bund
3	77.2653	11.0424	Nala Bund
4	77.2713	11.0664	Nala Bund
5	77.2483	11.0805	Nala Bund
6	77.2610	11.0831	Nala Bund
7	77.2539	11.0424	Nala Bund
8	77.2485	11.0531	Nala Bund
9	77.2218	11.0511	Nala Bund
10	77.2034	11.0255	Nala Bund
11	77.1926	11.0533	Nala Bund
12	77.1841	11.0302	Nala Bund
13	77.1801	11.0469	Nala Bund
14	77.1847	11.0674	Nala Bund
15	77.2264	11.0557	Nala Bund
16	77.1912	11.0434	Nala Bund
17	77.2361	11.0098	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 **46** existing ponds/tanks have been identified with latitude and longitude given below and marked on Plate 1.The above **46** 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 Samalapuram Firka.

Sl.NO	LONGITUDE	LATITUDE	STRUCTURE	ACTION
1	77.2261	11.0705	TANK / RESERVOIR	DESILTTAION AND RECHARGE
2	77.2236	11.0677	TANK / RESERVOIR	DESILTTAION AND RECHARGE
3	77.2680	11.0561	TANK / RESERVOIR	DESILTTAION AND RECHARGE
4	77.2324	11.0564	TANK / RESERVOIR	DESILTTAION AND RECHARGE
5	77.2060	11.0467	TANK / RESERVOIR	DESILTTAION AND RECHARGE
6	77.2106	11.0422	TANK / RESERVOIR	DESILTTAION AND RECHARGE
7	77.2200	11.0356	TANK / RESERVOIR	DESILTTAION AND RECHARGE
8	77.2525	11.0329	TANK / RESERVOIR	DESILTTAION AND RECHARGE
9	77.2240	11.0302	TANK / RESERVOIR	DESILTTAION AND RECHARGE
10	77.1974	11.0296	TANK / RESERVOIR	DESILTTAION AND RECHARGE
11	77.2094	11.0236	TANK / RESERVOIR	DESILTTAION AND RECHARGE
12	77.2237	11.0240	TANK / RESERVOIR	DESILTTAION AND RECHARGE
13	77.1952	11.0237	TANK / RESERVOIR	DESILTTAION AND RECHARGE
14	77.1861	11.0232	TANK / RESERVOIR	DESILTTAION AND RECHARGE
15	77.2108	11.0162	TANK / RESERVOIR	DESILTTAION AND RECHARGE
16	77.2482	11.0152	TANK / RESERVOIR	DESILTTAION AND RECHARGE
17	77.2306	11.0150	TANK / RESERVOIR	DESILTTAION AND RECHARGE
18	77.2254	11.0148	TANK / RESERVOIR	DESILTTAION AND RECHARGE
19	77.1708	11.0140	TANK / RESERVOIR	DESILTTAION AND RECHARGE
20	77.2016	11.0122	TANK / RESERVOIR	DESILTTAION AND RECHARGE
21	77.2193	11.0125	TANK / RESERVOIR	DESILTTAION AND RECHARGE
22	77.2093	11.0121	TANK / RESERVOIR	DESILTTAION AND RECHARGE
23	77.1862	11.0117	TANK / RESERVOIR	DESILTTAION AND RECHARGE
24	77.2216	11.0118	TANK / RESERVOIR	DESILTTAION AND RECHARGE

25	77.2234	11.0117	TANK / RESERVOIR	DESILTTAION AND RECHARGE
26	77.2143	11.0100	TANK / RESERVOIR	DESILTTAION AND RECHARGE
27	77.2347	11.0087	TANK / RESERVOIR	DESILTTAION AND RECHARGE
28	77.1751	11.0063	TANK / RESERVOIR	DESILTTAION AND RECHARGE
29	77.2181	11.0037	TANK / RESERVOIR	DESILTTAION AND RECHARGE
30	77.2381	11.0028	TANK / RESERVOIR	DESILTTAION AND RECHARGE
31	77.2276	10.9982	TANK / RESERVOIR	DESILTTAION AND RECHARGE
32	77.2258	11.0706	TANK / RESERVOIR	DESILTTAION AND RECHARGE
33	77.2681	11.0563	TANK / RESERVOIR	DESILTTAION AND RECHARGE
34	77.2060	11.0467	TANK / RESERVOIR	DESILTTAION AND RECHARGE
35	77.1973	11.0296	TANK / RESERVOIR	DESILTTAION AND RECHARGE
36	77.2094	11.0239	TANK / RESERVOIR	DESILTTAION AND RECHARGE
37	77.2483	11.0149	TANK / RESERVOIR	DESILTTAION AND RECHARGE
38	77.1706	11.0142	TANK / RESERVOIR	DESILTTAION AND RECHARGE
39	77.2015	11.0120	TANK / RESERVOIR	DESILTTAION AND RECHARGE
40	77.2193	11.0126	TANK / RESERVOIR	DESILTTAION AND RECHARGE
41	77.2094	11.0122	TANK / RESERVOIR	DESILTTAION AND RECHARGE
42	77.1862	11.0118	TANK / RESERVOIR	DESILTTAION AND RECHARGE
43	77.1754	11.0066	TANK / RESERVOIR	DESILTTAION AND RECHARGE
44	77.2179	11.0036	TANK / RESERVOIR	DESILTTAION AND RECHARGE
45	77.2278	10.9981	TANK / RESERVOIR	DESILTTAION AND RECHARGE
46	77.2386	11.0026	TANK / RESERVOIR	DESILTTAION AND RECHARGE

5.3.2 Water conservation measure

5.3.2.1 Farm Pond

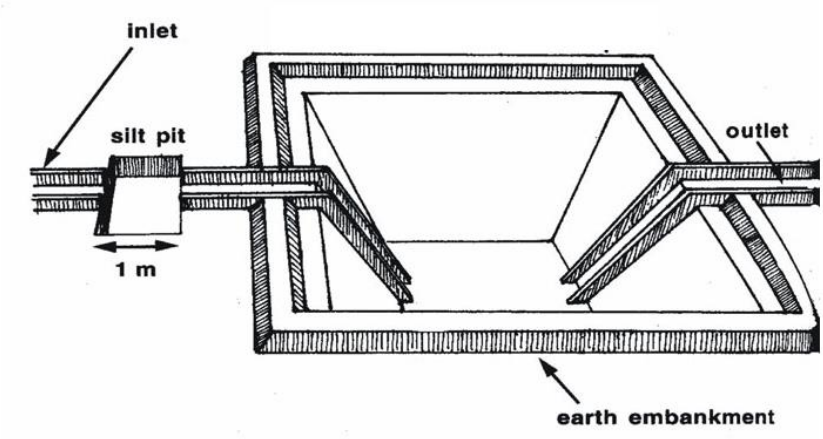
A farm pond is a large dug out in the earth, usually square or rectangular in shape, which harvests rainwater and stores it for future use. It has an inlet to regulate inflow and an outlet to discharge excess water. The pond is surrounded by a small bund, which prevents erosion on the banks of the pond. 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.Tentativelocations of proposed micro irrigation are shown in Plate 1.

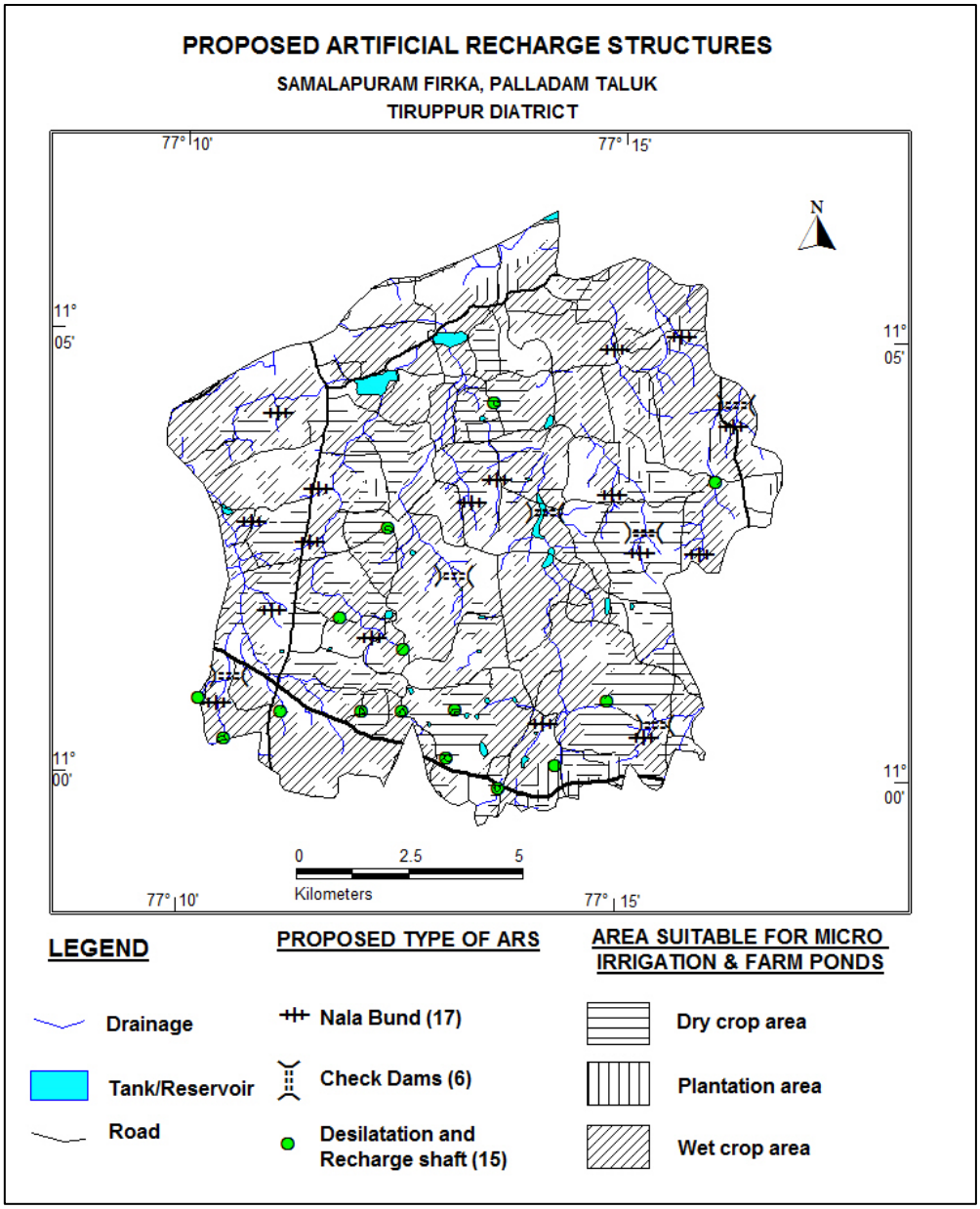


Plate 1. Location map showing the proposed AR Structures in Samalapuram Firka

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	6	3400 (80%)	9.0	54	81600
Nala bund/Gab ion (4 fillings)	Width: 5 to 15 m)	17	3000	2.0	34	40800
Revival, repair of water bodies (3 fillings)	(~150 m x150 m x1.5m)	46	33750 (80%)	25.0	1150	3726000
Recharge shaft within larger tanks	Shaft = 1.5 m dia x 2m depth with filter media in lower 1 m . Bore dia =10", Casing = 6" Depth = 30 m)	46		2.0	92	
Farm Pond (in ha)(5 filling)	(30 m x 30m x 1.5 m)	100 unit	1200(85%)	1	100	600000
				Sub total	**1430**	**4448400**
Water Conservation Measure						
Sprinkler/ drip/ HDPE pipes	For 1 ha with 5 m interval HDPE pipe	100 ha		0.6 /ha	60	700000
				Total	**1490**	**5148400**
Impact assessment and O & M						
Piezometers Up to 50 m bgl –4 nos. @ 0.6 lakh (Impact assessment to be carried out by the implementing agencies)					**2.4**	
				Total cost of the Project	**1492.4**	
O & M - 5 % of total cost of the scheme					**74.62**	
Impact assessment to be carried out by the implementing agencies @ 5% of Total cost					**74.62**	
				TOTAL	**1641.64**	

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).

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 artificial recharge structures.