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Final Report

**SUPPLEMENTING WATER SUPPLY
THROUGH WATER HARVESTING
BY UTILISING DEAD QUARRIES**

Submitted to

Kerala Research Programme on Local Level Development

**Centre for Water Resources Development and Management
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SUMMARY

Water is an inexplicable commodity for the sustenance of life on the earth. Though 71 % of the surface of earth is covered with water, fresh water is becoming more and more precious over the years. The available fresh water on the earth is about only 2.5 % and utilisable quantity is about 15 % of the available fresh water. The availability of fresh water on the earth does not change, but the demand for water is increasing considerably. Increase in population, industrial development, extensive agricultural practices to attain food security, power generation, etc contributed tremendous pressure on fresh water. Precipitation, natural process to replenish all fresh water sources on the earth is a part of hydrologic cycle and its distribution varies drastically all over the world. Kerala State is blessed with plenty of rainfall and due to its uneven distribution drought is experienced just after monsoon periods. Collecting and storing rainwater is helpful not only to tide over the scarcity of water but also to reduce the intensity of flood at 'midland' and 'lowland' during monsoon.

Extraction of rock for different construction activities resulted in formation of large depressions, which are generally impervious in nature and are available at all parts of the State. These quarries are generally located at higher elevations and people living near these quarries are few in numbers. At these places, locally available water resources are very limited and water bringing from other places may not be justifiable. Creation of local water resources is the best solution to overcome the water scarcity of the area. Rainwater harvesting utilizing these quarries is one of the ways to develop local water resources at these places.

With this objective in mind, studies are conducted in Ottapalam Taluk of Kerala State for utilization of quarries for rainwater harvesting and thereby supplementing the water

supply. Fieldwork carried out in 27 out of 29 Grama Panchayats of the taluk revealed the following:

- In most of the quarries due to its features, rainwater is stored and is generally clear. This is the main sources of water for the people staying scattered around the quarries.
- The stored water is used extensively for different purposes and the types of use of water depend on user pattern of the quarry. The types of uses are either for supplementing drinking water, bathing and washing, irrigating adjacent land, industrial use, cattle bathing, pisciculture or their combination.
- With proper management of these quarries (particularly quarries close to each other) scarcity of water of the area can be solved to a great extent.
- Economic backwardness of the people staying near the quarry does not permit them to develop the quarry by their own for providing drinking water. Hence, financing from other developmental agencies is required for implementation of the scheme.
- About 5.8 % of the population of the taluk is staying near the quarries and about 64 % of these (3.7% of the taluk population) are getting benefits from the water in the quarry.

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1. INTRODUCTION

1.1 AUTHORISATION

The Centre for Water Resources Development and Management (CWRDM), Kozhikode communicated a project proposal 'Supplementing water supply through water harvesting utilizing dead quarries' to Kerala Research Programme on Local Level Development (KRPLLD), Centre for Development Studies, Ulloor, Thiruvananthapuram on 27 February, 1999. The Steering Committee of the KRPLLD, which met on 5 August, 1999 had approved the proposal and communicated to the Principal Investigator vide letter No: KRPLLD/TRM/KILA/99 dated 12 August, 1999. The project was originally proposed for a period of three years with a total outlay of Rs. 1,95,000/- (rupees one lakh ninety five thousand only). The project commenced on 1 September, 1999 and should have ended not later than 31 August, 2002. On request the project was extended till December, 2002 within the sanctioned amount vide letter No: KRPLLD/EXT/33/99 dated 06 November, 2002.

1.2 GENERAL

Though nature is bestowed with plenty of rainfall and number of rivers, drought and scarcity of drinking water are recurring phenomena in many parts of Kerala State. Nonuniform distribution of rainfall, rolling topography, extensive changes in landuse, high population density etc. are some of the factors contributing to this condition. Almost 90 % of the annual rainfall occurs during six months of two monsoon seasons (June-November) and because of steep slope, considerable rainwater is lost as runoff. This resulted in floods in low lying areas and eventually, this water reach the Arabian Sea.

Different water harvesting structures of varying magnitudes are constructed across the State and they are adequate to harvest only a meager portion of the rainwater. Harvested water with the help of these structures is adequate to meet the water requirement in the immediate vicinity of the system; sometimes can meet only partial

requirements. Due to vast diversity in topography, soil and geology, some of the water harvesting systems could not render its benefits to immediate surrounding areas, but its benefits will be obtained at different places.

In rural areas, water is extracted mainly from wells and due to lowering of ground water table during summer, some of these wells used to dry up. To supplement the shortage of water during summer, proper water harvesting techniques are to be adopted. Water harvesting can be through artificial recharging of ground water, creation of surface water / ground water storage etc.

This study is meant to explore the feasibility of developing old quarries for harvesting rainwater. If possible, the project also envisages for developing a system at most suitable location by mobilizing the required finance from the beneficiaries and Local Bodies.

1.3 NEED FOR THE STUDIES

Consumption of water has increased significantly mainly because of increase in consumption in all sectors. To cope up with the situation, more water is drawn from the groundwater sources through dug wells and bore wells resulting in lowering of the groundwater table which in turn resulted in drying up of wells causing people to walk kilometers for fetching drinking water.

Rain replenishes our water resources both surface water and groundwater every year. Though we are getting good amount of rain, its distribution is restricted to two monsoon periods of the year. Three fourth of this monsoon rainfall are obtained in the southwest monsoon months i.e., June- September. Distribution of large amount of rain in short duration resulted in floods in rainy season and drought in summer. Both these problems can be simultaneously solved to a great extent by implementing effective rainwater harvesting measures. Rainwater is the purest water available to us. In rainwater harvesting, providing appropriate and economical storage for the collected water is the

main challenge. Economical storage facilities are developed for micro scale (rooftop) rainwater harvesting system.

For different construction purposes, stones (mainly granite and laterite) are extracted throughout the State. Extraction of stones resulted in formation of large depressions. Depressions formed due to the extraction of granite stone are generally impervious whereas that of laterite is pervious in nature. After years of mining activities in these quarries mining is discontinued due to various reasons. This resulted in formation of large depressions with good storage for rainwater. The storage can be increased further by minimum civil work costing nominal expenditure. Such quarries are available in large numbers throughout the State. These quarries can be developed into storage space for harvested water with nominal cost.

It is in this context that this project was proposed. It is expected that this project can serve as a guideline for developing cheap storage facility for drinking water for small isolated communities staying near quarries.

1.4 OBJECTIVES OF THE STUDY

The major objectives of the study are:

- 1) To conduct detailed feasibility study for utilising the dead quarries into rainwater harvesting systems
- 2) To suggest suitable cost effective construction techniques to close the open side of the quarry to create/ increase the storage facility.
- 3) To motivate local bodies for implementing the project (conversion of viable dead quarries for water harvesting) and extend technical assistance to local bodies during the implementation of the project.
- 4) To create surface water impoundment to supplement the water supply of the area.

- 5) To recommend suitable treatment methods for the harvested water if required.
- 6) To convert the nearby wasteland for useful purpose.

2. STUDY AREA

Though old granite quarries are available throughout the length and breadth of the State, Ottapalam taluk of Palakkad district is selected for the studies for various reasons. Some of them are:

- 1) Location: Ottapalam taluk is located almost at the middle of Kerala State.
- 2) Rainfall: The taluk receives good average annual rainfall of 2560 mm compared to the average annual rainfall of 3100 mm received in the State.
- 3) Surface water source: The entire taluk falls within Bharathapuzha basin. Though Bharathapuzha river and its tributary Pulanthode river flow almost along the northern and southern boundaries of the taluk, the availability of water in these rivers during nonmonsoon months is very low.
- 4) Density of population: This taluk is thickly populated and average density of population is 885 persons per square kilometer as compared to the State average of 749 person per square kilometer.

2.1 THE OTTAPALAM TALUK

2.1.1 General

Ottapalam, one among the 65 taluks of Kerala is located at the middle of the State. It lies between latitude 10° 41' 39" N and 10° 57' N and 72° 32 ' 6" E and 76° 02' 42" E. Physiographically, Kerala is divided into three strips along its entire length; they are 'lowland' (elevation upto 7.6 m above mean sea level), 'midland' (elevation

between 7.6 m and 76 m above msl) and 'highland' (elevation above 76 m above msl). Ottapalam taluk is confined into the midland portion of Kerala (Fig. 1). It covers an area of 846.29 square kilometers with a total population of 749,149. The taluk comprises of 29 Grama Panchayats clubbed under four Development Blocks and two Municipalities (Fig. 2).

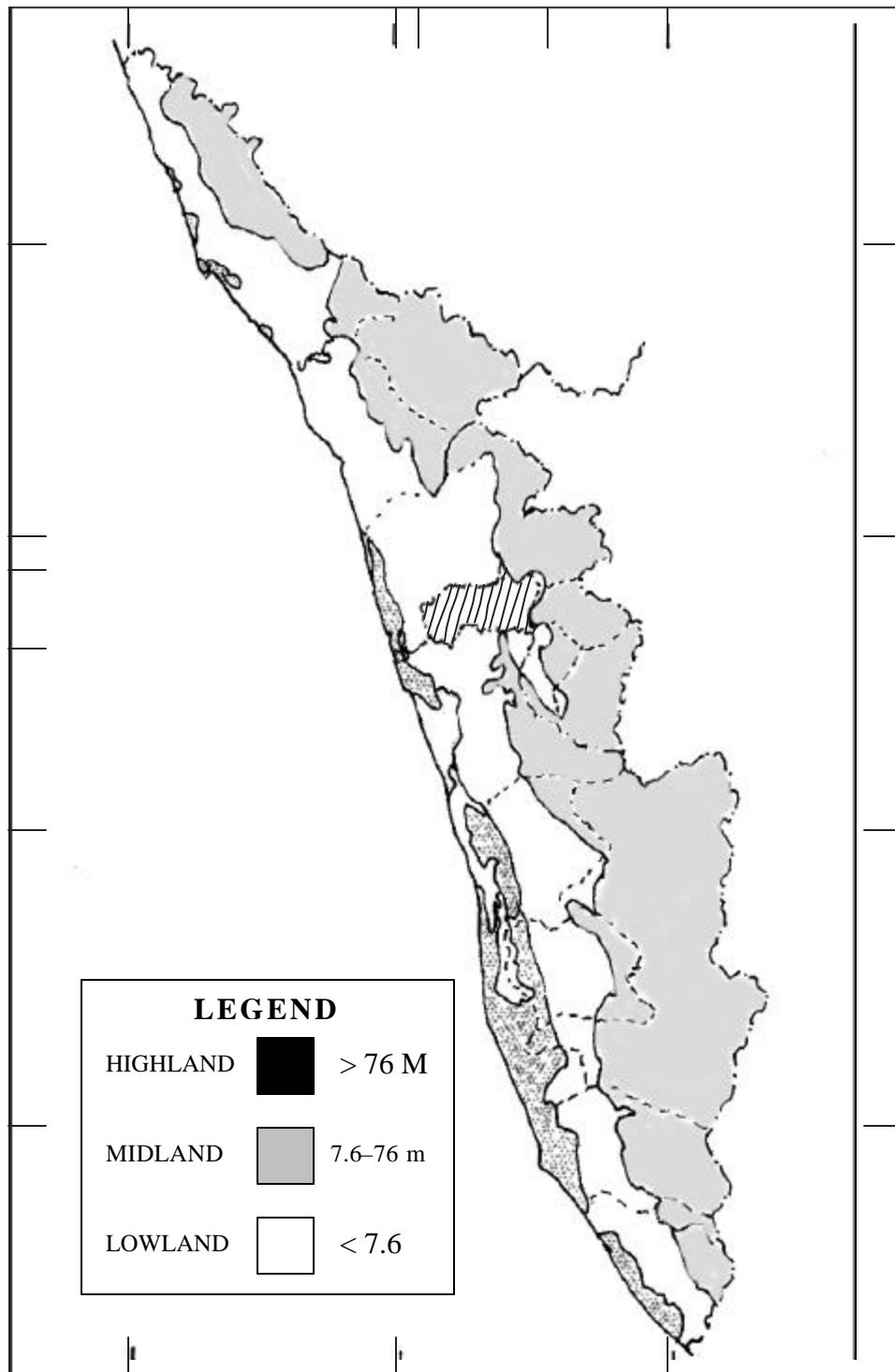


Fig. 1 Physiographical Divisions of Kerala

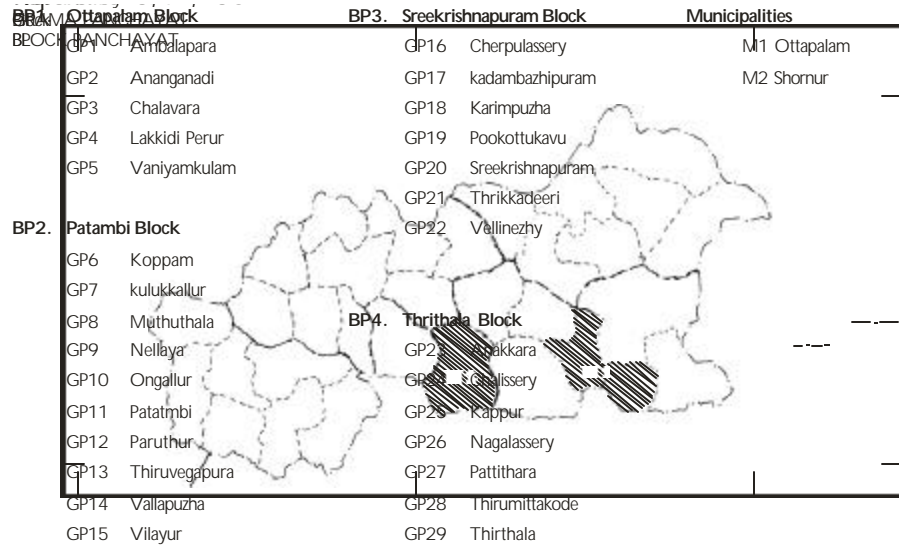


Fig. 2 Location map & details of the area

Details of local bodies within the taluk are given in Table I. Following observations can be drawn from the above Table.

- Pattambi block panchayat is thickly populated (1037 person per sq. km.) followed by Thrithala (954 person per sq. km.), Ottapalam and Sreekrishnapuram (661 person per sq. km.) block panchayats.
- Pattambi grama panchayat got highest density of population (1396 person per sq. km.). The lowest density of population is 551 person per sq. km. in Karimpuzha grama panchayat.
- Biggest block panchayat is Pattambi (10 grama panchayats with total area of 224.21 sq. km.) followed by Sreekrishnapuram (7 grama panchayats with total area of 219.41 sq. km.), Thrithala (7 grama panchayats with a total area of 172.16 sq. km.) and Ottapalam (5 grama panchayats with an area of 165.07 sq. km.) block panchayats.
- Average size of family is 5.7 persons. Biggest size of family is 6.2 persons in Pattambi followed by Thrithala (5.8 persons per family) block panchayats.
- The biggest size of family is in Vallapuzha grama panchayat (6.6 persons per family) followed by Thiruvegapura grama panchayat (6.5 persons per family).

Work force of the taluk engaged in different activities is tabulated in Table II. From this Table it can be seen that:

- Work force comprises of 27 % of the taluk population, lowest availability of work force is in Pattambi (23 %) block panchayat.
- Agricultural labourer is the lion share of the work force, ie; about 39 % and are concentrated in Ottapalam and Sreekrishnapuram block panchayats (44 % each).

Table I. Geographic and demographic particulars of Ottapalam Taluk.

Sl. No:	Panchayat		Population		No: of house holds
	Name	Area (km ²)	Number	Density (per km ²)	
GP1.	Ambalappara	50.08	31,525	630	5872
GP2.	Ananganadi	20.78	20,284	976	3395
GP3.	Chalavara	27.90	19,273	691	3522
GP4.	Lakkidiperur	30.79	26,571	863	4789
GP5	Vaniyamkulam	35.52	26,153	736	5140
BP1	Ottapalam Block	165.07	123,806	750	22718
GP6.	Koppam	25.85	22,286	862	3591
GP7.	Kulukkallur	22.89	22,193	970	3538
GP8.	Muthuthala	19.95	18,491	927	3114
GP9.	Nellaya	27.41	27,714	1011	4519
GP10	Ongallur	31.68	31,755	1002	5167
GP11	Pattambi	15.84	22,108	1396	3521
GP12	Paruthur	20.71	21,809	1053	3535
GP13	Thiruvegapura	20.46	26,562	1298	4092
GP14	Vallapuzha	21.64	21,634	1000	3268
GP15	Vilayur	17.73	17,873	1008	2927
BP2	Pattambi Block	224.21	232,425	1037	37272
GP16	Cherpulassery	27.60	27,020	979	4744
GP17	Kadampazhipuram	39.71	24,934	628	4988
GP18	Karimpuzha	47.39	26,104	551	4662
GP19	Pookkottukavu	22.01	12,441	565	2527
GP20	Sreekrishnapuram	29.56	17,476	591	3691
GP21	Thrikkatiri	26.28	21,304	811	3619
GP22	Vellinezhi	26.86	15,649	583	3186
BP3	Sreekrishnapuram	219.41	144,928	661	27417
GP23	Anakkara	20.95	20,047	957	3439
GP24	Chalissery	19.20	20,415	1063	3545
GP25	Kappur	23.52	25,369	1079	4139
GP26	Naga lassery	26.20	23,288	889	4158
GP27	Pattithara	27.20	26,968	991	4531
GP28	Thirumittacode	32.31	25,855	800	4547

GP29	Thrithala`	22.78	22,312	983	3804
BP4	Thrithala Block	172.16	164,254	954	28163
Block Total		780.85	665,413	852	115570
M1	Ottapalam	32.66	44,186	1353	7938
M2	Shornur	32.78	39,550	1207	7612
Municipality Total		65.44	83,736	1280	15550
Taluk Total		846.29	749,149	885	131120

Source: Panchayat Level Statistics, Palakkad District, 1996, Department of Economics and Statistics, Government of Kerala.

Table II. Classification of work force in Ottapalam taluk (Numbers).

Sl. No: (1)	Panchayat Name (2)	Culti- vator (3)	Agricultural labourer (4)	L.F.P (5)	M.P.S. H (6)	M.P.S.O .H (7)	Trade & commerce (8)
GP1.	Ambalappara	1166	4739	165	181	726	894
GP2.	Ananganadi	669	2531	151	168	372	596
GP3.	Chalavara	723	2352	109	54	352	509
GP4.	Lakkidiperur	843	3652	150	187	765	879
GP5	Vaniyamkulam	761	3040	173	227	1093	806
BP1	Ottapalam Block	4162	16314	748	817	3308	3684
GP6.	Koppam	697	2128	40	125	337	539
GP7.	Kulukcallur	867	2000	83	110	283	449
GP8.	Muthuthala	428	1870	31	79	482	644
GP9.	Nellaya	1096	2996	78	193	280	680
GP10	Ongallur	858	2723	141	109	750	1192
GP11	Pattambi	366	1216	115	77	643	1076
GP12	Paruthur	659	2267	61	148	390	832
GP13	Thiruvegapura	732	2126	63	140	391	858
GP14	Vallapuzha	816	2069	63	69	307	592
GP15	Vilayur	573	1751	63	86	168	419
BP 2	Pattambi Block	7092	21146	738	1136	4031	7281
GP16.	Cherpulassery	880	3025	86	374	658	912
GP17.	Kadampazhipuram	1588	3382	158	146	694	698
GP18.	Karimpuzha	1239	3464	235	318	248	531
GP19.	Pookkottukavu	484	2008	50	41	277	241
GP20	Sreekrishnapuram	764	2013	110	94	453	622
GP21	Thrikkaderi	817	2779	125	116	356	557
GP22.	Vellinezhi	676	1889	97	177	290	443
BP3.	Sreekrishnapuram	6448	18560	861	1266	2976	4004
GP23.	Anakkara	520	2078	164	59	298	619
GP24.	Chalissery	870	2224	170	120	521	871
GP25.	Kappur	1019	2386	66	98	319	753
GP26	Nagalassery	768	2540	177	174	696	801
GP27	Pattithara	968	2670	105	124	529	820
GP28	Thirumittacode	1045	3080	179	221	506	774
GP29	Thrithala	482	1687	136	105	427	869
BP4	Thrithala Block	5672	16665	997	901	3296	5507

	Block Total	23374	72685	3344	4120	13611	20476
M1	Ottapalam	736	3542	147	507	1371	2086
M2	Shornur	600	2503	106	362	1744	1435
	Municipality Total	1336	6045	253	869	3115	3521
	Taluk Total	24710	78730	3597	4989	16726	23997

Note: L.F.P. Live Stock, Forestry, Fishing, Hunting & Plantation orchards and allied activities

MPSH. Manufacturing, Processing, Servicing and Repairs in Household Industry
MPSOH. Manufacturing, Processing, Servicing and Repairs in other than Household Industry,

Source: Panchayat Level Statistics, Palakkad District, 1996, Department of Economics and Statistics, Government of Kerala.

Table II. Classification of work force in Ottapalam taluk (Numbers).
(Cont)

Sl: No: (1)	Panchayat Name (2)	T.S.C. (9)	Construction (10)	Mining & Quarrying (11)	Other Services (12)	Total (13)
GP1.	Ambalappara	400	268	88	1029	9656
GP2.	Ananganadi	255	186	39	640	5607
GP3.	Chalavara	146	211	21	557	5034
GP4.	Lakkidiperur	451	183	54	984	8148
GP5.	Vaniyamkulam	494	276	35	1111	8016
BP1	Ottapalam Block	1746	1124	237	4321	36461
GP6.	Koppam	174	192	72	737	5041
GP7.	Kulukallur	151	227	94	644	4908
GP8.	Muthuthala	256	186	52	501	4529
GP9.	Nellaya	170	185	25	672	6375
GP10.	Ongallur	388	510	117	918	7706
GP11.	Pattambi	506	180	27	995	5201
GP12.	Paruthur	228	152	100	621	5458
GP13.	Thiruvegapura	187	173	89	778	5537
GP14.	Vallapuzha	206	111	94	492	4819
GP15.	Vilayur	153	120	31	492	3856
BP 2	Pattambi Block	2419	2036	701	6850	53430
GP16.	Cherpulassery	373	135	32	1125	7600
GP17.	Kadampazhipuram	246	187	26	875	8000
GP18.	Karimpuzha	148	100	48	757	7088
GP19.	Pookkottukavu	93	94	48	453	3789
GP20.	Sreekrishnapuram	193	162	23	810	5244
GP21.	Thrikkaderi	218	115	74	658	5815
GP22.	Vellinezhi	128	69	43	646	4458
BP3.	Sreekrishnapuram	1399	862	294	5324	41994
GP23.	Anakkara	265	271	252	771	5297
GP24.	Chalissery	374	170	142	678	6140
GP25.	Kappur	301	243	97	647	5929
GP26.	Nagalassery	347	184	112	796	6595
GP27.	Pattithara	452	255	318	743	6984
GP28.	Thirumittacode	340	229	310	807	7491

GP29	Thrithala	455	192	138	781	5272
BP4	Thrithala Block	2534	1544	1369	5223	43708
	Block Total	8098	5566	2601	21718	175593
M1	Ottapalam	1044	400	78	2585	12496
M2	Shornur	2100	339	28	2205	11422
	Municipality Total	3144	739	106	4790	23918
	Taluk Total	11242	6305	2707	26508	199511

Note: TSC. Transport, Storage and Communication

Source: Panchayat Level Statistics, Palakkad District, 1996, Department of Economics and Statistics, Government of Kerala.

- In municipalities other than agricultural labourers, work forces are concentrated on manufacturing, processing, servicing and repairs in other than household industry (M.P.S.O.H), trade and commerce and transportation storage and communication (TSC) sectors.
- About 3.8 % of the workforce is engaged in construction sector. About 1.3 % of the workforce is engaged in mining and quarrying.
- In Thrithala block panchayat, mining and quarrying is a major activity and about 3.1 % of the workforces are engaged in this sector.

2.1.2 River basin

This taluk completely falls in the Bharathapuzha basin, one of the biggest rivers in Kerala. Out of the total basin area of 6186 square kilometers, 1786 sq. km. falls in Tamil Nadu. Number of storage reservoirs and diversion structures has been constructed both in Kerala and Tamil Nadu for irrigation and hydropower generation purposes. All these interventions are located on the upstream reaches of Ottapalam. Locations of these interventions are shown in Fig. 3. Details of these interventions are given in Table III. All schemes located within Tamil Nadu and Moolathara scheme of Kerala are situated in Chitturpuzha tributary with a total live storage of 188 million cubic metres. In Gayathripuzha tributary, four reservoirs (Mangalam,

Pothundi, Chulliyar and Meenkara) with total live storage of 93.56 million cubic metre and Cheerakuzhi diversion scheme are located. Chulliyar and Meenkara reservoirs are filled mainly through diversion of water from Chitturpuzha tributary. Malampuzha and Walayar reservoirs located on Kalpathypuzha have a total live storage of 245.83 million cubic metres. Kanjirapuzha dam with a live storage of 58.0 million cubic metres is the only scheme available in Thuthapuzha. Due to these interventions, flow in the Ottapalam reach of the river is very little and is dry during non-monsoon months.

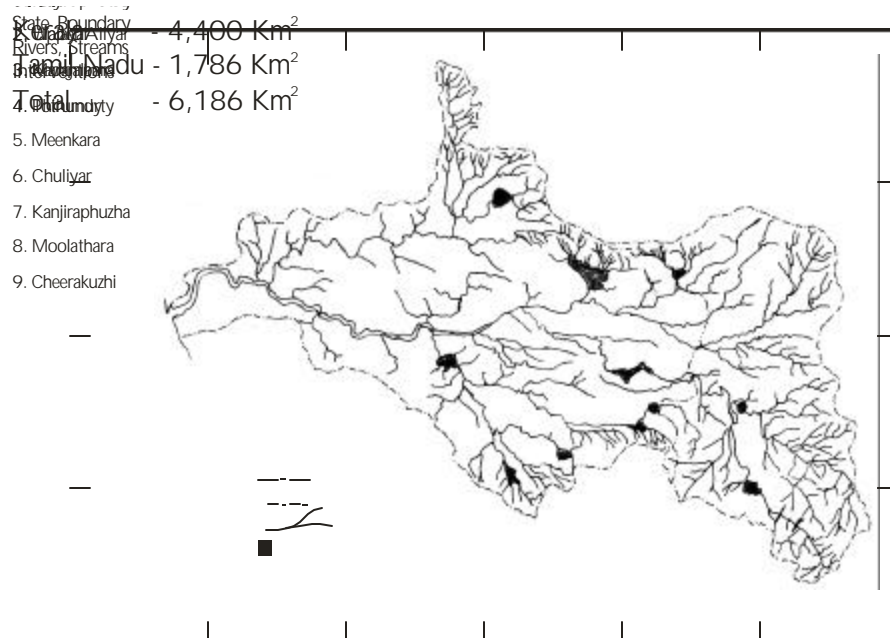


Fig. 3 Barathapuzha basin and locations of interventions

Table III. Details of Storage reservoirs / Diversion schemes in Bharathapuzha basin upstream of Ottapalam

Sl: No:	Scheme			Live storage capacity (Mm ³)	Catchment area (km ²)	Ayacut (km ²)
	Name	Nature	Structure			
	KERALA					
1	Malampuzha	Storage.	Dam.	226.96	147.63	205.53
2	Walayar	Storage.	Dam.	18.87	106.35	34.36
3	Mangalam	Storage.	Dam.	24.67	48.80	33.08
4	Pothundy	Storage.	Dam.	43.89	30.82	46.85
5	Meenkara	Storage.	Dam.	11.33	90.65	30.35
6	Chuliyar	Storage.	Dam.	13.70	29.78	24.30
7	Kanjirapuzha	Storage.	Dam	58.00	70.00	97.13
8	Moolathara	Diversion	Weir			157.00
9	Cheerakuzhi	Diversion	Weir		91.00	16.20
	TAMIL NADU					

1	Aliyar #	Storage	Dam.	100.61	194.56	
2	Upper Aliyar●	Storage	Dam.	26.56	138.85	Nil
3	Kadampara◆	Forebay	Dam.	0.76	58.34	--
4	Wandall♠ ¹	Diversion	Dam.	--	115.38	--
5	Akkamalai♠ ²	Diversion	Weir.	--	4.634	--
6	Deviar♠ ³	Diversion	Weir.	--	17.23	--
7	Pallivilagal	Diversion	Anicut.	--	--	2.66
8	Ariyarpuram	Diversion	Anicut.	--	--	5.03
9	Karapathy	Diversion	Anicut.	--	--	3.16
10	Periyantai	Diversion	Anicut.	--	--	7.70
11	Vadakkallur	Diversion	Anicut.	--	--	7.20
12	Thirumurthy #	Storage	Dam.	49.39	79.36	--
13	Valayapalaya	Diversion	Anicut.	--	--	--
14	Elavankara	Diversion	Anicut.	--	--	--

Note: # Inter basin reservoir

● Hydroelectric scheme

◆ Pumped Hydroelectric scheme

♠ Diversion to Kadampara scheme

Diversion at FRL ♠¹ 794.7 cumecs, ♠² 40.9 cumecs ♠³ 89.15 cumecs

Entire basin has a network of 39 raingauge stations (Fig. 4) and average annual rainfall in the basin is 2300 millimeters. Bharathapuzha and its tributary Pulanthode river flow respectively almost along the southern and northern boundaries of the taluk. Locations of hydrometeorological stations within the taluk are given in Fig. 5.

2.1.3 Rainfall

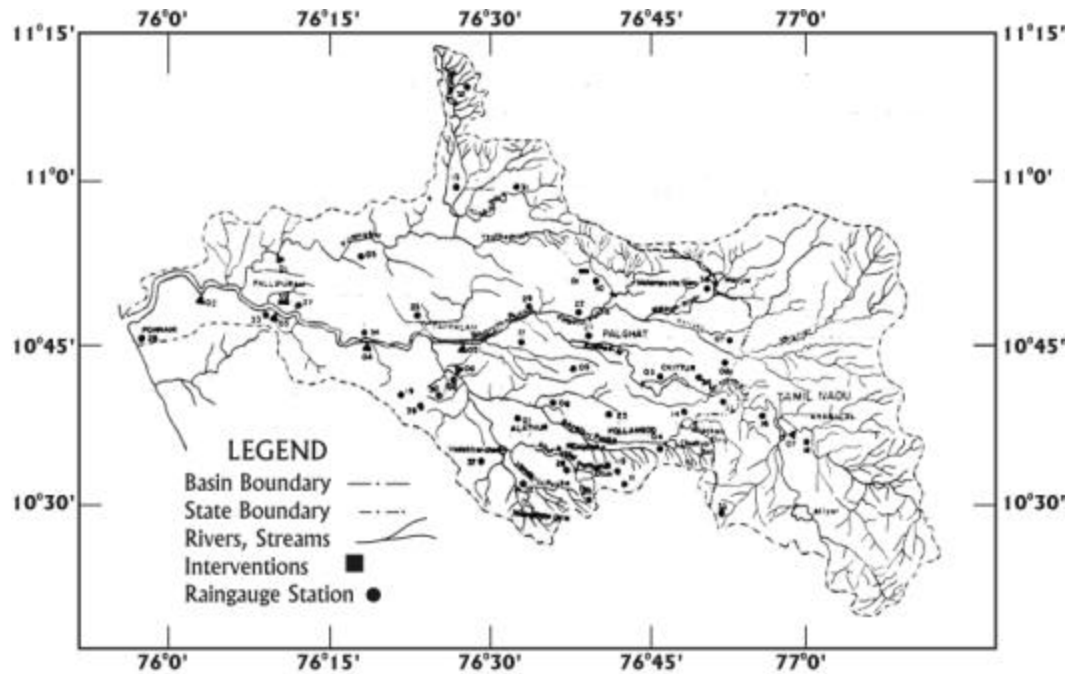
Five raingauge stations are located within the taluk. They are Ottapalam, Shornur, Pattambi, Thrithala and Cherpulassery. Distribution of average rainfall at these locations is given in Table IV. It can be seen from this table that about 55 % of the annual rainfall occurs in two months of June and July. 75% of annual rainfall receives during south- west monsoon (June-Sept.), 15% during north- east monsoon (Oct. – Dec.) and remaining 10% during nonmonsoon (Jan.-May) period. Average

annual rainfall of the taluk is 2560 mm, which is more than the annual rainfall of the basin i.e.; 2300 mm.

2.1.4 River flow

Three river gauge stations are available within the taluk. They are at Cheruthuruthy, Thirthala in Bharathapuzha and Thiruvegapura in Pulanthode river. Variations of flow during monsoon and summer months at these stations are given in Table V. From the Table it can be noted that at Thrithala, flow during monsoon period is more than the flow at upstream gauge point i.e., at Cheruthuruthy. However, during summer months the flow at Thrithala is much smaller than the upstream gauge station. This is because water is being drawn at several points between these gauge stations for irrigation and drinking water supply schemes. Pavareddy drinking water scheme supplies water to 3 municipalities and 17 grama panchayats and lift irrigation schemes under Water Resources Department are the major contributors.

Dependable flow (50%, 75% and 90%) at Cheruthuruthy, Thrithala in Bharathapuzha and Thiruvegapura gauge stations during lean period (Jan.- May) is given in Table VI. It can be noted from this Table that:

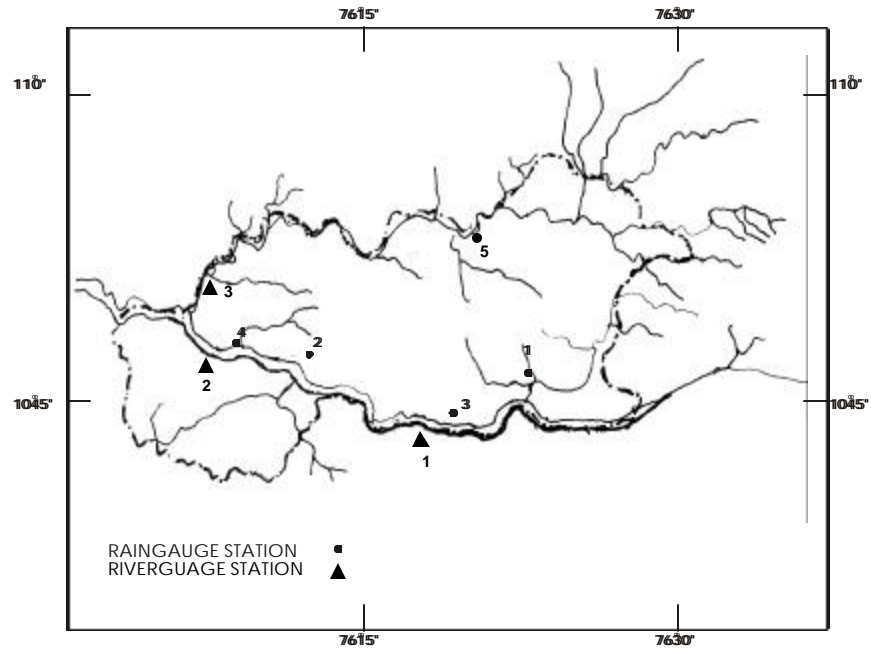


Average Rainfall : 2,300 mm

RAINGAUGE STATIONS

- | | |
|-------------------------|---------------------------|
| 1. ALATHUR | 21. NURNEE |
| 2. CHEERAKUZHY | 22. OLAVAKKOT |
| 3. CHITTUR | 23. OTTAPALAM |
| 4. CHULLIAR | 24. PALGHAT |
| 5. CHERPLACHERI | 25. POKKUNNI |
| 6. ERIMAYUR | 26. PONNANI |
| 7. ERUTHEMPATHY ISF | 27. PATTAMBI |
| 8. KUNNAMKATTUPATHY | 28. POTHUNDI |
| 9. KODUVAYUR | 29. PARLI |
| 10. MALAMPUZHA | 30. PAZHAYANNUR SEED FARM |
| 11. MANALLOORU ESTATE | 31. PULIKKAL |
| 12. MANGALAM DAM | 32. SILENT VALLEY |
| 13. MANNARGHAT | 33. SUNGAM |
| 14. MEENKARA DAM | 34. SHORNUR RLY STATION |
| 15. MEERA FLORES ESTATE | 35. THRITHALA |
| 16. MOOLATHARA | 36. THEMBARAMADAKU |
| 17. MATHUR | 37. VADAKKANCHERY |
| 18. MANAKADAVU | 38. WALAYAR |
| 19. MALLISSERIKAVU | 39. ELANADU |
| 20. NELLIAMPATHY | |

Fig. 4 Drawing map with Raingauge Stations in Bharathapuzha basin



RAINGUAGE STATION

1. Ottapalam
2. Pattambi
3. Shornur
4. Trithala
5. Cherpulacherry

RIVERGUAGE STATION

1. Cheruthuruthy
2. Trithala
3. Thiruvegapura

Fig. 5 Location of Hydrometeorological stations

Table IV. Distribution of annual rainfall in Ottapalam taluk mm

Month	Raingauge station				
	Ottapalam	Pattambi	Shornur	Trithala	Cherpulssery
January	40	14	11	9	7
February	0	3	1	11	9
March	6	5	7	23	29
April	89	75	68	49	98
May	136	112	142	135	180
June	699	796	704	722	607
July	682	760	699	660	709
August	341	364	360	359	378
September	118	91	132	103	181
October	293	304	253	253	298
November	121	93	122	124	157
December	3	21	7	3	28
Total	2,528	2,638	2,506	2,451	2681

Table V. River flow at different gauge stations in Ottapalam taluk (Mm³)

Parameter	Cheruthuruthy		Trithala		Thiruvegapura	
	Monsoon	Lean	Monsoon	Lean	Monsoon	Lean
Average	2634.84	214.33	2952.52	122.84	1442.69	17.49
Maximum	3533.54	590.85	4869.06	431.65	2412.89	48.29
Minimum	1309.15	81.10	1346.76	10.36	744.68	0.88

Table VI. Dependable lean flow at different gauge stations at Ottapalam taluk (Mm³)

Gauge station	Cheruthuruthy			Trithala			Thiruvegapura		
	50 %	75%	90 %	50 %	75%	90 %	50 %	75%	90 %
January	35.8	28.3	16.4	38.3	8.83	3.72	9.40	6.46	4.70
February	21.4	10.7	8.57	5.06	1.49	0.07	3.25	1.77	1.18
March	9.26	5.19	0.37	0.91	0	0	0.42	0	0
April	10.7	6.92	4.62	3.19	0	0	2.65	0.88	0.59
May	34.6	19.1	11.0	14.1	4.97	0.79	8.20	4.98	4.68

- Quantity of dependable flow at these three gauge stations decreases from January to March and then increases gradually.
- 50% dependable flow at Thrithala is less than that at Cheruthuruthy except in the month of January.
- 75% and 90% dependable flow at Thrithala is less than that of Cheruthuruthy for all lean months
- At Thrithala, 75% and 90% dependable flow is zero during the months of March and April

- At Thiruvegapura, 75% and 90% dependable flow during March is zero.

2.1.5 Water Resources

Main sources of surface water in this taluk are rivers, streams, canals and tanks/ponds. Panchayat wise availability of rivers, streams and canals are given in Table VII. From this Table it can be noted that:

- Total length of rivers flowing through the taluk is 114.048 km and only 14 grama panchayats and two municipalities are blessed with rivers. However, 20 grama panchayats have got access to river; the discrepancy may be because some grama panchayats do not have any right on the river though the river is flowing along the boundary of that panchayat. Examples are Vaniyamkulam, Muthuthala etc.
- Out of the available 627.706 km length of streams, only 83.168 km length of streams i.e.; about 13 % is perennial. Only 13 grama panchayats and Ottapalam municipality got the advantage of having perennial streams.
- Out of the 186.194 km. length of canals available, only 99.231 km. length (53%) is useful. The worst affected panchayats are Chalavara, Lakkidiperur, Kadambazhipuram, Pookkottukavu and Sreekrishnapuram. These unused canals are mainly parts of partially commissioned Kanjirapuzha irrigation project.

Details of ponds / tanks available within the taluk is tabulated in Table VIII. Following observations can be drawn from the above Table.

- 85 % of the total available tanks (6526) are owned by private parties and do not change much in block panchayats or municipalities level.
- About 65 % of the ponds are perennial and it holds good both for private and public.

- Lowest percentage of perennial ponds is in Thrithala block panchayat (50 %) and is followed by Ottapalam (62 %), Pattambi (67 %) and Sreekrishnapuram (74 %).

Table VII. Availability of Rivers, Streams and Canals in Ottapalam taluk.
(km)

	Panchayat	Rivers	Streams			Canals		
	Name		Non-Perennial	Perennial	Total	Not Used	Used	Total
GP1.	Ambalappara		26.050	7.450	33.500	1.750	0.950	2.700
GP2.	Ananganadi		14.560		14.560		8.560	8.560
GP3.	Chalavara		13.475		13.475	29.800		29.800
GP4.	Lakkidiperur	2.900	14.475		14.475	18.625		18.625
GP5	Vaniyamkulam *		34.100	7.950	42.050			
BP1	Ottapalam Block	2.900	102.660	15.400	118.060	50.175	9.510	59.685
GP6.	Koppam		18.950		18.950			
GP7.	Kulukallur	6.525	12.550	2.850	15.400	1.025	2.400	3.425
GP8.	Muthuthala		18.635		18.635		1.625	1.625
GP9.	Nellaya	0.650	15.700	0.650	16.350		1.750	1.750
GP10	Ongallur	1.200	19.083	10.370	29.453			
GP11	Pattambi	4.750	12.290		12.290		1.150	1.150
GP12	Paruthur	10.300	16.650		16.650	3.925		3.925
GP13	Thiruvegapura	11.075	13.250	11.850	25.100		1.605	1.605
GP14	Vallapuzha		26.940		26.940	0.550		0.550
GP15	Vilayur	8.600	27.310		27.310		1.300	1.300
BP2	Pattambi Block	43.100	181.358	25.720	207.078	5.500	9.830	15.330
GP16	Cherpulassery	8.750	17.850	2.825	20.675	0	3.350	3.350
GP17	Kadampazhipuram	9.275	19.720	7.300	27.020	12.900	7.100	20.000
GP18	Karimpuzha *	0	0	0	0	0	0	0
GP19	Pookkottukavu	0	12.500	0	12.500	11.550	1.600	13.150
GP20	Sreekrishnapuram	10.050	7.775	14.225	22.000	8.870	7.100	15.970
GP21	Thrikkatiri	0	26.625	0	26.625	0.270	12.250	12.520
GP22	Vellinezhi	0	0	0	0	0	0	0
BP3	Sreekrishnapuram	28.075	84.470	24.350	108.820	33.590	31.400	64.990
GP23	Anakkara	10.530	16.010	1.500	17.510	0.700	6.600	7.300
GP24	Chalissery	0	20.080	0	20.080	0	0	0
GP25	Kappur	0	21.660	2.480	24.140	0	0	0
GP26	Nagalassery	0	18.630	0	18.630	0	0	0
GP27	Pattithara	7.250	40.930	3.440	44.370	0	1.760	1.760
GP28	Thirumittacode	0	25.782	0	25.782	0	2.320	2.320
GP29	Thrithala`	11.108	5.138	2.808	7.946	8.636	7.452	16.088
BP4	Thrithala Block	28.888	148.230	10.228	158.458	9.336	18.132	27.468
Block Total		102.963	516.718	75.698	592.416	98.601	68.872	167.473
M1	Ottapalam	1.385	4.410	7.470	11.880	0.230	16.441	16.671
M2	Shornur	9.700	23.410	0	23.410	0.400	1.650	2.050
Municipality Total		11.085	27.820	7.470	35.29	0.630	18.091	18.721
Taluk Total		114.048	544.538	83.168	627.706	99.231	86.963	186.194

Note: * Incomplete information

Source: Resource Mapping at Panchayat Level for Palakkad District, Kerala
State Land Use Board 2002

Table VIII. Availability of Ponds /Tanks in Ottapalam taluk.
(Numbers)

Sl. No:	Panchayat	Private				Public				Total
	Name	Non Perennial	Perennial	Not Used	Total	Non Perennial	Perennial	Not Used	Total	
GP1.	Ambalappara	99	217	0	316	4	33	0	37	353
GP2.	Ananganadi	61	44	4	109	8	7	1	16	125
GP3.	Chalavara	58	152	0	210	9	27	0	36	246
GP4.	Lakkidiperur	55	22	0	77	10	32	0	42	119
GP5	Vaniyamkulam *	42	92	0	134	0	0	0	0	134
BP1	Ottapalam Block	315	527	4	846	31	99	1	131	977
GP6.	Koppam	60	54	3	117	8	16	0	24	141
GP7.	Kulukkallur	1156	132	7	1295	8	32	0	40	1335
GP8.	Muthuthala	40	110	16	166	12	22	4	38	204
GP9.	Nellaya	48	135	0	183	18	20	0	38	221
GP10	Ongallur	60	91	0	151	20	26	0	46	197
GP11	Pattambi	26	19	0	45	6	9	0	15	60
GP12	Paruthur	22	73	0	95	15	33	0	48	143
GP13	Thiruvegapura	38	60	0	98	7	13	1	21	119
GP14	Vallapuzha	57	111	0	168	14	15	1	30	198
GP15	Vilayur	32	140	15	187	11	17	0	28	215
BP2	Pattambi Block	404	925	41	1370	119	203	6	328	1698
GP16	Cherpulassery	44	110	1	155	4	17	0	21	176
GP17	Kadampazhipuram	117	417	8	542	7	38	0	45	587
GP18	Karimpuzha *	0	0	0	0	0	0	0	0	0
GP19	Pookkottukavu	108	207	3	318	19	27	3	49	367
GP20	Sreekrishnapuram	35	222	4	261	11	32	0	43	304
GP21	Thrikkatiri	76	143	0	219	7	23	0	30	249
GP22	Vellinezhi	55	241	4	300	7	30	0	37	337
BP3	Sreekrishnapuram	435	1340	20	1795	55	167	3	225	2020
GP23	Anakkara	79	139	1	219	12	13	0	25	244
GP24	Chalissery	63	33	0	96	12	3	0	15	111
GP25	Kappur	135	132	1	268	14	15	0	29	297
GP26	Nagalassery	102	32	2	136	38	18	0	56	192
GP27	Pattithara	96	105	0	201	14	13	0	27	228
GP28	Thirumittacode	79	63	0	142	30	20	0	50	192
GP29	Thrithala`	27	84	2	113	3	15	0	18	131

BP4	Thrithala Block	581	588	6	1175	123	97	0	220	1395
Block Panchayat Total		1735	3380	71	5186	328	566	10	904	6090
M1	Ottapalam	33	131	3	167	6	34	1	41	208
M2	Shornur	34	153	14	201	13	14	0	27	228
Municipality Total		67	284	17	368	19	48	1	68	436
Taluk Total		1802	3664	88	5554	347	614	11	972	6526

Note: * Incomplete information

Source: Resource Mapping at Panchayat Level for Palakkad District, Kerala State Land Use Board 2002

- About 1.5 % of the total ponds are not used. Percentage non utilisation of ponds are more in municipalities (about 4 %) followed by Pattambi (3 %) block.

Area and capacity of these tanks varies drastically, the largest tank is having an area of 34.8 sq. km. with 1 m depth of water (Paradur grama panchayat) during March-April months.

Main sources of groundwater in this taluk are dug wells and bore wells. Panchayat wise availability of dug wells within the taluk is given in Table IX. From the Table it can be observed that:

- 98 % of the total available wells (93058) are owned by private parties and this does not change much in block panchayats or municipalities level
- About 56 % of the wells are perennial and it holds good both for private and public wells
- Lowest percentage of perennial wells is in Pattambi (53 %) block panchayat and highest percentage in Sreekrishnapuram (60 %) block panchayat.
- About 1.3 % of the total wells are not used. Percentage non utilisation of wells is more in Shornur (about 3.6 %) municipality.

- Average density of dug well is 110 per square kilometer. The density varies from 63 per square kilometer in Ottapalam block panchayat to 137 per square kilometer in Thrittala block panchayat.

Table IX. Availability of wells in Ottapalam taluk. (Numbers)

Sl. No:	Panchayat Name	Private				Public				Total
		Non Perennial	Perennial	Not Used	Total	Non Perennial	Perennial	Not Used	Total	
GP1.	Ambalappara	1714	1980	12	3706	28	54	2	84	3790
GP2.	Ananganadi	651	294	63	1008	17	14	2	33	1041
GP3.	Chalavara	1012	959	5	1976	34	36	0	70	2046
GP4.	Lakkidiperur	1231	2299	39	3569	26	56	0	82	3651
GP5	Vaniyamkulam *	974	1104	0	2078	0	0	0	0	2078
BP1	Ottapalam Block	5582	6371	119	12337	105	160	4	269	10528
GP6.	Koppam	1298	1026	55	2379	22	11	2	35	2414
GP7.	Kulukallur	1156	2028	49	3233	25	33	4	62	3295
GP8.	Muthuthala	1660	1672	32	3364	39	13	5	57	3421
GP9.	Nellaya	1177	1510	0	2687	20	38	0	58	2745
GP10	Ongallur	1819	2035	22	3876	21	37	2	60	3936
GP11	Pattambi	1030	1180	22	2232	8	18	2	28	2260
GP12	Paruthur	1146	1327	31	2504	25	39	1	65	2569
GP13	Thiruvegapura	1109	1972	23	3104	12	15	5	32	3136
GP14	Vallapuzha	1604	1263	58	2925	32	10	1	43	2968
GP15	Vilayur	1285	1554	136	2975	30	39	1	70	3045
BP2	Pattambi Block	13284	15567	428	29279	234	253	23	510	29789
GP16	Cherpulassery	1219	1345	7	2571	24	31	3	58	2629
GP17	Kadampazhipuram	1588	3176	147	4911	50	87	3	140	5051
GP18	Karimpuzha *	611	1353	0	1964	0	0	0	0	1964
GP19	Pookkottukavu	1067	1443	0	2510	29	36	0	65	2575
GP20	Sreekrishnapuram	1024	2652	16	3692	34	43	3	80	3772
GP21	Thrikkatiri	1271	1172	44	2487	23	35	1	59	2546
GP22	Vellinezhi	1353	1828	67	3248	47	36	3	86	3334
BP3	Sreekrishnapuram	8133	12969	281	21383	207	268	13	488	21871
GP23	Anakkara	997	2398	10	3405	49	46	3	98	3503
GP24	Chalissery	904	1569	0	2473	14	11	1	26	2499
GP25	Kappur	1463	3034	42	4539	45	28	1	74	4613
GP26	Nagalassery	2265	1271	2	3538	52	24	3	79	3617
GP27	Pattithara	1672	1520	23	3215	61	19	1	81	3296
GP28	Thirumittacode	1978	1378	77	3433	34	28	13	75	3508
GP29	Thrithala`	1247	1402	0	2649	21	26	1	48	2697

BP4	Thrithala Block	10526	12572	154	23252	276	182	23	481	23733
Block Panchayat Total		37525	47479	982	86251	822	863	63	1748	85921
M1	Ottapalam	943	1851	36	2830	68	38	4	110	2940
M2	Shornur	1391	2621	151	4163	15	17	2	34	4197
Municipality Total		2334	4472	187	6993	83	55	6	144	7137
Taluk Total		39859	51951	1169	93244	905	918	69	1892	93058

Note: * Incomplete information

Source: Resource Mapping at Panchayat Level for Palakkad District, Kerala State Land Use Board 2002

Availability of bore wells within the taluk is tabulated in Table X. From the Table it can be observed that:

- 90 % of the total available bore wells (8977) are owned by private parties and this pattern does not change much in block panchayats or municipalities level.
- About 6 % of the total bore wells are not used. Percentage nonutilisation of bore wells is more in Pattambi (8.5 %) block panchayat.
- Average density of bore well is 11 per square kilometer. The density varies from 5 per square kilometer in Sreekrishnapuram block panchayat to 19 per square kilometer in Pattambi block panchayat.

Table X. Availability of Bore wells in Ottapalam taluk. (Numbers)

	Name	Private			Public			Total BoreWells	Public Tapes
		Not used	Used	Total	Not Used	Used	Total		
GP1.	Ambalappara	5	207	212	4	26	30	242	170
GP2.	Ananganadi	15	189	204	3	28	31	235	76
GP3.	Chalavara	7	404	411	3	44	47	458	67
GP4.	Lakkidiperur	2	169	171	2	15	17	188	170
GP5	Vaniyamkulam *	0	78	78	0	0	0	78	0
BP1	Ottapalam Block	29	1047	1076	12	113	125	1201	483
GP6.	Koppam	18	449	467	2	17	19	486	332
GP7.	Kulukkallur	11	286	297	2	32	34	331	80
GP8.	Muthuthala	9	434	443	4	28	32	475	285
GP9.	Nellaya	170	322	492	26	30	56	548	0
GP10	Ongallur	2	296	298	0	28	28	326	436
GP11	Pattambi	9	343	352	5	34	39	391	160
GP12	Paruthur	9	429	438	5	32	37	475	355
GP13	Thiruvegapura	10	325	335	5	16	21	356	252
GP14	Vallapuzha	6	464	470	5	35	40	510	260
GP15	Vilayur	34	226	260	23	7	30	290	157
BP2	Pattambi Block	278	3574	3852	77	259	336	4188	2317
GP16	Cherpulassery	12	221	233	2	11	13	246	178
GP17	Kadampazhipuram	5	48	53	8	17	25	78	70
GP18	Karimpuzha *	21	11	32	0	0	0	32	0
GP19	Pookkottukavu	11	48	59	8	24	32	91	0
GP20	Sreekrishnapuram	7	60	67	2	31	33	100	41
GP21	Thrikkatiri	0	320	320	1	25	26	346	60
GP22	Vellinezhi	2	81	83	3	27	30	113	22
BP3	Sreekrishnapuram	58	789	847	24	135	159	1006	371
GP23	Anakkara	6	108	114	4	30	34	148	80
GP24	Chalissery	0	268	268	0	11	11	279	70
GP25	Kappur	4	241	245	1	35	36	281	46
GP26	Nagalassery	46	336	382	2	6	8	390	138
GP27	Pattithara	13	138	151	6	40	46	197	153
GP28	Thirumittacode	0	394	394	3	34	37	431	106
GP29	Thrithala`	8	229	237	2	8	10	247	154

BP4	Thrithala Block	77	1714	1791	18	164	182	1973	747
BP Total		442	7124	7566	131	671	802	8368	3918
M1	Ottapalam	1	329	330	2	28	30	360	212
M2	Shornur	4	212	216	0	33	33	249	270
Municipality Total		5	541	546	2	61	63	609	482
Taluk Total		447	7665	8112	133	732	865	8977	4400

Note: * Incomplete information

Source: Resource Mapping at Panchayat Level for Palakkad District, Kerala State Land Use Board 2002

3. TECHNICAL PROGRAMME

Main technical programme contemplated for this project are the following

1. Data collection: Details of dead quarries will be collected from different agencies connected with quarrying activities, like Revenue Department, Mining and Geology Department, Quarry Owners/ Operators Associations, etc.
2. Conduct reconnaissance survey in dead quarries and identify quarries that can be converted into storage facilities for water harvesting.
3. For selected quarries conduct detailed studies which involve:
 - i) Inspecting the quarry to find out fault/ fissures, the extent of the faults/ fissures and assess the suitability of the quarry for converting into water harvesting system. It is also required to suggest suitable plugging for fault/fissures if required.
 - ii) Detailed survey of selected quarries: -
 - To identify the catchment areas of the quarries

- To fix the locations of embankments/ bunds for closing the open side of the quarry
 - To prepare elevation – storage curve for the quarry
 - To assess the quantity of water that can be collected & stored.
4. Motivate local people for implementing the project at economically viable sites. This includes getting permission for developing the quarry, mobilizing funds required for the development from beneficiaries or local bodies, ensure active participation of all concerned, etc.
 5. Provide technical assistance during the implementation of the scheme.
 6. Suggest suitable methods for treatment of water before supplementing the water supply system of the area.

The technical programme envisaged at the beginning could not be adhered to during the fieldwork. The difficulties encountered in adhering to the programme mentioned above are the mobilisation of funds required and permission for developing the quarry. Hence, at a later stage, technical programme is modified by deleting the items Nos: 4, 5 and 6 and adding additional item of collecting details of utilized quarries, extent of its use and its benefits etc. (Thrissur Study Circle meeting of KRPLLD held on 29 September, 2001 at Conference Hall of COSTFORD, Thrissur).

4. FIELDWORK AND QUARRIES IN GENERAL

Extensive fieldwork is carried out in the area to identify suitable quarries for rainwater harvesting. Entire length and breadth of 27 out of 29 grama panchayats are covered in the fieldwork. During the field visits to different quarries in the study area, it is noticed that for economic operation, the periphery of quarries are provided with low embankment (15-25 cm height) to prevent the surface runoff reaching the quarry. During monsoon, the waters entering the quarry are rainwater and subsurface runoff and these waters do not contain floating objects and are generally clear. Also it is noticed that no quarries exist in Vilayoor and Challissery grama panchayats.

4.1 CLASSIFICATION OF QUARRIES

Based on the outcome of the fieldwork, the quarries can be broadly classified into operational, partially operational and inoperational quarries. Operational quarries are quarries working almost throughout the year. Partially operational quarries are the ones spread in large area and only one portion of the quarry is under operational condition and on the other portion rainwater is stored and is used for different purposes. Inoperational quarries are not operational for some time, generally couple of years. Inoperational quarries can be further divided into temporarily and permanently stopped quarries. In temporarily stopped quarries, water stored in the monsoon season is utilized for different

purposes during and just after monsoon. When water level recedes in the quarry, water is pumped out to make the quarry again operational. Quarries in which mining activities are stopped for years are called permanently stopped quarries, and fieldwork mainly focused on such quarries.

4.1.1 Discarded quarries

Quarries which are inoperational for years are not utilized due to either impoundment is not possible or possibility of very little water to impound. Non impoundment of water may be due to presence of pervious bed or the existing bed level of the quarry is almost at the level of the entrance of the quarry (Plate No: 1). Both these factors resulted in draining of all the



Plate 1. Quarry with bed level at or higher than the level at the Entrance (Adakkaputtur, Vellinizhi grama panchayat)

water coming to the quarry. List of discarded quarries with the reasons for it is tabulated in Table XI.

4.1.2 Utilised quarries

In majority of the quarries, large quantity of water is stored. Water stored in the quarries is utilized throughout the year/ substantial period of the year, for different purposes. Water level in some quarries reduces gradually and the lowest level is reached just

		bottom	Outlet	leakage	water	demand	accesses	water	
GP1	Ambalapara	2	1	-	-	-	-	-	3
GP2	Anangadi	-	1	-	-	-	-	-	1
GP3	Chalavara	-	1	1	-	-	-	-	2
GP4	Lakkidiperur	1	1	-	-	-	-	-	2
GP5	Vaniyamkulam	1	1	2	-	2	-	1	7
BP1	Ottapalam Block	4	5	3	-	2	-	1	15
GP6	Koppam	N I L							
GP7	Kulukkallur	1	-	-	-	-	-	-	1
GP8	Muthuthala	-	-	1	-	-	-	-	1
GP9	Nellaya	-	-	-	-	-	-	2	2
GP10	Ongallur	2	-	-	-	1	1	-	4
GP11	Pattambi	-	-	-	-	-	-	1	1
GP12	Parathur	1	-	-	-	1	-	-	2
GP13	Thiruvegapura	1	-	-	-	-	1	-	2
GP14	Vallapuzha	-	1	-	-	-	-	-	1
GP15	Vilayur	No quarries							
BP2	Pattambi Block	5	1	1	-	2	2	3	14
GP16	Cherpulassery	-	-	-	-	1	1	-	2
GP17	Kadambazhipuram	-	1	-	1	-	1	-	3
GP18	Karimpuzha	-	1	-	--	-	1	-	2
GP19	Pookkottukavu	Not covered							
GP20	Sreekrishnapuram	-	-	--	-	1	-	-	1
GP21	Thrikkatiri	-	-	-	-	2	1	2	5
GP22	Vellinezhi	-	1	2	-	-	-	-	3
BP3	Sreekrishnapuram	-	3	2	1	4	4	2	16
GP23	Anakkara	2	-	-	-	-	-	-	2
GP24	Chalissery	No quarries							
GP25	Kappur	-	-	-	-	-	-	-	-
GP26	Nagalassey	-	-	1	1	-	-	-	2
GP27	Pattithara	-	-	1	-	-	-	1	2
GP28	Thirumittacode	-	-	-	1	1	2	1	5
GP29	Thrithala	1	-	-	1	-	-	-	2
BP4	Thrithala Block	3	-	2	3	1	2	2	13
Block Total		12	9	8	4	9	8	8	58
M1	Ottapalam	Not covered							
M2	Shornur	Not covered							
Municipality Total		-	-	-	-	-	-	-	-
Taluk Total		12	9	8	4	9	8	8	58

Data incomplete

4.3 REASONS FOR STOPPING THE QUARRYING

After years of operation, mining activities of quarries will be discontinued due to various reasons or its combinations. Discontinuance of quarrying (mining) may be either permanent or temporary in nature depending on the reasons. Some of the reasons for discontinuing the quarrying are:

- Local agitation against quarrying: This is the major reason for stopping most of the quarries. People use to get agitated when stone pieces reach their residential areas and thoroughfare endangering the life and properties of the people staying nearby areas. Besides, in some cases vibration due to blasting also causes damages to the property.
- Less return to the owner for leasing the land for mining: Generally landowners lease out the quarry for mining on yearly basis. Less income for leasing out the quarry leads to discontinuing of the mining. Besides, sometimes owner develops the land surrounding the quarry into plantations and continued mining in such quarries leads to damage to the adjoining plantation.
- Uneconomical for the operators: Continuing the mining operations from a quarry may be less remunerative to the operators. Excessive depth of quarry, continuous dewatering of quarry for blasting, less yield per blast, major portion of yield obtained consist of small pieces of stones, are some of the factors making mining less profitable.
- Adverse impact on mining in adjacent developed land (mainly plantation).
- No access for the lorries to the quarry: Fragmentation and exchange of land surrounding the quarry leads to cutting off the existing road to the quarry.

4.4 USER PATTERN

Almost all quarries are owned by private individuals. Exceptions are one quarry each under the ownership of Forest Department and Railways in Ongallor panchayat and two quarries owned by Devasom in Kadambazhipuram panchayat. Hence wishes and wills of individuals play a major role in deciding the user pattern of the water in the quarry. The user pattern of the water is:

- Private use: In this, water in the quarry is exclusively used by the owner for domestic purpose, irrigation and pisciculture. Often such quarries are protected by proper fencing. In few cases, quarries are used for supplementing drinking water and also for industrial purposes.
- Semi private use: In this, owner uses water stored in the quarry for domestic, irrigation and pisciculture whereas the neighbours depend on the quarry water mainly for domestic purposes such as bathing and washing. In this, pisciculture is resorted mainly for maintaining the quality of water in the quarry.
- Public use: Here, there is no restriction on the user. Sometimes owner does not use the water in the quarry and is not bothered about the nature of use of the water stored in the quarry by the public. In this case, domestic use is given prime importance though irrigation to a limited extent is carried out. Fishes are introduced into the water, mainly for maintaining the quality of water.

4.5 TYPE OF MAINTENANCE

The quality of water in the quarry is required to be maintained, for which different methods are resorted to. They are:

- Low embankment provided around the quarry for operational purposes is maintained by plugging breaches. This ensures that rainwater and subsurface runoff, which are generally clear will only enter the quarry.
- Dilution: The new water entering the quarry is allowed to mix with the existing water and store till water level in the quarry reaches a particular

level. Additional water entering the quarry mixes with already stored water, dilute the impurity and overflow through the outlet.

- Aquatic organism: Aquatic organisms mainly sucker variety fishes are introduced into the water for maintaining the quality. The species introduced varies with the type of users of water.

4.6 UTILISATION OF QUARRIES

From the fieldwork it is found that quarry is one of the source of water and are being extensively used for different purposes in Ottapalam Taluk. Documentation about the details of quarry and its use in meeting water requirement for different purposes will be quite useful database. Hence a structured questionnaire (Annexure I) is prepared to get pertinent information about the quarry. Information collected are area and capacity of the quarry, cropping pattern and population around the quarry, number of beneficiaries, user pattern, types of uses, potential for improvement etc.

4.6.1 Size and capacity

Size and capacity (amount of water stored during April- May) are tabulated in Table XII. It can be seen from the Table that:

- About 70 % of the quarries have area less than 500 m² and 20 % have area between 501 m² and 1000 m².
- About 65 % of the quarries, capacity is less than 1500 m³ and 13 % have capacities between 1501 m³ and 3000 m³.
- Vellinezhi grama panchayat in Sreekrishnapuram Block got biggest quarries both in area and capacity.

Table XII. Area and Capacity of quarries in Ottapalam taluk

Sl. No:	Panchayat	Area (Sq. m.)				Capacity (Cu. m.)				
	Name	1 - 500	501- 1000	1001- 2000	Above 2000	0- 1500	1501- 3000	3001- 4500	4501- 10000	Above 10000
GP1.	Ambalappara	1	1	1	-	2	-	-	1	-
GP2.	Ananganadi	5	2	-	-	5	1	1	-	-
GP3.	Chalavara	4	1	-	-	3	-	-	2	-
GP4.	Lakkidiperur	-	2	-	1	1	1	-	1	-
GP5	Vaniyamkulam	5	2	1	-	6	1	1	-	-
BP1	Ottapalam Block	15	8	2	1	17	3	2	4	-
GP6.	Koppam	5	3	2	-	4	3	2	1	-
GP7.	Kulukkallur	3	2	1	1	3	-	1	2	1
GP8.	Muthuthala	17	1	-	-	14	3	1	-	-
GP9.	Nellaya	6	-	-	-	6	-	-	-	-
GP10	Ongallur	Not covered								
GP11	Pattambi	7	4	-	-	7	2	-	2	-
GP12	Paruthur	12	-	-	-	12	-	-	-	-
GP13	Thiruvegapura	10	-	-	-	8	1	1	-	-
GP14	Vallapuzha	8	2	1	-	8	1	1	1	-
GP15	Vilayur	No quarries								
BP2	Pattambi Block	68	12	4	1	62	10	6	6	1
GP16	Cherpulassery	7	1	1	-	6	1	-	1	1
GP17	Kadampazhipuram	6	1	-	-	5	2	-	-	-
GP18	Karimpuzha	4	2	-	-	4	-	1	-	1
GP19	Pookkottukavu	Not covered								
GP20	Sreekrishnapuram	No used quarries								
GP21	Thrikkatiri	5	2	2	-	5	-	2	1	1
GP22	Vellinezhi	1	-	3	2	1	-	1	1	3
BP3	Sreekrishnapuram	23	6	6	2	21	3	4	3	6
GP23	Anakkara	6	2	1	-	5	3	1	-	-
GP24	Chalissery	No quarries								
GP25	Kappur	1	1	1	-	1	-	1	-	1
GP26	Nagalassery	8	2	-	-	7	1	-	2	-
GP27	Pattithara	1	1	2	-	1	1	-	2	-
GP28	Thirumittacode	18	7	1	-	17	3	3	3	-
GP29	Thrithala`	6	1	-	-	3	4	-	-	-
BP4	Thrithala Block	40	14	5	-	34	12	5	7	1
Block Panchayat Total		146	40	17	4	134	28	17	20	8
M1	Ottapalam	Not covered								
M2	Shornur	Not covered								
Municipality Total		-	-	-	-	-	-	-	-	-
Taluk Total		146	40	17	4	134	28	17	20	8

Data incomplete

- Sreekrishnapuram grama panchayat in Sreekrishnapuram block has got no utilised quarry.

4.6.2 Landuse pattern

On the land around the quarries, different types of crops are cultivated. They are mainly coconut, cashew, rubber, paddy and plantain. At almost at all places, the landuse pattern is mixed cropping system. Table XIII gives the details of the landuse pattern around the quarry.

4.6.3 Population and beneficiaries

People are staying around all quarries. Number of families staying near the quarry vary between 10 and 50. However, number of families using the quarry vary between 10 and 100. Exceptions are one quarry each at Millumpadikkal (Plate No: 2) in Thrikkadiri panchayat and Chengalottupara (Plate No: 3) in Vellinezhi panchayat where about 250 and 500 families use them respectively. Number of families around the quarries and its beneficiaries are also tabulated in Table XIII. It can be noted from the Table that:

- About 5.8 % of the families are staying near the quarries.
- About 64 % of the families staying near the quarries (about 3.7 % of total family in the taluk) depend on the water stored in the quarry for some purpose.
- In Pattambi block panchayat, percentage of families near the quarry is more (7.7%) and in Ottapalam block it is the lowest (4.2%). This is in agreement with the density of population in these block panchayats.
- In Sreekrishnapuram block panchayat percentage of beneficiaries among the population near the quarry are maximum (80 %) and it is minimum in Ottapalam block (46 %).

Table XIII. Number of beneficiaries and land use pattern around the quarries in Ottapalam taluk

Sl.No	Name of Panchayat	No. of quarries	No. of families		Crops						Total
			Population	Beneficiaries	Cocunut	Cas-hew	Rub-ber	Pad-dy	Pla-ntain	Misc.	
GP1	Ambalapara	3	85	45	3	-	3	1	-	-	3
GP2	Anangadi	7	235	194	7	3	2	-	-	1	7
GP3	Chalavara	5	240	77	3	-	2, 2*	1	-	1	5
GP4	Lakkidiperur	3	140	12	3	-	2	3	-	-	3
GP5	Vaniyamkulam	8	158	73	7	3	3	-	-	1	8
BP1	Ottapalam Block	26	858	401	23	6	12, 2*	5	-	3	26
GP6	Koppam	10	426	275	10	5	3	3	3	2	10
GP7	Kulukkallur	7	210	175	7	1	4	-	3	1	7
GP8	Muthuthala	18	735	569	18	11	6	3	1	2	18
GP9	Nellaya	6	155	112	6	2	1	1	-	-	6
GP10	Ongallur	Not covered									
GP11	Pattambi	11	405	255	10	6	4	-	1	1,1*	11
GP12	Parathur	12	273	238	11	-	1*	1	-	1	12
GP13	Thiruvegapura	10	315	135	10	4	-	1	1	-	10
GP14	Vallapuzha	11	147	154	8	1	2	-	-	6, 2*	11
GP15	Vilayur	No quarries									
BP2	Pattambi Block	85	2666	1913	80	30	20, 1*	9	9	13,3*	85
GP16	Cherpulassery	9	210	253	9	1	4	1	2	1	9
GP17	Kadambazhipuram	7	205	146	4	-	7	1	-	-	7
GP18	Karimpuzha	6	181	112	2	4	6	1	-	-	6
GP19	Pookkottukavu	Not covered									
GP20	Sreekrishnapuram	No used quarries									
GP21	Thrikkatiri	9	425	235	9	4	2	-	2	2	9
GP22	Vellinezhi	6	340	351	5	-	2, 1*	1	3	3	6
BP3	Sreekrishnapuram	37	1361	1097	29	9	21, 1*	4	7	6	37
GP23	Anakkara	9	320	262	9	1	1	3	6	-	9
GP24	Chalissery	No quarries									
GP25	Kappur	3	120	100	3	-	-	-	2	1	3
GP26	Nagalassery	10	333	210	10	1	2	2	-	3	10
GP27	Pattithara	4	163	163	4	2	-	-	2	1	4
GP28	Thirumittacode	26	550	380	25	7	9	4	1	-	26
GP29	Thrithala	7	207	191	7	-	2	-	1	1	7
BP4	Thrithala Block	59	1693	1306	58	11	14	9	12	5	59
Block Panchayat Total		207	6578	4717	190	56	67, 4*	27	28	27, 3*	207
M1	Ottapalam	Not covered									
M2	Shornur	Not covered									
Municipality Total		-	-	-	-	-	-	-	-	-	-
Taluk Total		207	6578	4717	190	56	67, 4*	27	28	27, 3*	207

Plate 3. A big quarry used by about five hundred people
(at Chengoalottupara in Vellinizhi grama panchayat)

- Percentage beneficiaries is higher wherever relatively big quarries are available alongwith either public or semi private user pattern e.g. Vellinezhi panchayat (11%).

4.6.4 Use pattern

Water in the quarry is not affected by water hyacinth, exceptions are only two quarries and hence most of the quarries are utilized to some extent. Depending on the user pattern quarries are put to use for different purposes. The uses of quarries exclusively used by the owner are:

- Supplementing drinking water: - Here quarry water is pumped into the pits near the well so that the water stored in the quarry is filtered before it reaches the well water (Plate No: 4 and 5). Entrance of the quarry is closed by dry random rubble masonry and earthen bund.
- Supplementing drinking water and pisciculture: - Rainwater stored in the quarry is utilized for supplementing drinking water by pumping into the pits near the well so that filtering of quarry water is ensured before it reaches the well water. Besides he uses the quarry for pisciculture.
- Exclusively for domestic purposes, bathing and washing (Plate No: 6) (two in Cherpulassery and one each in Pattambi and Vaniyamkulam panchayats).
- Exclusively used for irrigating adjoining farm/ plantation (Plate No: 7) (One each in Thrikadiri, Pattithara, Pattambi and Chalvara panchayats).
- Industrial use: - One industrialist converted two quarries for rainwater harvesting to run his hollow brick making unit; in one of the quarry,

entrance is closed by masonry work to store water (Plate No: 8). Again another industrialist uses the water stored in the quarry to run his metal crushing unit (Plate No: 9) (Lakkidiperur panchayat).

- Cattle bathing: - Again in Lakkidiperur Panchayat a farmer converted his quarry exclusively for cattle bathing by closing the entrance by random rubble masonry.

Good numbers of quarries are under semi private use pattern and are used for:

- Domestic use (other than drinking and cooking), bathing and washing by the owner and a few neighbouring people. Quality of water is maintained by good management practices, that is; drawing water from the quarry and using it similar to that of wells (Plate No: 10 and 11).
- Irrigation purposes by the owner and for bathing and washing by the adjacent families. Most of the quarries fall under this category (Plate No: 12 and 13).
- Pisciculture by the owner and for bathing and washing by the near-by families.
- For irrigation, pisciculture purposes by the owner and for bathing and washing by the adjacent families (Plate No: 14).

Good number of quarries are used by public and the landowner does not interfere in the use of quarry by the local people under this category. Very few quarries are used for bathing cattles in addition for bathing and washing. Throughout the taluk, such quarries are used by public for bathing and washing (Plate No: 15). If more than one good quarries are available nearby, then one of the them will be exclusively earmarked for women (Plate No: 16 and 17).

Table XIV. Utilization of quarries in Ottapalam taluk

Sl.No.	Name of Panchayat	Private					
		D& Dom	B& W	I	P	Others	Total
GP1	Ambalapara	-	-	-	-	-	-
GP2	Anangadi	-	1	-	-	-	1
GP3	Chalavara	-	1	-	1	-	2
GP4	Lakkidi perur	-	-	-	1*	2	2
GP5	Vaniyamkulam	1*	2	1*	-	-	2
BP1	Ottapalam Block	1*	4	1*	1, 1*	2	7
GP6	Koppam	1	1*	1	1*	-	2
GP7	Kulukkallur	-	-	-	-	-	-
GP8	Muthuthala	-	4	2*	-	-	4
GP9	Nellaya	1*	2	-	1*	1*	2
GP10	Ongallur	Not covered					
GP11	Pattambi	-	2	-	-	-	2
GP12	Parathur	1	1	-	-	-	2
GP13	Thiruvegapura	-	2	2*	2*	1*	2
GP14	Vallapuzha	-	1	-	-	-	1
GP15	Vilayur	No quarries					
BP2	Pattambi Block	2, 1*	12, 1*	1, 4*	4*	2*	15
GP16	Cherpulassery	-	2	1	2*	-	3
GP17	Kadampazhipuram	-	1	1*	-	-	1
GP18	Karimpuzha	-	-	-	-	-	-
GP19	Pookkottukavu	Not covered					
GP20	Sreekrishnapuram	No used quarries					
GP21	Thrikkatiri	-	2	-	-	-	2
GP22	Vellinezhi	-	-	-	-	1	1
BP3	Sreekrishnapuram	-	5	1, 1*	2*	1	7
GP23	Anakkara	1*	2	1*	1*	-	2
GP24	Chalissery	No quarries					
GP25	Kappur	-	-	-	-	-	-
GP26	Nagalassery	-	1	1*	-	-	1
GP27	Pattithara	-	-	-	-	-	-
GP28	Thirumittacode	-	4	4*	1	-	5
GP29	Thrithala	-	-	-	-	-	-
BP4	Thrithala Block	1*	7	6*	1, 1*	-	8
Block Total		2, 3*	28, 1*	2, 12*	2, 8*	3, 2*	37
M1	Ottapalam	Not covered					
M2	Shornur	Not covered					
Municipality Total		-	-	-	-	-	-
Taluk Total		2, 3*	28, 1*	2, 12*	2, 8*	3, 2*	37

Note: D & Dom: Drinking & Domestic, B & W: Bathing & Washing,
I: Irrigation, P: Pisciculture.

Data incomplete.

Table XIV. Utilization of quarries in Ottapalam taluk (Continue)

Sl. No.	Name of Panchayat	Public					
		D& Dom	B&W	I	P	Others	Total
GP1	Ambalapara	-	3	-	-	-	3
GP2	Anangadi	1*	4	-	-	1*	4
GP3	Chalavara	-	2	-	1*	-	2
GP4	Lakkidi perur	-	-	-	-	-	-
GP5	Vaniyamkulam	-	2*	-	2	1	3
BP1	Ottapalam Block	1*	9, 2*	-	2, 1*	1, 1*	12
GP6	Koppam	1*	6	-	1*	1*	6
GP7	Kulukkallur	-	3	-	1*	1*	3
	Muthuthala	-	9	-	1*	-	9
GP9	Nellaya	-	2	-	-	-	2
GP10	Ongallur	Not Covered					
GP11	Pattambi	-	2	-	-	-	2
GP12	Parathur	1	-	-	-	-	1
GP13	Thiruvegapura	2*	4	-	-	1, 1*	5
GP14	Vallapuzha	-	2	-	-	-	2
GP15	Vilayur	No quarries					
BP2	Pattambi Block	1, 3*	28	-	3*	1, 3*	30
GP16	Cherpulassery	-	-	-	-	-	-
GP17	Kadampazhipuram	-	5	1*	-	1*	5
GP18	Karimpuzha	-	5	-	1*	1*	5
GP19	Pookkottukavu	Not covered					
GP20	Sreekrishnapuram	-	-	-	-	-	-
BP21	Thrikkatiri	-	-	-	-	-	-
GP22	Vellinezhi	-	3	1*	1*	-	3
BP3	Sreekrishnapuram	-	13	2*	2*	2*	13
GP23	Anakkara	-	2	1*	-	-	2
GP24	Chalissery	No quarries					
GP25	Kappur	-	2	-	1*	-	2
GP26	Nagalassery	-	8	1*	-	-	8
GP27	Pattithara	-	3	1*	2*	2*	3
GP28	Thirumittacode	-	6	2*	-	-	6
GP29	Thrithala	-	3	-	1*	-	3
BP4	Thrithala Block	-	24	5*	4*	2*	24
Block Total		1, 3*	74, 2*	7*	2, 10*	2, 8*	79
M1	Ottapalam	Not covered					
M2	Shornur	Not covered					
Municipality Total		-	-	-	-	-	-
Taluk Total		1, 3*	74, 2*	7*	2, 10*	2, 8*	79

Note: D & Dom: Drinking & Domestic, B & W: Bathing & Washing,

I: Irrigation, P: Pisciculture.

Data incomplete

Table XIV. Utilization of quarries in Ottapalam taluk (Continue)

Sl. No.	Name of Panchayat	Mixed						Total
		D& Dom	B& W	I	P	Othe rs	Total	
GP1	Ambalapara	-	-	-	-	-	-	3
GP2	Anangadi	-	2	1*	2*	-	2	7
GP3	Chalavara	1	1*	-	1*	-	1	5
GP4	Lakkidi perur	-	1	-	1*	-	1	3
GP5	Vaniyamkulam	-	3	1*	-	-	3	8
BP1	Ottapalam Block	1	6, 1*	2*	4*	-	7	26
GP6	Koppam	-	2	1*	1*	1*	2	10
GP7	Kulukallur	-	4	4*	1*	-	4	7
	Muthuthala	-	5	1*	1*	-	5	18
GP9	Nellaya	-	2	1*	-	-	2	6
GP10	Ongallur	Not covered						
GP11	Pattambi	-	7	1*	3*	-	7	11
GP12	Parathur	1*	9	4*	1*	2*	9	12
GP13	Thiruvegapura	-	3	2*	-	-	3	10
GP14	Vallapuzha	1*	8	2*	2*	1*	8	11
GP15	Vilayur	No quarries						
BP2	Pattambi Block	2*	40	16*	9*	4*	40	85
GP16	Cherpulassery	-	6	2*	3*	-	6	9
GP17	Kadampazhipuram	-	1	-	-	-	1	7
GP18	Karimpuzha	-	1	-	-	-	1	6
GP19	Pookkottukavu	Not covered						
GP20	Sreekrishnapuram	No used quarries						
BP21	Thrikkatiri	-	7	3*	3*	-	7	9
GP22	Vellinezhi	-	2	-	-	-	2	6
BP3	Sreekrishnapuram	-	17	5*	6*	-	17	37
GP23	Anakkara	1*	5	4*	1*	1*	5	9
GP24	Chalissery	No quarries						
GP25	Kappur	-	1	1*	1*	-	1	3
GP26	Nagalassery	-	1	1*	1*	-	1	12
GP27	Pattithara	-	1	1*	1*	-	1	4
GP28	Thirumittacode	3*	14	7*	6*	1, 2*	15	26
GP29	Thrithala	1*	4	4*	2*	1*	4	7
BP4	Thrithala Block	5*	26	18*	12*	1, 4*	27	59
Block Total		1, 7*	89, 1*	41*	31*	1, 8*	91	207
M1	Ottapalam	Not covered						
M2	Shornur	Not covered						
Municipality Total		-	-	-	-	-	-	-
Taluk Total		8	89, 1*	45*	31*	1, 8*	91	180

Note: D & Dom: Drinking & Domestic, B & W: Bathing & Washing,

I: Irrigation, P: Pisciculture.

Data incomplete

4.7 SELECTION OF SITE

From the fieldwork it is found that discarded quarries are only few in numbers. Quarries are discarded either due to leakage through the bottom and sides or the bed of quarry is at or above the entrance level to the quarry. Other reasons for discarding the quarries are small size of the quarry with less capacity, water in the quarry causes irritation to skin due to the presence of small aquatic organisms, less demand etc. Potential of development of quarries with leakage through bed (due to permeable rock, soil, fissure, etc.) is very limited because of the excessive cost involved in providing impermeable bed to the quarry.

However, quarries with bed at or above the level of entrance to the quarry have potential to develop into rainwater harvesting. In this, closing the entrance will enable to store the rainwater in the quarry and storage can be increased further by desilting the quarry, if required. Some quarries which are presently used for bathing, washing etc. and containing large quantity of earth filled during operation for facilitating the movement of men and vehicles can be used to store more water after removing the earth. In addition to the potential of the quarry, need for the project is the major factor affecting the selection of the site. Other factors considered in the feasibility of the scheme are:

- Housing pattern near the quarry: This will give an idea about the number of users, demand for water and method of supply.
- Standard of living of people near the quarry: This is an indicator of economic capacity of the people to contribute through cash and kind for implementing the project.
- Cost of conversion of the quarry for the purpose.

Considering due weightages for each factor, it is found that none of the discarded quarry has the potential to develop. However, few utilised quarries can be developed further to overcome the drinking water scarcity of the area. Three sites are chosen.

They are Chekkode in Kappur, Irumbakassery in Thirumittakkode and Mangode in Thrikadiri panchayats.

4.7.1 Chekkode

4.7.1.1 General

Chekkode, in Kappur panchayat situated about 10 km away from Thrithala on Thrithala- Kuttipuram road is generally high laying area and covered by laterite. About 40 families are living here depending on few shallow dug wells, which yield water only during monsoon. In addition, there are two deep dug wells of which one (owned by panchayat) yields water only upto February. In addition, waters from three nearby quarries are being used by the people for bathing and washing (Fig. 6). The scheme proposed is to convert one of the quarry (size about 20m x 12m) exclusively for drinking water (Plate No. 18).

4.7.1.2 Problems at site

Problems faced at site are listed below.

- ◆ Ownership of the quarry: Major problem for the implementation of the scheme is the ownership of the quarry. The quarry is owned by three brothers and they stay about 1 km. away from the quarry. The owners have no objection to use the quarry by the people. However, they have reservations to develop the quarry further for providing drinking water to the people.
- ◆ Economic status of the people: From the detailed survey of the area, it is seen that most of the families are very poor (casual agricultural labourers) and they may not be able to contribute financially much for the scheme. However, they can definitely contribute much to the implementation of the scheme through manpower.

LOCATION : CHECKODE

BLOCK Pt : THRITHALA



GRAMA Pt : KAPPUR

WARD No. : I

OWNER : 3 BROTHERS

NOT TO SCALE

INDEX

- H : HOUSES (Numbers)
-  : QUARRY (PRO. RWHS). SIZE 20 m x 12 m.
-  : QUARRY USED FOR BATHING, WASHING. SIZE : A 50 m x 20 m, B 20 m x 10 m.

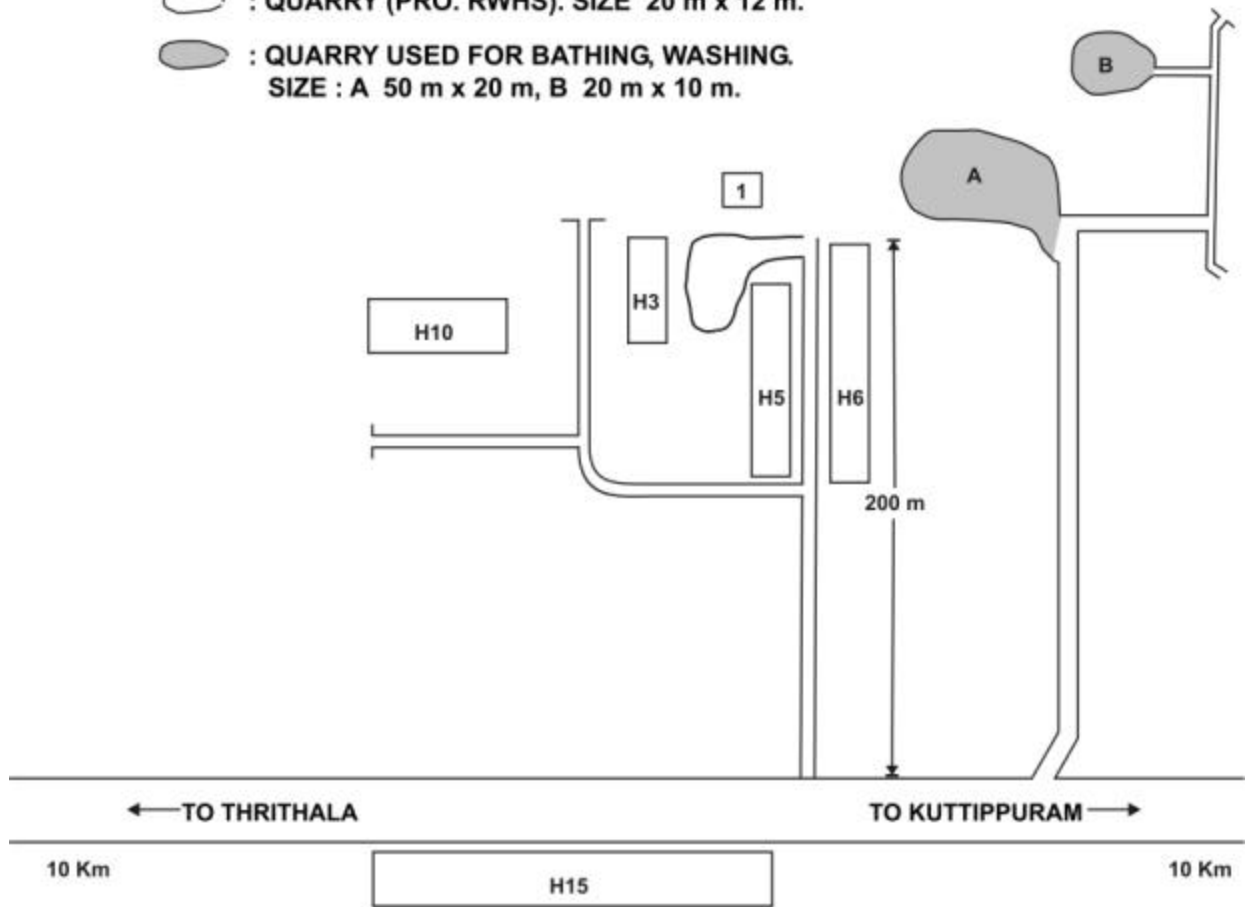


Fig. 6 - SKETCH OF SITE SELECTED AT CHEKKODE

- ◆ Agony of the local people: The local people were knocking at the doors of the different authorities for drinking water and responses they got were not encouraging. These led to building up of indifferent attitude in them towards the activities of various developmental agencies. With the awareness programme and continuous dialogue, we could overcome their indifferent attitude to a great extent.

4.7.2 Irumbakassery

4.7.2.1 General

Irumbakassery, in Thirumittakkode panchayat is located about 10 km away from Pattambi on Pattambi – Shornur road. About 40 families (200 members) are living here depending on two dug wells, which yield water only during June to February. During summer, water is collected from a distance of about 1 km. Besides this, water accumulated in two quarries is being used for bathing and washing. Among the two quarries, the small one (size about 22m x 26m), infested with water hyacinth (Fig. 7) is proposed to be converted for drinking water purpose (Plate No. 19).

4.7.2.2 Problems at site

Problems faced at site are listed below

- ◆ Ownership of the quarry: The owner proposes to sell the land to a NRI. Present owner thinks that if he allows people to convert the quarry into drinking water source he may lose the price of his land. Moreover, he is not willing to sell the quarry alone as this will lead to considerable reduction in price of his land.
- ◆ Economic status of the people: Most of the beneficiaries of the scheme are coolies and potters. They may not be able to contribute financially much for

this. However, they can contribute manpower for implementation of the scheme.

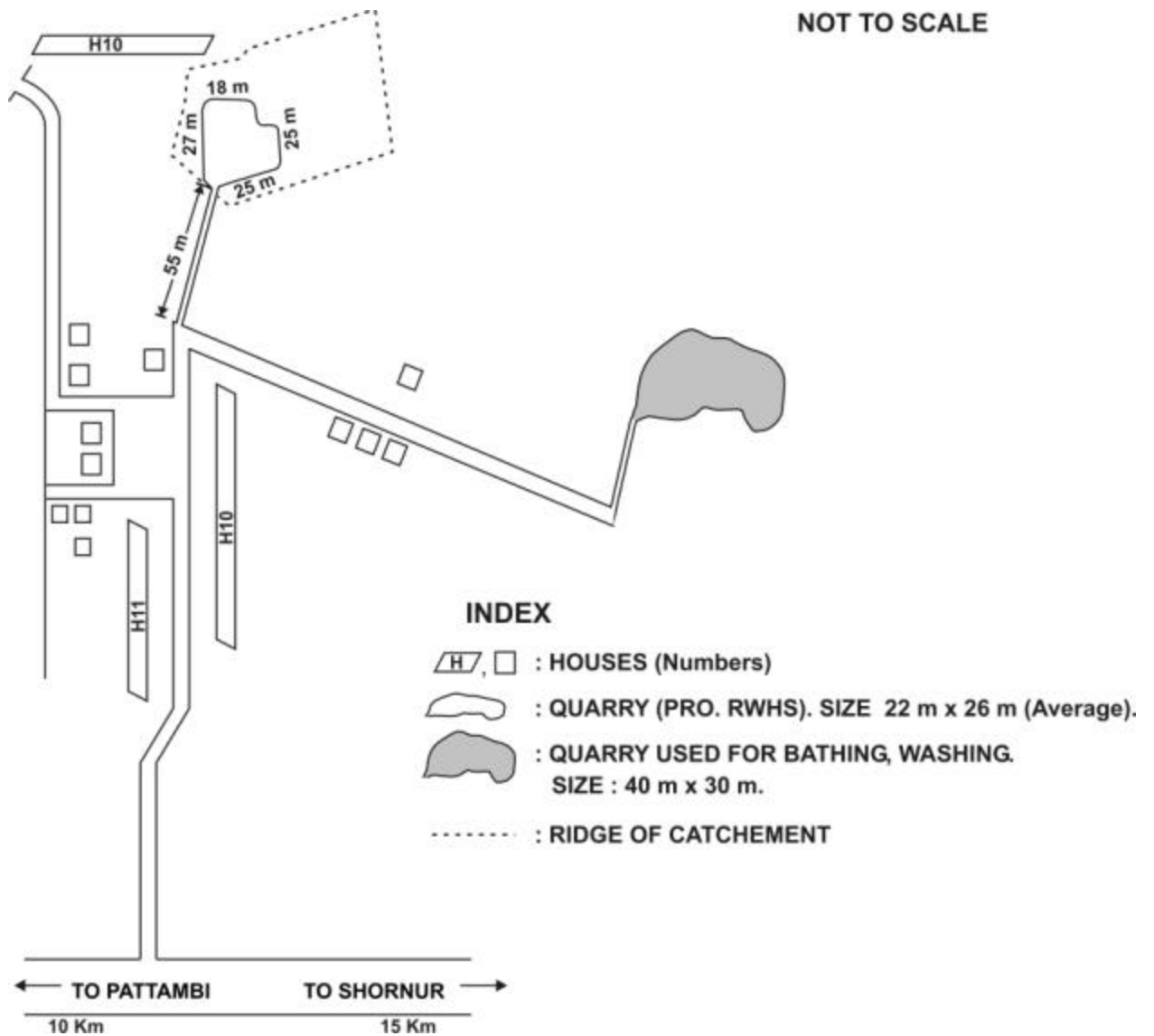
LOCATION : IRUMBAKASSERI

BLOCK Pt : THRITHALA

GRAMA Pt : THIRUMITTAKODE

WARD No. : 3

OWNER : Mr. PALLATHU ABDUL RAHMAN



grama panchayat) or supplementing water supply.

4.7.3. Mangode

4.7.3.1 General

Mangode in Thrikadiri panchayat is situated about 3.5 km. away from Cherpulssery on Palakkad-Cherpulassery road. About 45 families (270 members) are staying here. They are mainly depending on few private dug and tube wells for drinking water, and nearby two quarries and a stream which is two kms away, for bathing and washing. Among the two adjacent quarries (Fig. 8), the smaller one (size about 25m x 14m) is proposed for converting into drinking water purpose (Plate No: 20).

4.7.3.2 Problems at site

Problems faced at site are listed below.

- ◆ Ownership of the quarry: The land on which the quarry is situated owned by two brothers, the elder one is a NRI. Hence, for getting permission for conversion of quarry into drinking water source, dialogues should be continued when the NRI is available in Kerala and this may take time.
- ◆ Unwillingness of the local people: The local people, about 45 families who are affected by water scarcity both for drinking and domestic purposes are of the opinion that more quantity of water is required for bathing & washing than required for drinking purpose. They are ready to bring drinking water from near-by wells, which is not much difficult than going to river or stream. In such a situation, though they are disappointed towards the indifferent attitude of authorities for water supply schemes they are not ready for

implementing a drinking water supply scheme using the quarry, which is presently used mainly for bathing and washing.

LOCATION : MANGOD

BLOCK Pt : SREEKRISHNAPURAM

GRAMA Pt : THRIKKADIRI

WARD No. : I

OWNER : Mr. HAMZA

NOT TO SCALE

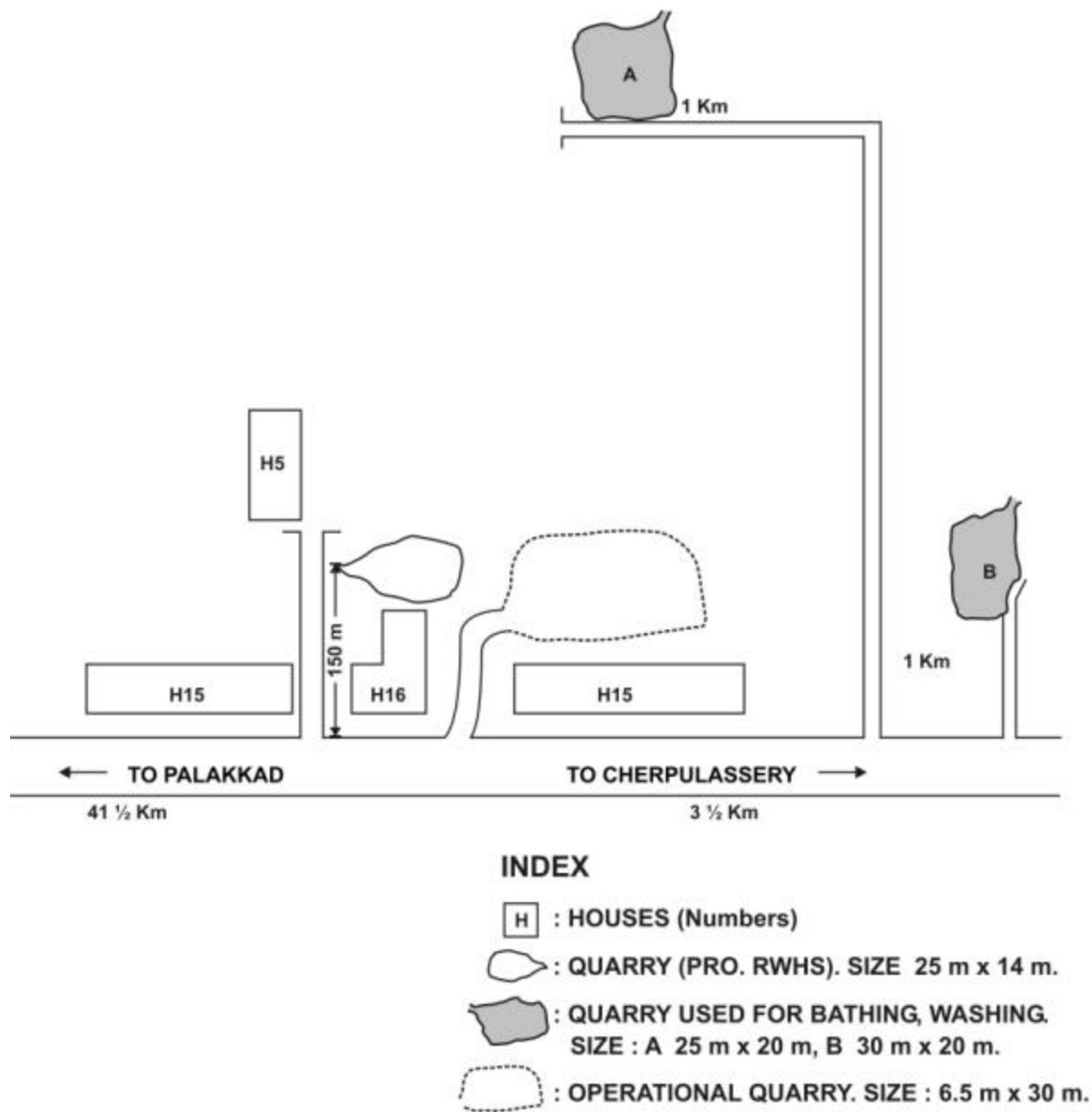


Fig.8 - SKETCH OF SITE SELECTED AT MANGOD

4.8 IMPLEMENTATION

Among the three quarries mentioned in 4.7., the quarry at Chekkode in Kappur panchayat is selected for implementing the scheme precisely for the following reasons:

- ◆ Acute shortage of drinking water: This location experiences acute shortage of drinking water.
- ◆ Availability of alternative sources of water to meet the domestic use (bathing & washing). There are three adjacent sources of water (quarries) and all the three sources are put to same use. Hence it is quite possible to keep apart one quarry exclusively for drinking water purpose.

- ◆ Housing pattern: Most of the households having acute shortage of water are very near to the quarry and are concentrated on the two sides only. Few households with lesser scarcity of water are little away from the quarry. This housing pattern is ideal for a distribution system with minimum cost.

- ◆ Cost of conversion of the quarry: The open side of the quarry is very narrow and hence cost for closing the open side will be small. In addition, de-watering and cleaning the quarry for harvesting water, arresting the surface runoff to the quarry and protecting it from the animals are also required. Since the shape of this quarry is almost a circle, the cost required for arresting the surface runoff and protection from the animal will be the lowest.

- ◆ Dependability of the source: From the observations during summer, it is noticed that the water level in the quarry is not falling in spite of drawing of water (manual) for different purposes and losses due to evaporation. This leads to the conclusion that once water level in the quarry reaches a particular level, further loss of water is replenished by some source, even it can be the bigger adjacent quarry. Assessment of rate of replenishment requires detailed study and can be conducted through a pumping out test. Implementation of the project requires dewatering the quarry and it is decided that pumping out test can be conducted at the implementation stage of the project.

- ◆ Effectiveness of the site for demonstration and dissemination of the idea: Chekkode is midway (10 km) on Thrithala- Kuttipuram road and the proposed quarry is only 200 m away from the main road. Moreover, an Anganawadi (ICDS project) is located very near to the quarry, which, can easily be seen from the road. Hence this is an ideal location for demonstration / dissemination of idea on water supply scheme based on harvested water using quarries.

4.9 PROBLEMS ENCOUNTERED

Though the site selected (Chekkode) is an ideal one, the scheme couldn't be implemented at the site. Various factors worked against the implementation at this location. They are:

a) Ownership of the quarry and surrounding land

The quarry and surrounding land (total about 16 cents) is owned by three brothers. These brothers have no objection in using the quarry water as such by the people. However they object the proposal of converting the quarry into drinking water source. They are willing to sell out the whole land provided they get very handsome price.

b) Economic status of the people

The people living around the quarry are economically backward and consist of mainly casual labourers in agricultural sector. Due to fall in price of agricultural produces, the people are not getting work even 50 % time. Most of the houses of the area are built under any one of the shelter schemes of the Government. In this condition, the local people cannot financially contribute to the project.

c) Lack of unity among the local people

Though the local people discuss their problems and collectively decide the course of action to be taken for solving their problems, they are easily carried away by the influence of external agents. Hence they cannot stick to their earlier decisions and course of actions.

d) Lack of effectiveness in presenting the case in various fora

Effectively presenting the problems and suggesting sustainable solution in different fora like Grama Sabha is one of the means to solve problem, particularly in the era of Peoples' Plan Campaign. Though materials and training are given to the local people to present this case in Grama Sabha, they could not effectively present the case and get approval and sanction within the Grama Sabha. This may be partly because of the reasons just mentioned above.

e) Political polarization

The local people have different political ideologies, quite often they are very reluctant to unite together for their common cause and fight for its logical conclusion.

f) Land development near the adjacent big quarry

Ownership of the big quarry and surrounding land adjacent to the proposed quarry is changed recently. New owner developed the surrounding land into a plantation by fencing and irrigating with the water in the quarry (Plate No: 21). Because of this, local people are concerned that in near future they may lose the accessibility to the quarry for bathing and washing, which they enjoyed over the years. This might have damned the spirit of local people for conversion of the quarry.

g) Promises on water supply schemes during electioneering

During electioneering candidates promise water supply schemes to this area. This includes extension of pipeline from already overstrained schemes of the neighbouring areas, bore wells, etc. It is learnt that earlier surveys indicated that this location is not suitable for bore well. People used to be easily carried away with these promises, which are not feasible. It is learnt that presently no concrete proposal is on the anvil for water supply scheme in this area.

h) Impact of laterite mining

The land between the quarry and the road is mainly laterite and due to this only very meager portion of the rainwater infiltrate into the ground and a major share of it is drained as surface runoff. Extensive mechanized mining of laterite from this area reduced surface runoff and increased infiltration (Plate No: 22). Mining provides not only a more pervious surface but also creates a flatter terrain, both these increased the infiltration process. In addition, formation of shallow depression over a large area due to laterite mining caused pondage of rainwater and resulted in better infiltration. The extensive laterite mining in this area resulted in improvement of groundwater table. This is evident from the fact that public well of this area is now yielding water though limited in quantity which otherwise used to dry up in December January during previous years i.e, prior to 2002.

i) Inclination towards bore well

Though the survey reveals that bore well in the area cannot give water, people still longs for bore well.

5. CONCLUSION

1. Rainwater collected in inoperational quarries is the main sources of water for the people staying around the quarries.
2. Water collected in the quarries is extensively used by the people for various purposes.
3. Type of use of the harvested water is decided by the user pattern of the quarry.
4. Various use of water harvested by the quarries are, supplementing drinking water, bathing and washing, irrigating adjacent land, industrial use, cattle bathing, pisciculture and its combination.
5. With proper management of these quarries (particularly quarries close to each other) scarcity of water of the area can be solved to a great extend.
6. Economic backwardness of the people staying near the quarry does not allow them to develop the quarry by their own for providing drinking water. Hence financing from other developmental agencies is required for implementation the scheme.
7. About 5.8 % population of the taluk is staying near the quarries.
8. About 3.7 % population of the taluk is getting benefits from the water harvested in the quarries.

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Water resources survey

Project: Supplementing Water Supply Through Water Harvesting by Utilising Dead Quarries.

Sl No

Date:

I. General

A. Location details

1. Name of Place :
2. Village & nearest town :
3. Panchayat, Pt. H.Q. & distance from quarry:
4. Ownership/Authority :
5. Population near the quarry :
(in 0.5km radius)

B. Geographical details

1. Soil / rock type of the locality :
2. Land use in surroundings of quarry :
(in 0.5 km radius)

II. Quarry Dimensions and details .

A. Dimensions

1. Length x Breadth :
2. Depth of quarry
 - a) Minimum (from entrance level) :
 - b) Maximum (from top level) :
 - c) Depth of quarry basin : Maximum Average

K. Other water resources (Dug wells, Tube wells, Ponds, Canals, Water supply System, etc.)