



The Impact on Water Pollution on Noyyal River Basin: A Special Reference to Scheduled Caste Group in Trippur District, Tamil Nadu

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ABSTRACT

The groundwater sources and surface water have not been conducive for human and animal use. It is very painful to note that the problem of drinking water is the major issues in the study area. The village panchayat of this area has taken measures to provide drinking water from different parts (unpolluted) through Panchayat overhead tanks and pipelines. For instance, borewell point at Thottipalayam, Balasamundram, Papampalayam and Sokkanathapalayam are able to provide drinking water. These points are 5 to 6 km away from the affected village in the Noyyal basin. The secondary information collected are the quality of the village, sources of drinking water, pipe - distance of the borewell/ common tap, water quality parameter value, alternate sources of drinking water. The details of agricultural land fallow land, forest land, land cultivated land, cultivated number of villages affected due to water pollution, cropping pattern of the villages before pollution and after pollution, average productions (per acre) irrigated land and unirrigated land, farmers details, average income per acre, source of irrigation, no. of wells in the village, total agricultural land of the village, land uncultivable due to pollution and water resource.

Introduction

The deterioration of water quality of the Noyyal River Basin has adversely affected human health and fisheries and it has accelerated migration. Many tests of water quality analysis have been carried out. Three medical camps were conducted in order to collect data about the water-borne diseases. Willingness to migrate along with reasons, have been determined through field visit.

During the post Liberalization Period of the Indian economy, the cotton textile and garment industries grew swiftly and account for the major shares of Indian export (Compendium of Textile statistics, 1999). The percentage of textiles in the total exports from India has increased and accounts for 14% of the national industrial production and about 4% of GDP (Ministry of textiles, 1999). Tiruppur, Major knitwear centre in India, is holding more than 9000 small-scale units produces one-third of the total apparel exports from India. The export earnings from Tiruppur during the year 2005-06 were about ₹ 10,250 Crores (Nelliya, 2007). Wet processing (bleaching and dyeing) is a sub sector of the hosiery industry. There are 702 bleaching and dyeing units in 2001. Presently there are 750 bleaching and dyeing units in Tiruppur. The majorities of the units are small in size and function as job workers for the hosiery industry. Out of the 729 wet Processing Units 125 are located in Tiruppur municipality and the remaining is extending out in the adjacent villages. Most of the units are located on both sides of the Noyyal Rivers which makes them commodious to discharge the effluent into the Noyyal River. Most of the chemical used in the processing or discharged as waste material which leads to high pollution load in the effluents. Water is an inevitable contribution factor for textile processing. The quantity of water consumed by these industries has increased to 86 Million of Liters per day (MLD). Earlier the textile units suctioned water from the Noyyal River or from their own wells. But during early 1990s. The water quality in Tiruppur got degraded. The water needed for textile units was transported from the surrounding villages through tankers. This constant performance of the water market has affected the groundwater availability of the villages and groundwater tables have declined in many places. Currently the water both for the industry and the Tiruppur municipality is accessible through the Tiruppur Area Development projects water supplies schemes to transport water from the Cauvery River. (Nelliya, 2007)

Surface water pollution

The Pollution (EC/TDS) concentration in Noyyal River is low till the river reaches Tiruppur. But it increases in Tiruppur area due to effluent discharge and continues up to Orathupalayam dam. (Central Water commission) . Pollution concentration in the river is more in summer. The existing Moderate flow in Noyyal River is not sufficient to dilute the pollutants. High alkalinity , chloride , electrical conductivity , iron in Phosphate . And BDO are seen in the water in orathupalayam Reservoir . (PWD,001) (Loss of ecology Authority for the state of Tamil Nadu, 2004) . The flow of the Noyyal River is confined to the monsoon periods. For most part of the year , the river carries only dyeing effluents and sewage .The water is saline and no longer useful for irrigation (PWD 2002). The water is very turbid , pH is highly alkaline. EC and TDS levels are very high, and water hardness is very high (Govindarajulu, 2003.The Orathupalayam dam was filled with industrial effluent. the stagnation of polluted water in the dam has caused pollutants to percolate to the groundwater.(PWD) The TDS levels in the surface water at Orathupalayam dam is high (approximately 4000 ppm). and decreases further in downstream(Govindarajulu 2003).

Water and Soil Quality standards

The major Ions present in water are Sodium, Potassium calcium magnesium. Chloride, sulphate, bicarbonate, and carbonate. The major variables used to characterize water are pH, and Electrical conductivity. pH indicated the degree of acidity . Electrical conductivity is a good estimator of Total Dissolved Solvents (TDS) The suitability of irrigation water depends upon the nature and amount of salts present in water, Soil to be irrigated climatic conditions and crop species, These conditions vary from place to place and the classification of the irrigation water depends upon the amount and nature of salt present in the irrigated water.

Drinking water standards

A selected part, useful for this study, of the physical and chemical standards for drinking water prescribed by Indian standards Institution (ISI) and the Indian council of Medical Research (ICMR) is given in Table. The WHO (world Health Organization) guidelines for the same parameters and sodium follow

Parameters	ISI maximum permissible level	ICMR highest desirable level	Maximum Permissible level
PH	6.5 to 8.5	7.0 to 8.5	6.5 to 9.2
TDS(Mg/1)	500	500	1500
Choride(mg/1)	250	200	1000
Sulpate (mg/1)	150	200	400
Calcium(mg/1)	75	75	200
Magnesium(mg/1)	30	50	--

Source: Secondary Date, Tamilnadu Agricultural University, (2008).

Reliable data on possible health associated with ingestion of high **TDS**in drinking water are not available, and no health -based guideline is proposed by WHO. The presence of high levels of TDS may, however, be objectionable to consumers. (WHO 2nd ed.). The palatability of water with a TDS level less than 600 mg/1 is generally considered to be good. Drinking water becomes significantly unpalatable at TDS levels greater than 1200 mg/1.(WHO,3rd ed.)

The WHO does not have a health-based guideline for chloride drinking water. Chloride concentrations in excess of about 250mg/1can, however, give rise to a detectable taste in water. Excessive concentrations also increase rate of metals which may lead to increased concentration also increase the corrosion rates of metals which may lead to increased concentration of metals in the water supply. (WHO,2nd ed) consumers may become accustomed to low levels of chloride induced taste (WHO,3rd ed).

Objectives of the study

- To study the socio economic background sample villages in the Noyyal River Basin.
- To analysis the economic impact of water pollution on drinking water and agricultural production of the scheduled caste group household in the study area.

Hypothesis of the study

There are no significances different in the drinking water and agricultural production between the periods of before and after pollution.

Methodology of the study

Data pertaining to the agricultural production, livestock, water quality, before and after pollution, human health, migration, fisheries activities of the household have been gathered from the sample respondents in the Noyyal River Basin area. For this purpose a standard questionnaire has been used to collect the Pre-tested data. This helped in modifying the nature of questions and the choices given in the interview schedule. Then the field survey was conducted among the sample farmers, household, person in the study area to gather information pertaining to the basic details about the sample.

Water Quality Analysis

Samples of water from 31 villages in the Noyyal river basin area have been collected and tested for water analysis, at water Technology centre in the Tamil Nadu agriculture university. The results are given in the table

Table – Water Quality Analysis Report- Sample Villages.

Roll No	Name of the village	pH	TDS	EC	BOD	Quality Ranking
1	Manickapurampudur	8.48	4600	6310	12.0	Water qualities bad, no use for drinking purpose and agriculture purpose
2	Anaipalyam	8.12	4800	9080	12.0	Water qualities bad, no use for drinking purpose and agriculture purpose
3	Anaipalyampudur	9.42	3230	5560	14.0	Water qualities bad, no use for drinking purpose and agriculture purpose
4	Kullayoor	8.86	3300	3840	7.0	Water qualities bad, no use for drinking purpose and agriculture purpose
5	Edakkadu	8.39	4900	5642	nil	Water qualities bad, no use for drinking purpose and agriculture purpose
6	Arugam palyam	9.41	3990.0	4990	4.10	Water qualities bad, no use for drinking purpose and agriculture purpose
7	Pallapalyam	9.41	3990	4900	4.10	Water qualities bad, no use for drinking purpose and agriculture purpose
8	Subbour	9.92	3510	3840	4.30	Water qualities bad, no use for drinking purpose and agriculture purpose
9	Vengalapalyam	9.5	2440	4360	2.90	Water qualities bad, no use for drinking purpose and agriculture purpose
10	Kodummanal	8.91	5730	6310	6.70	Water qualities bad, no use for drinking purpose and agriculture purpose
11	Siviar palayam	8.35	110.0	162.0	6.60	Water qualities bad, no use for drinking purpose and agriculture purpose
12	Mudalipalyam	7.53	6600	1043.00	6.70	Water qualities bad, no use for drinking purpose and agriculture purpose
13	Orathupalayam	6.28	5400	8994	4.30	Water qualities bad, no use for drinking purpose and agriculture purpose
14	Ramalingapuram	9.36	3820	6245	2.90	
15	Sokkanthanpalayam	8.02	3300.0	5240.0	6.50	Water qualities bad, no use for drinking purpose and agriculture purpose
16	Kathanganni	8.39	265	5240	6.60	Water qualities bad, no use for drinking purpose

						and agriculture purpose
17	Palakkattupudur	8.86	450	7470	6.60	Water qualities bad, no use for drinking purpose and agriculture purpose
18	Pallanickenpalayam	9.41	3240	5120	7.61	Water qualities bad, no use for drinking purpose and agriculture purpose
19	Reddipalayam	9.58	5620	6430	18.0	Water qualities bad, no use for drinking purpose and agriculture purpose
20	Kannimarkovilpudur	7.72	7440	7590	6.0	Water qualities bad, no use for drinking purpose and agriculture purpose
21	Vayakkapttupudur	8.12	5120	6240	8.0	Water qualities bad, no use for drinking purpose and agriculture purpose
22	Kararipudur	9.58	5240	7020	9.0	Water qualities bad, no use for drinking purpose and agriculture purpose
23	Thambereddipalyam	8.48	7720	8400	8.0	Water qualities bad, no use for drinking purpose and agriculture purpose
24	Thambereddipalyam pudur	8.44	3230	4500	6.0	Water qualities bad, no use for drinking purpose and agriculture purpose
25	Rangampalyam	9.58	3300	4900	6.0	Water qualities bad, no use for drinking purpose and agriculture purpose
26	Namakkaran palyam	8.12	4600	5640	9.0	Water qualities bad, no use for drinking purpose and agriculture purpose
27	Maravampalyam	8.12	4600	5640	9.0	Water qualities bad, no use for drinking purpose and agriculture purpose
28	Semmamgualipalyam	8.35	5120	7700	8.0	Water qualities bad, no use for drinking purpose and agriculture purpose
29	Valaiyampalyam	7.64	5240	64520	6.0	Water qualities bad, no use for drinking purpose and agriculture purpose
30	Valliankkattuvalasu	5.36	5350	7590	10.0	Water qualities bad, no use for drinking purpose and agriculture purpose
31	Kuppogoundan valasu	8.73	8240	9400	14.0	Water qualities bad, no use for drinking purpose and agriculture purpose

Source: Computed Form Field Survey (2008).

From of water analysis, it has been found, in all the village, the water quality is bad because the values of PH, COD, BOD and EC are greater than the maximum value of each and so this water cannot be used for drinking. The water here cannot be used for agriculture purpose for the same reason. When the cattle drink the same polluted water, it affects their health and they perish due to water- borne diseases, This has led to a fall in the population of the cattle.

S.NO	Parameters	Reddipalyam well	Vayakattupudur well
1	PH	7.61	8.27
2	Temperature deg.cent	28.5	28
3	Colour (visual)	Colourless	Colourless
4	Dissolved oxygen Mg/1	6.5	6.6
5	Total suspended solids Mg/1	17	16
6	Total dissolved solid Mg/1	6600	5400
7	Electrical conductivity us/cm	10430	8994

8	Total hardness as CaCo ₃ Mg/1	4602	2655
9	Calcium Hardness as CaCo ₃ Mg/1	2124	855
10	Calcium Mg/1	851	355
11	Magnesium Mg/1	595	432
12	P-Alkalinity as CaCo ₃ Mg/1	Nil	Nil
13	Total Alkalinity as CaCo ₃ Mg/1	436	16
14	Carbonate Alkalinity as C aCo ₃ Mg/1	Nil	5400
15	Bi-Carbonate Alkalinity as CaCo ₃ Mg/1	436	8994
16	Chloride Mg/1	2920	2655
17	BOD Mg/1	7	855
18	COD Mg/1	42	355
19	Sulphate Mg/1	750	432
20	Total Nitrogen Mg/1	8.4	Nil
21	Amm. Nitrogen Mg/1	Nil	355
22	Sulphate Mg/1	Nil	Nil
23	Copper Mg/1	3.9	2.6
24	Iron Mg/1	0.02	0.25
25	Flouride Mg/1	0.2	0.65
26	Nitrate Mg/1	3.1	2

Source: Computed From Field survey (2008).

For analysing well water, samples from the well of various villages , have been collected, and put to test at water Technology centre of Tamil Nadu agricultural University. It has been found that in all the parameters, the water has been proved that it is highly polluted and would adversely affect the health of the people.

Result of Water Analysis – Noyyal River Basin

Samples of water also has been collected from the Orathupalyam dam and its proximity and the analysis of the 26 parameters here also prove to be highly polluted leading to health hazards.

S.No	Parameters	Sample.1	Sample.2	Sample.3	Sample.4	Sample.5	Sample.6
	Date	1.2.2008	4.2.2008	5.2.2008	15.2.2008	16.3.2008	17.3.2008
1	PH	9.42	8.02	8.91	8.86	8.39	9.41
2	Tempersture deg.cent	2.8	29	28.5	27	28	27
3	Colour (Visual)	p.Green	Colourness	Colourness	p.Green	Colourness	Colourness
4	Total suspended solids Mg/1	5.9	2.9	6.3	4.3	6.6	6.7
5	Total dissolved solids Mg/1	32	21	16	36	10	8
6	Electrial Conductivity us/cm	3990	5730	3510	2440	2720	110
7	Electrical Conductivity us/cm	6310	9080	5560	3940	4360	162
8	Total Hardness as CaCo ₃ Mg/1	885	1239	840	840	1416	88
9	Calcium Hardness as CaCo ₃ Mg/1	531	537	398	221	531	57
10	Calcium Mg/1	213	213	160	89	213	23
11	Magnesium Mg/1	85	170	106	148	212	7
12	P-Alkalinity as CaCo ₃ Mg/1	54	Nil	54	108	54	13
13	Total Alkalinity as CaCo ₃ Mg/1	217	540	271	270	217	5

14	Carbonate Alkalinity CaCo ₃ Mg/1	108	Nil	108	216	108	10
15	Bi-Carbonate Alkalinity as CaCo ₃ Mg/1	109	540	163	54	109	3
16	Chloride Mg/1	2315	2810	1790	980	1088	21
17	BOD Mg/1	18	6	8	9	8	6
18	COD Mg/1	102	41	53	62	43	14
19	Sulphate Mg/1	560	790	380	210	260	7
20	Total Nitrogen Mg/1	11.2	13.3	9.4	7.5	4.8	Nil
21	Amm.Nitrogean Mg/1	Nil	Nil	Nil	Nil	Nil	Nil
22	Sulphate Mg/1	Nil	Nil	Nil	Nil	Nil	Nil
23	Copper Mg/1	0.22	0.53	0.06	0.94	0.8	0.58
24	Iron Mg/1	0.4	0.2	0.6	0.2	0.11	0.07
25	Flouride Mg/1	Nil	0.2	Nil	0.05	0.3	0.02
26	Nitrate Mg/1	1.4	0.2	2.4	1.2	0.6	0.9

S.No	Parameters	Sample.7	Sample.8	Sample.9	Sample.10	Sample.11
	Date	18.3.2008	19.3.2008	12.06.2008	12.06.2008	12.6.2008
1	PH	8.48	8.44	9.58	7.72	8.12
2	Tempersture deg.cent	27	28	28	26	27.5
3	Colour (Visual)	P.Yellow	Colourless	P.Yellow	Colourless	Colourless
4	Total suspended solids Mg/1	4.3	5.9	4.5	6.4	5.3
5	Total dissolved solids Mg/1	30	38	14	7	14
6	Electrial Conductivity us/cm	4600	4800	3230	3300	4900
7	Electrical Conductivity us/cm	7470	7590	5120	5240	7720
8	Total Hardness as CaCo ₃ Mg/1	885	1062	752	1610	1328
9	Calcium Hardness as CaCo ₃ Mg/1	620	443	266	664	531
10	Calcium Mg/1	248	178	107	266	213
11	Magnesium Mg/1	64	149	116	227	191
12	P-Alkalinity as CaCo ₃ Mg/1	108	108	160	Nil	Nil
13	Total Alkalinity as CaCo ₃ Mg/1	432	325	318	325	650
14	Carbonate Alkalinity CaCo ₃ Mg/1	216	216	320	Nil	Nil
15	Bi-Carbonate Alkalinity as CaCo ₃ Mg/1	216	109	60	325	650
16	Chloride Mg/1	2540	2516	1670	1510	2350
17	BOD Mg/1	12	10	14	7	6
18	COD Mg/1	82	60	122	32	28
19	Sulphate Mg/1	540	610	320	390	520
20	Total Nitrogen Mg/1	6.3	5.8	7.2	Nil	Nil
21	Amm.Nitrogean Mg/1	Nil	Nil	Nil	Nil	Nil
22	Sulphate Mg/1	Nil	Nil	Nil	Nil	Nil
23	Copper Mg/1	1.84	2.65	0.56	3.9	4.6
24	Iron Mg/1	0.06	0.16	0.07	0.06	0.03
25	Flouride Mg/1	Nil	Nil	Nil	0.05	0.82
26	Nitrate Mg/1	1.4	2	2.4	1.2	2.5

Source: Computed from Survey, Water Quality Test Analysis, Tamilnadu University, (2008).

Sample 1 Anaipalyam Bridge

Sample 2. Anaipalyam Tank

Sample 3. Borewell

- Sample 4. Well
 Sample 5. Orathupalyam Dam
 Sample 6. Orathupalyam Dam out let
 Sample 7. Muthur Barrage
 Sample 8. Noyyal Dam
 Sample 9. Near Noyyal Dam (well water)
 Sample 10. Sengnaapally (Borewell)
 Sample 11. Orathupalayam Village (Well -Water)

Use of Water for Domestic, Drinking and Irrigation Purpose

From the responses of the 612 people to the questionnaire II of the household Survey, the uses of water for domestic purpose, drinking and irrigation were collected. The difference in these uses before and after pollution, have been analyzed and the results .

	Paired difference		t	sig	Effect size	
	Mean	Standard deviation				
Domestic water use before pollution – Domestic water use after pollution	1.796	1.028	43.222	0.000	1.747	Large size effect

Source: Computed from Field Survey (2008).

T(611)=43.222 p=0.000 d=1.747

Reports the effect on water pollution on the average domestic water use, measured in quality terms. From the table included it can be noticed that, average means differ significantly from the period before after pollution. The average difference is estimated at 1.796 which is statistical significance by at 1% level. The Cohen's effect also shows that there is large size effect of water pollution on domestic water use.

Difference in Drinking water Use – Before and After Pollution

	Paired difference		T	sig	Effect size	
	Mean	Standard deviation				
Domestic water use before pollution – Domestic water use after pollution	1.101	1.128	24.149	0.000	97.60	Large size effect

Source: Computed from, Field Survey (2008)

Reports the effect on water pollution on the average drinking water measured in quality terms. From the table included it can be noticed that; the average means differ significantly between periods before and after pollution. The average difference is estimated at 1.101 which was statically significance at 1% level. The Cohen's effect also shows that there is large size of effect of water pollution on drinking water use.

Difference in Irrigation Water Use – Before and After Pollution

	Paired difference		T	sig	Effect size	
	Mean	Standard deviation				
Domestic water use before pollution – Domestic water use after pollution	2.119	1.559	32.218	0.000	1.359	Large size effect

Source: Computed from Field Survey (2008).

T(611)=32.218 p=0.000 d=1.359

Reports the effect on water pollution on the average irrigation water use measured in quality terms, From the table included it can be noticed that, the average means differed significantly from period before to that after pollution, The average difference is estimated at 2.119. Which is statically significance at 1% level. The Cohen;s effect also shows that there is large size effect of water pollution on irrigation water use.

Domestic water Supply sector

The domestic water supply sector is also affected by the textile pollution from Tiruppur. The domestic water supply includes the potable (drinking and cooking) and non-potable.(bathing, washing, flushing and gardening) use of water .

Findings of the study

- Open wells and borewells in and around Tiruppur and the downstream stretch of Noyyal exhibit high level of TDS (most areas >3000 mg/l and some places even up to 11,000 mg/l) and chloride (generally >2000 mg/l and certain areas upto 5000 mg/l) due to industrial pollution.
- The current values of pollution concentration are very much higher than the normal values in the sample village (as per water sample analysis)
- Rainfall has only a marginal influence in reducing the concentration of TDS.
- High possibility of increase in pollution concentration in groundwater in future if effluent discharge by textile processing units continue.
- The open and bore wells located around 4 km radius of Orathupalayam reservoir are highly polluted with high TDS level and concentration of various salts.
- The establishment of effluent treatment plants in Tiruppur has not had any positive impact on the groundwater quality.
- It is evident that the available groundwater is not suitable for domestic, industrial or irrigation use.