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Environmental Impact of leather Industrial Pollution on Agricultural Production in Vellore District

Mr. M. P. Parvez Ahmed[1*], Dr. A. Royal Edward Williams[2]

[1]Ph. D., Research Scholar, PG & Research Department of Economics, Sacred Heart College (Autonomous), Tirupattur – 635601*
[2]Asst. Prof of Economics, PG & Research Department of Economics,Sacred Heart College (Autonomous), Tirupattur – 635601

Email: [2]royaledward@shctpt.edu
Corresponding Email: [1]prof.mppa@gmail.com*

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Abstract: ***Water plays a vital role on agricultural production and industrial process, but this valuable resource is gradually declining from the past few decades due to increasing industrial activities, irrigation, drinking and domestic usage etc. Leather and leather goods manufacturing industry is one of the traditional business in India. It requires huge amount of water and chemical, dye and dye intermediates, distilleries etc for leather process. The wastewater produces during the process which released into the lands and water sources. It leads to damage of crops and declining the agricultural productivity. The rate of environmental degradation was identified by the decline of agricultural productivity and the quality of surface and ground water has decline at very high rate. This study focused on impact of leather industrial pollution on agricultural production and to give the remedial measures for reducing water pollution. In order to obtain the objectives of this study, we used secondary data sources.***

Keywords: Water, Quality of Water, leather Industries, Agricultural Production.

1. INTRODUCTION

Agriculture is the principle source of livelihood for more than 54 of the people of India. An agricultural activity contributes nearly 18% to the nation's GVA (Gross Value Added) for the year 2016-17. It is generating employment opportunity as well as providing raw materials for Agro-based industries. Agriculture crops requires huge amount of water for irrigation. Water is an essential component of life after air, but it is limited on globe. The water resource is declining as well as polluting due to industrial activity. Vellore District is one of the most polluted areas in Tamil Nadu because around 240 tanneries, 17 red category industries and small scale chemical industries are located in Tirupattur and Vellore District. The majority of leather industries have production centres, which are located in Erode, Chennai, Ranipet, Ambur, Vaniyambadi, Dindigul, and Trichy in Tamil Nadu.

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Partially treated or untreated industrial effluents wastes combined with sewage and other wastes, discharged into the ground cause humongous groundwater pollution in the industrial belt. This poses a crisis of safe drinking water supply, in the rural areas of the study area. The physico-chemical standard characteristics of ground water quality in various towns in Vellore District such as Ranipet, Arcot, Walljahpet, Ambur and Vaniyamabdi etc., are below par, posing contamination threat to groundwater from TDS, salinity, Total Hardness, Calcium and chloride, which are connected with sewage and tannery wastes. These polluted water reduce the quality of soil, it leads to reduce the agricultural productivity.

Statement of the Problem

The untreated industry wastes and effluents, dumped into water bodies in the vicinity of factories, leads to water contamination. The industrial wastes generated by tanneries, account for contaminated water, not being suitable for drinking purpose as well as for irrigation purpose. These wastes when it is discharged into the nearby water sources and land, it leads to reduce the quality of the soil and water, which resulted poor agricultural productivity. The present study focused mainly impact of industrial water pollution on the agricultural productivity. This result will be more useful to cultivators to better understand the problems concerning industry effluents and their farmlands.

Purpose of the study

- To know agricultural production in Tirupattur District.
- To examine the crop impact due to industrial pollution in the water supply.
- To trace the problems and give remedial measures to enhance wastewater treatment capacity.

2. RESEARCH METHODOLOGY

The present study was based on secondary data. Secondary source of data were collected from various sources i.e. journal, newspaper, books, electronic sources, Department of Economics and Statistics, Tamil Nadu Water and Drainage board etc. The data which is relevant to the study have been collected. Statistical Tools like Regression analysis and diagrammatic representation have been used for analysis purpose.

Review on the Subject

Mondal N.C. et al (2005) the way investigated the way the ground water is being polluted by tannery industry. The leather processing requires a large amount of fresh water along with various chemicals. Approximately 3500 liters of fresh water is required for every 10 kg of raw skin tanned. As a result, water is over exploited for tanning purpose through deep bore well.

Shankar (2015), in the study, found that the tanning industry requires about 30 – 35 litre of water, per kg of leather processed and it generates approximately 680 million litres of effluent wastes every day. In India, around 2000 – 3000 tons of chromium are released into the environment from tanneries and hence India is a highly polluted area due to the effluent discharge into the open place, which does not conform to the standard limits. The CETP (Common Effluent Treatment Plant) treats a huge amount of effluent water from large

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scale tanning industries but it helps in removal of some degree of chromium and other chemical substance and the water is still unfit for reuse due to high level of many ions. CETP generates large quantity of solid waste as sludge from wastewater treatment.

Vasanthan et al. (2018) assessed that the ground water quality depends on surrounding environmental conditions and many regions in Vellore District do not get quality water due to untreated waste water, being discharged into river and land by industries. Vellore has a cluster of leather tanning units. Tanneries require huge amount of fresh water and chemicals during the leather processing, which one kg leather requiring 50 to 150 litres of freshwater. Small tannery unit produces around 3 to 4 tons of leather per day, which require one lakh litres of freshwater, which is around 2,500 peoples' demand for water. Even a single tannery establishment can cause groundwater pollution, within 7 – 8 km radius. The study concludes that the groundwater and soil of the Ambur Taluk are unfit for drinking as well as for irrigation purposes.

Yuvasakthi and Dinesh Kumar (2017) traced the economic impact of water pollution on the value of crop land. Water pollution is mainly due to discharging of untreated industrial wastewater into water bodies. The majority of rivers get polluted across the country, due to disposal of industrial effluents and domestic sewage, fertilizers and insecticides. The researcher observed in Tiruppur District, that by increasing the quality of irrigation water would boost the cropland value by Rs. 2,651.49 per hectare, other variables remaining constant. One km increase in distance between polluted water river and farm land, would increase the value of crop land by Rs. 1,21,317.6 per ha, other variables remaining constant. It shows that the industrial effluent wastewater pollution adversely affected the cropland value.

Analysis of the Data

Table No.1 Title: Source of Area Irrigated (in Acres) in Vellore District

Year	Canals	Tanks	Tube Wells / Bore Wells	Open Wells (Sole Irrigation)	Other Sources	Net Area Irrigated By All Sources	Area Irrigated More Than Once	Gross Area Irrigated By All Sources
1985-86	18408.91	224071	9.88	338246.7	4463.29	585199.8	311425	896624.8
1990-91	1921.66	1687.01	0	188535.1	545.87	192689.6	56362.93	249052.6
1995-96	4952.35	55471.26	2.47	206798.3	978.12	268202.5	74058.01	342260.5
2000-01	1946.36	40772.29	550.81	218276.4	0	261545.8	81673.02	343218.9
2005-06	1079.39	52028.08	28444.52	172601.1	1109.03	255262.2	54298.01	309560.2
2010-11	128.44	5483.4	33752.55	183036.9	0	222401.3	39502.71	261904

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2015-16	0	4937.53	38220.78	161901.1	0	205059.4	60957.13	266014.1
2016-17	0	3408.6	36675.33	153075	0	193158.9	49385.18	242544.1

Source: Department of Economics and Statistics, Chennai – 6 (2019)

The above table clearly highlights the area irrigated through groundwater sources like tube wells or bore wells or open wells, from 2010-11 to 2016-17. Tube well or bore well source of irrigation was next to open well source of irrigation. The majority of 38,220 acres of land were irrigated through tube well or bore well source during the 2015-16. After the establishment of manufacturing industries, agricultural activities had to compete with them for fresh water, to produce agricultural products.

Table No.2 Title: Area under cultivate of Principal Crops (in Acres) in Vellore District

Year	Total Cereals	Total Pulses	Total Fruit and Vegetable	Total Oilseeds	Sugar Cane	Groundnut	Coconut	Cotton
1985-86	788621.6	21113.56	13945.62	9361.3	15664.74	163091.6	6392.36	647.14
1990-91	597354.7	32927.57	16835.52	10603.71	31475.21	186687.5	10327.07	666.9
1995-96	633611.8	32870.76	26989.69	8136.18	43686.89	173557	10480.21	353.21
2000-01	331088.7	6861.66	7155.59	2225.47	17329.52	65756.34	9714.51	400.14
2005-06	284921.9	12186.98	8365.89	5594.55	14577.94	60060.52	11443.51	281.58
2010-11	237404.1	6061.38	9003.15	1094.21	2566.33	40327.69	8501.74	2.47
2015-16	242025.4	5046.21	10168.99	2465.06	4665.83	27303.38	7649.59	7.41
2016-17	180468.1	12826.71	11186.63	2287.22	5063.5	23795.98	6975.28	4.94

Source: Department of Economics and Statistics, Chennai – 6 (2019)

Note: 1. Total Cereals – Rice, Cumbu, Ragi, Cholam and Maize
2. Total Pulses – Bengal, Red, Black, Green and Horse Gram
3. Total Fruit and Vegetables – Banana, Mango, Chillies, Onion, Potato and Turmeric

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4. Total Oilseeds – Sunflower, Castor, Coriander and Gingelly

The above table reveals that the cultivation of cereals like Rice, Cumbu, Ragi, Cholam and Maize, had been continuously declining from 788621.6 acres during 1985-86 to 180468.1 in 2016-17.

Table No.3 Title: Production of Principal crops (in Tons) in Vellore District

Year	Total Cereals	Total Pulses	Total Fruit and Vegetable	Total Oilseeds	Sugar Cane (in Cane)	Groundnut (in Dry Pods)	Coconut (in Lakh Nuts)	Cotton (In Bales of 170 KgLint each)
1985-86	697130	20630	199710	1060	285660	238930	1081	2510
1990-91	160550	15830	110590	730	167540	104360	1227	3720
1995-96	210050	10580	366390	660	289580	145820	2360	30150
2000-01	265651.26	15509	216981	1505.99	202060	108440	1710	5810
2005-06	198022	6709	282819	493	1410960	87327	2765	9585
2010-11	178000.94	7162	377689	332.95	1267726	97821	2081	13102
2015-16	276617	25877	158867	389	583680	106070	2448	14051
2016-17	230133	19566	94415	257	561812	81450	2904	10505

Source: Department of Economics and Statistics, Chennai – 6 (2019)

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Note:
1. Total Cereals – Rice, Cumbu, Ragi, Cholam and Maize
2. Total Pulses – Bengal, Red, Black, Green and Horse Gram
3. Total Fruit and Vegetables – Banana, Mango, Chillies, Onion, Potato and Turmeric
4. Total Oilseeds – Sunflower, Castor, Coriander and Gingelly
5. Suger cane - in terms of Cane
6. Ground Nut – in terms of Dry Pods
7. Coconut - in Lakhs
8. Cotton - In Bales of 170 Kg Lint each

The pattern of production of principal crops in Vellore District, in the study period, is presented in Table 3. It indicated that the total cereals output had fallen down from 697130 tons to 230133 tons, from 1985-86 to 2016-17. In other words, total cereals, pulses, oilseeds, fruits and vegetables outputs were adversely affected in Vellore District. Vellore District is the tanneries hub and these tanneries, wastes were one of the reasons to negatively affect the output of principal crops, over the past few decades.

Table No.4 Title: Yield Rate for Principal Crops (Kg. per Hectare) in Vellore District

Year	Total Cereals	Total Pulses	Total Fruit and Vegetable	Total Oilseeds	Sugar Cane (in Gur)	Ground nut (in Dry Pods)	Coco nut (in Nuts)	Cotton (in Lint)
1985-86	8178	2443	63694	1876	8438	1185	13199	501
1990-91	9054	2167	61681	1735	8049	1408	9032	237
1995-96	9453	2150	95506	1856	9922	1905	12980	307
2000-01	11735	2200	64190	2694	7416	1891	9405	198
2005-06	8208	1236	81149	2266	82	1459	11972	232
2010-11	12941	2215	82060	2467	90	2265	9335	390
2015-16	20875	3582	60933	2682	80	3064	11764	294
2016-	15804	2893	59617	1563	95	2383	14152	292

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17								

Source: Department of Economics and Statistics, Chennai – 6 (2019)
Note:

1. Total Cereals – Rice, Cumbu, Ragi, Cholam and Maize
2. Total Pulses – Bengal, Red, Black, Green and Horse Gram
3. Total Fruit and Vegetables – Banana, Mango, Chillies, Onion, Potato and Turmeric
4. Total Oilseeds – Sunflower, Castor, Coriander and Gingelly
5. Sugarcane - in terms of Gur
6. Coconut - in terms of Nuts
7. Cotton - In terms of Lint

Productivity is another important aspect to be considered, in the cultivation of principal crops. According to Table 4, principal crop productivity in Vellore District had fluctuated from the year 1985-86 to 2016-17.

Table No.5 Title: Comparism of Vellore District Industry Effluent analytical data with Environmental Standard

Parameters	**Environmental Standard**		**Minimum**	**Maximum**	**Mean**	**S.D**
	Acceptable Limit	**Permissible Limit**				
pH	5.5 – 9.0	No relaxation	8.5	4.3	6.7	1.5
TSS	100	NA	20139	432	3650	6739
TDS	500	2000	30488	1476	17023	9253.5
Cl	250	1000	13946	2680	8029.5	4197.5
SO4	200	600	7020	207	2697.5	2460
BOD	30	NA	4323	92	1108	1374
COD	250	NA	5800	1120	4308	1434
S	2.0	No Relaxation	1405	40	330.5	445

Source: **tnpcb.gov.in (2017)**

Groundwater is one of the important sources for drinking, domestic use and irrigation purpose and its quality plays a crucial role in the human health and the productivity of crops. The ground water quality analysis report is presented in Table 5. The groundwater quality of Ambur Taluk, was identified, by collecting samples of well water, from selected wells, in the vicinity of a tannery, every January and June, each year. Parameters such as Total Dissolved Solids (TDS), Calcium (Ca), Magnesium (Mg), Sodium (Na), Potassium (K), Chlorine (Cl), Sulphate (SO4), Fluoride (F), Electrical Conductivity (Ec) and Hardness (HAR) were used to test the quality of water. Water has capability to dissolve a range of inorganic and organic salts or minerals such as calcium, chlorides, sodium, magnesium, potassium, sulphate, bicarbonates, etc. and these minerals produced unpalatable taste and colored (brownish) the water.

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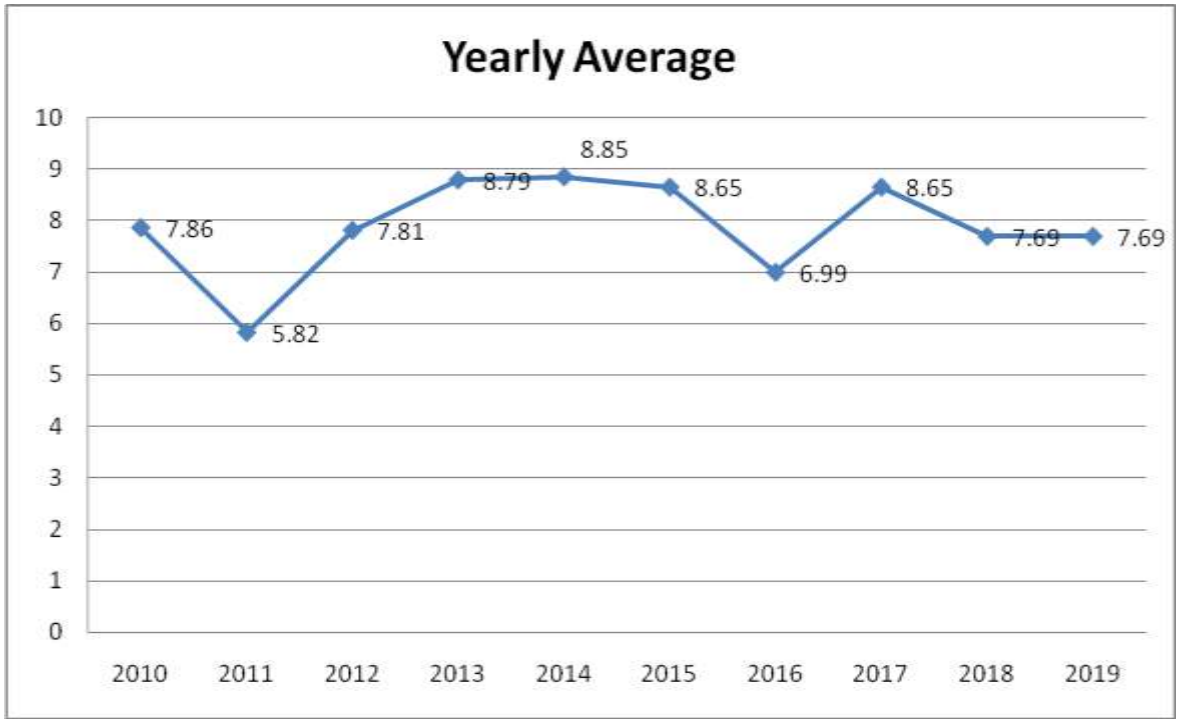
Figure No 1 Title: Quarterly Average-Ground Water Level Status in meters below Ground Level – Vellore District



The figure no.1 clearly shows that the groundwater level is fluctuating during the period from 2010 to 2019, with 8.85 meter depletion of groundwater reported in the year 2014-15, 8.78 meter groundwater drop during 2013-14, 8.65 meter and 8.64 meter in the year 2015-16 and 2017-18 respectively. The groundwater level has gone down due to many reasons such as decreasing rainfall, global warming, and excess use of groundwater by human beings, extraction for irrigation purpose and finally, requirement of industries. Leather industry is one of the water-intensive industries. Cluster of leather industry is located in major places at Vellore and Tirupattur Districts such as Ambur, Vaniyambadi, Pernambut, Ranipet, Walajah and Melvisharam.

Table No.6 Title: Correlation between Agricultural Production and Groundwater Water Quality

Correlations			
		Agricultural Production	**Groundwater Water Quality**
Agricultural Production	Pearson Correlation	5	.823*
	Sig. (2-tailed)		.000
	N	13	13
Groundwater Water Quality	Pearson Correlation	.823*	5

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	Sig. (2-tailed)	.000	
	N	13	13
*. Correlation is significant at the 0.05 level (2-tailed).			

From the above table it can be interpreted that there exists highly positive correlation of (0.823**) at 5 per cent level of significant between the agricultural production and groundwater quality in the study area, it is clearly understood that the groundwater quality caused to decreases of agricultural production by nearly 82 per cent in the study.

Suggestion:

1. The government should enforce industries to control and manage its effluent water before it discharge.
2. The pollution control board should take severe action against the industrial sector when they let out their untreated or partially treated effluents into the river and other water sources.
3. The government should provides more subsidies to establishment of Effluent Treatment Plants in their own premises.

3. CONCLUSION

The outcome of this study suggest that the role of tanning industry in the creation of water pollution as well as crop damage at large should be brought to the immediate attention of the effluent. Crop cultivation patterns are already being affected by water pollution, but only on the margins, and effects of aggregate agricultural production are not yet apparent. Agricultural production increases by fluctuation over the 15 years. Many farmers who lack secure access to ground water are already giving up many crops productions because the surface water supplies are not reliable.

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