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**Growth prospects for Leather industry and waste water
pollution in Palar River Basin in Vellore district.**

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Abstract

The production of leather from rawhides, which is called tanning, has been considered as one of the most important industrial processes in Vellore district. Wastewater from tannery industry is contamination of heavy metals in the Palar river basin. The present study aims at to examine the water pollution in the river.

Keywords: *Pollution, wastewater, leather, tanneries, water quality.*

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1. Introduction:

Indian leather industry has made significant progress during the last many decades. The footwear industry offers direct employment

of mainly from socially and economically backward sections of the society to the turn of 2.3 million and it is expected to increase additional workforce in the country. India is the world's second largest producer of

footwear both leather and non-leather(council for leather Exports2020).India's exports of leather and leather products declined about 28.3 percent to \$4.6billion in 2019-20.this due to COVID-19 impact. The key markets of the European Union, the UK and the USA,(council for leather exports 2021).The reason for reduction in exports was most of the sales in the overseas market are helping through e-commerce mode and hence, there is a vast change in the customer's requirements as malls and shops are closed in our overseas markets and hence customers do not want to pileup inventories,(Shai Aqeel Ahmed and Panaruna2020). On account of the changed market scenario, customers were now demanding quicker delivery of products as well. However, there was a shortage of containers which was affected the shipments, he pointed out. Panaruna said major markets were opening up but the industry was not producing the leather because of the impact of surging COVID-19cases in India on Exports. Import of leather, leather products and footwear have also declined drastically by 51.96 percent to \$451.68 in 2020. Furthermore imports declined by 28.79 percent in 2020(Panaruna2021).India's major exports were to USA and Europe. The competition for Indian footwear in the Global market is intense; countries like China, Brazil, South Korea, Spain, Portugal, Taiwan and Indonesia are India's main competitors. China and Vietnam are emerging as the major centers for the production of low price leather footwear.

Problems of the study:

It has been reported that nearly 42000 tonnes per annum of leather goods are processed in the area of study at Vaniyambadi alone about a large quantity of skins and hides are processed. However, the pollution along the river was mainly from Vaniyambadi, Ambur, Ranipet and Malvisharam. The tanneries use a large number of chemicals like, acids; Salts etc. The common salt to the raw skin for preservation is also scraped and dumped in the locality without proper disposal.

Objectives of the study:

1. To assess the extent of pollution along the Palar river.
2. To examine the households perception about the water quality in the study area.

Palar river Basin:

Palar river basin has a catchment area of 17480 sq.km with rainfall varying from 75 to 115 cm increasing towards the tail end. The length of the main river is 272km and is dry almost the year. There is sufficient ground water movement along the courses of the river to feed a large number of municipalities panchayat union, corporations and villages water supplies and industrial activities. A large number of tanneries were developed over a long period at Vaniyambadi and Ambur on the banks of the river. The first industry was started in 1940s .There are five main tannery clusters, all situated in Palar river basin, these tanneries were developed over long period. The numbers of industries and their production have also increased the table-1 -

shows the number of tanneries and the population, in Tamil Nadu the total number of leather Industries were 1394 in 2019, in Vellore district the total number of leather industries was 548 located in four major towns in the district. Vellore districts leather specialization is associated with the local Muslim community (Labbai who set up the first factory during the mid-19th century in response to British demand (DUPUIS 1960).Leather industry was strongly with Islamic culture and region. The members of

the Muslim community are close knit, a situation reinforced through extensive kinship relations and maintain strong community based institutions. The local leather industry has under gone substantial changes from a largely traditional industry, specialized in semi-finished leather, recently a number of firms moved further up the value added chain into the manufacture of leather products footwear, shoe uppers gloves etc.

Table-1 Tannery towns of Palar river Valley

| S.No | Name of the Town | Population(2011) | Number of Tanneries |
|------|------------------|------------------|---------------------|
| 1 | Ambur | 11,4608 | 108 |
| 2 | Melvisharam | 44786 | 25 |
| 3 | Pernambuttu | 51271 | 77 |
| 4 | Ranipet | 50764 | 202 |
| 5 | Vaniyambadi | 95061 | 136 |
| | Total | 356490 | 548 |

Sources: Census of India 2011, Department of Statistics, Vellore.

2. Materials and Methods

2.1. Study area and sampling:

This study was conducted on the Palar River, which passes through Vellore city, Tamil Nadu. About 823 samples were collected from the study area multistage random sampling was used to collect the respondent. Both rural and urban areas were selected.73% males and 27% females, 178 of them were males and 125 females under the age of 30 to 40 years of age.

2.2. Statistical analysis:

The data were statistically analyzed by the statistical package SPSS16.0 (SPSS, USA).The mean and standard deviations, chi-square test was used to water used for domestic consumption by the respondent and pollution.

2.3. Water quality parameters

Pollution: It has been reported that large number of leather goods are processed in this area of study. a majority of tanneries concentrate on the first stage of leather making, that is processing raw skins and

hides into an intermediary product called semi-finished leather. These primary tanneries practices two main types of tanning, vegetable based, called East India,

tanning and chromium tanning which yields wet blue(chromium gives a blue color to the pelt).

Table 2. Water quality Bulletin 2018

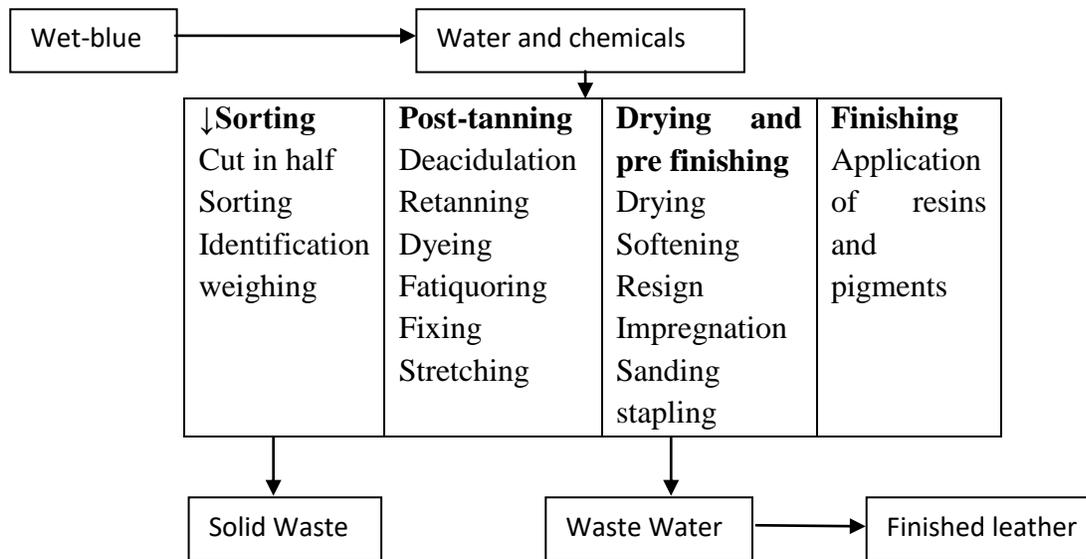
| S.No | Point of collection | Type of river | DO | BOD | Facal coliform | Total coliform | Water Quality Index(WQI) |
|------|---------------------|---------------|-----|-----|----------------|----------------|--------------------------|
| 1 | Palar | R | 6.3 | 4.4 | <1.8 | 230 | Not satisfactory |
| 2 | Vaigai | R | 5.6 | 6.3 | 1.8 | 3.6 | Not satisfactory |
| 3 | Bhavani | R | 6.2 | 1.1 | 460 | 110 | satisfactory |

Source: Tamil Nadu Pollution control board, Chennai,

All parameter values and volume of waste water are expressed in mg/l. The above table 2 shows the water quality index (WQI), the samples were collected from Palar river and it was presented in the above table, a water quality index is a means by which water quality data are summarized for reporting to the public in a consistent manner. In simple terms what the quality of drinking is from drinking water supply and the results are published as satisfactory or unsatisfactory in the table the physic chemical water quality parameters like pH and Do dissolved oxygen, BOD biological oxygen demand, fecal coli form, salinity of the river water, were measured by portable refractor meter like hardness Mg/L, dissolved oxygen mg/4 alkalinity were analyzing using kits. A majority of tanneries concentrate on the first stage of leather making the figure shows the leather process is schematically shown in figure highlighting post tanning operations. The

major pollution Problems from tanneries in Vellore District are water pollution and solid wastes. The waste generated in different stages of tanning the table gives a summary of the pollution generated at different tannery effluents on agricultural lands, drinking water, irrigation water; Transformation of wet blue leather into finished leather is carried out through a series of processes and operations, carried out in steps. In the case study evaluated, these steps are divided into sorting, post-tanning, drying, pre-finishing, and finishing. Among these steps, post-tanning is the most relevant in terms of water and chemical consumption leading to wastewater generation. The post tanning process consists of the following steps: deacidulation also known as neutralization, retanning, dyeing, fatiquoring, fixing, samming, and stretching. The leather process is schematically shown in the above fig.1 highlighting post tanning operations.

Fig.1. Case study processing steps.



Source: Developed by Author

3. Results and Discussion

3.1. Tannery waste characterization:

Tannery waste typically contains a complex mixture of both organic and inorganic chemicals. The most important pollutants associated with the tanning industry include chlorides, tannins chromium, sulfate, and sulfides and other trace organic chemicals. Table 3 shows the amount of released waste and the main wastewater characteristics from various leather making processes for two tanneries located in the town Vaniyambadi and Ambur in Vellore district. The main pollution characteristics of waste water released from two local tanneries including chemical oxygen demand COD, total solids TS, pH concentrations of chloride, and total chromium were determined by collecting representative

wastewater samples from the tanneries. Characterization of such processes effluents assists in identifying the waste generation rates and discharges and for suggesting cleaner production options. Interestingly, the amount of wastewater produced in the local Vaniyambadi and Ambur tanneries is much higher than those produced worldwide. However, it is more concentrated with a wide variety of toxic pollutants (table-2).the liming process has the highest COD and Highest pH value, while the tanning process releases wastewater highly concentrated with chromium.

Table-3, Tannery waste characteristics in Ambur, Vellore district.

| Process/parameter | Soaking | Liming | Deliming | Pickling | Tanning | Combined pool |
|---|---------|--------|----------|----------|---------|---------------|
| <i>Ph</i> | 6.73 | 12.37 | 10.89 | <2.00 | 4.6 | 12 |
| <i>COD(mg/L)</i> | 10,870 | 32,425 | 3800 | 3,130 | | 12,600 |
| <i>BOD₅(mg/L)</i> | 3,560 | 1510 | 750 | 480 | | |
| <i>CI(mg/L)</i> | 17750 | 13500 | 1500 | 0 | | 4050 |
| <i>SO₄²(mg/L)</i> | 545 | 3100 | 1240 | 1396 | | 13250 |
| <i>SS(mg/L)</i> | 2885 | 5093 | 572 | 522 | | 436 |
| <i>Ammonia</i> | | | 60 | 80 | | 4955 |
| <i>Total chromium(mg/L)</i> | | | | | 3600 | 280 |

Sources: Tannery wastewater treatment and recovery options, Hassansawalha, (2020).

Results of the Study

The first objective is to identify the extension of water borne diseases in the region that can directly be attributed to tannery related water pollution.

On an average each household has collected water for their day to day needs fifty three percent of the households collect water from public tap as well bore well all other sources. About thirty one percent collected water from bore well. Nearly sixty one percent of households collected from three sources, viz., and public tap and bore well other sources. The study involved 823 respondents of which 259 31 percent from rural areas. In urban areas 564 69 percent, location of the households is an important factor for drinking water supply. The household size ranged from two to fifteen members in the family the mean value of 5.86.

Sex ratio is 73 percent are males and 27 percent of them are females. Age distribution 201 respondents are male belonging to the age group of 40 to 50 years; female 125 belong to 30 to 40 years of age. The level of education 29 percent of the households are illiterates, 69 percent of the female and 52 percent have completed primary and secondary education. Overall the female

education is very low. With regard to occupation 49 percent of the people are government employees. Next highest amount is by the respondents who are engaged in daily agricultural labour. One of the interesting aspects to be noted is that the family members working at tannery industries were 33.4 percent. In rural and urban areas. In urban households 90.4 percent and in rural households 91.5 percent.

The first objective was tested with the chi-square test the following are the results. There is a positive relationship between water related variables and water borne diseases. Chi-square test was applied to test whether water born diseases and each of the nine aspects of location, quality of water, taste, dust, water storage, use of boiled water, habits and households members working in tannery industries are related Location of the households and water dust chi-square value was 57.7 p-value was 2.922 both the attributes are strongly associated. Location and quality of water the two attributes are strongly associated the chi-square value was 118.38 p-value was 1.96 significant at 5 percent level. Location of the households and water taste chi-square value was 57.7 p-value was 2.922 both the attributes are strongly associated.

Conclusion

Pollution by tanneries must be checked and damages already suffered must be compensated and corrected, but this can be done only by the collective efforts of the government, tanneries owners and the persons affected. Therefore, it is desirable to have a planning committee in the pollution control boards with skilled people in the subjects concerned to formulate location specific plans and to monitor their implementation.

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