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ADVERSE EFFECTS OF DYEING INDUSTRY EFFLUENTS ON AGRICULTURE PRODUCTIVITY IN TIRUPUR

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Introduction

The main activities in industrial sector here are ginning, spinning, weaving, knitting bleaching ,dyeing ,printing and allied works. The majority of bleachers and dyers, around
78% are linked to the overall knitwear cluster through the job work system ,while22% are independent producers. There are essentially three types of firms in the industry viz.,direct exporters, indirect exporters, and job-workers. Tirupur contributes about 85% of hosiery and cotton knitwear produced in India. 75% of which is exported to Europe, America and other countries. At present there are 6,450 units involved in various operations of the textile industries here. It has 4900 knitting and stitching unit, around 760 textile dying and bleaching units, 320 printing units, around 120 embroidery units and 200 units catering to compacting and rising. Thus this town annually contributes about INR 3000 crores in foreign exchange earnings to our country, besides an earning matching or surpassing the above figure to cater the domestic market. The dramatic improvement in Tirupur,s export market can be attributed to the disbanding of garment manufacturing in western countries due to environmental pollution and high cost of labour.The export of knitted garments from Tirupur started to grow very rapidly around 1985,and in the early 1990s the annual growth rate was above 50%.

Textile processing Industry-Environment Problems and Issues

The environmental problems of textile manufacturing are related to the bleaching and dyeing (textile processing) segment of the industry. In textile processing, bleaching and dyeing are the two major activities that require a large amount of water. However, these activities are "nonconsumptive and most of the water used by these units is discharged as effluent after processing.

For the last two decades, the dyeing units located in and around Tirupur have polluted the Noyyel river, a nonperennial river that ends in the Cauvery river. The river gets polluted when it passes through Tirupur, due to discharges of 96.1 million litres per day (MLD) of coloured effluent with high total dissolved units (TDS) in the range of 6000 to 7000 mg by the textile bleaching and dyeing units in Tirupur. Apart from the industrial pollution about 3MLD of untreated municipal water find its way into the Noyyal river and makes the river as one of the most polluted river in the state. The groundwater in the downstream of Tirupur and the surface water in Orathupalayam dam have become highly polluted.

Among these units dying and bleaching units use large quantities of water, but most of the water used by these units is discharged as effluents containing variety of dyes and chemicals to the Noyyel river. As a result, the industrial growth has led to the depletion of groundwater resources and a serious deterioration in environmental quality. The negative externalities of the industries are leading to loss in crop area and production, changes in cropping pattern, health problems, and socio-economic imbalance in the region. Moreover industrial pollution causes labour migration, changes in employment pattern and mainly decrease in share of farm income to the household income From the data presented it is apparent that the textile industry, although a very important foreign exchange earner for the country is creating an environmental havoc around Tirupur - one which is expected to have a lasting depilating impact on the region. There are 600,000 people in Tiruppur and around 800,000 people along the downstream of river are affected by this pollution .The industry also cannot be wished away and shut down on environmental grounds.

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In 1991, the Orathupalayam dam was constructed on the Noyyal River at the cost of Rs 16.46 crores to irrigate an area of 500 acres in Erode district and 9875 acres in Karur district But instead of serving its purpose it became a storage tank for wastewater as the textile units started releasing their effluent into the dam's reservoir. This effluent could neither be discharged into the river nor be stored due to percolation and contamination of groundwater aquifers .The effect of pollution was noticed when there was great economic loss for farmers in the downstream areas of Erode and Karur districts, in addition to contaminating the river Cauvery.

Issues

Energy Issues; Though Tirupur textile cluster cases the modern technologies in some of the subsectors like knitting and dyeing, energy utilization is poor in most of the modern units. The operating efficiencies of modern equipments are low because of poor loading and scheduling. It was observed that the sizes of the equipments are large in most of the units. Electrical energy, firewood, furnace oil. and high speed diesel are the primary sources used, while steam and hot thermic fluid are the secondary sources used in Tirupur cluster.for wet processing firewood is the main energy source.

Environmental Issues; In Tirupur,as in other Indian cities, there is no separate zone for industrial/commercial activities. Therefore ,many industries are located in residential areas. Urbanization, industrialization and associates activities increases pollution Also ,Tirupur is facing a severe problem of water and land pollution because of primitive processing methods of dyeing.

Impact on Agriculture Productivity

Agriculture sector was major sector which bore the brunt of the impact of pollution in the form of decline in yields, it is necessary to study the impact on agriculture. Agricultural yields depends upon many factors like seeds, weather soil fertility irrigation, technology, manures, fertilizers, and pesticides used, capital invested and management practices. Other things are remaining the same, water pollution and soil pollution mainly caused a significant fall in crop yield.

Normally the entire water used in the process of dyeing and bleaching is discharged as the chemical effluents. The biggest pollutant in the effluent is heavy metals. This effluent from the dyeing and bleaching units from Tiruppur is let out into the open, without any treatment or semi treated. The effluents from the dyeing and bleaching form stagnant pools, and their stench is quite unbearable. The presence of metals in excess of tolerable limits results in the withering away of standing crops including full grown palm and coconut trees while seedling just do not germinate. The dyeing and bleaching industry has not only ravaged the land but has also upset the intricate biological food chain of the area.

Statement of the Problem

One of the most significant problems for the Tirupur textile industry today is water. The bleaching and dyeing units use large quantities of water, but most of the water used by these units is discharged as effluents containing a variety of dyes and chemicals to the Noyyal river. As a result, the industrial growth has led to the depletion of groundwater resources and a serious deterioration in environmental quality.

However it is a matter of fact that the dyeing industries have Opportunities for the people and labourers to get employment, increased wage earnings and enhanced household level income. Hence it is clear that the dyeing industries have created both positive and negative effects on the public in general and farmers in particular area/group specific analysis is the need of the hour.

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Objectives

1. To study the environmental problems and issues of dying effluents.
2. To assess the crop productivity and value of farm lands in tirupur area.
3. To identify the problems faced by the farmers and to suggest suitable measures to get over them

Data and Methodology

A two-fold approach, Viz., Field Survey Method and Personal Interview Techniques were used in collection of data. Primary Data have been collected from the respondent both from dyeing units and the farmers.

Review of Literature

Regarding to the effluent of water Paul P Appasamy(2000) studied the economic assesment of environmental damage - a case study of water pollution in Tirupur. The pollutants responsible for widespread damage are not only organics, dyes etc. but total dissolved solids and largely chlorides. TDS has affected ground water to a significant extent, resulting in damage to agriculture, fisheries, and ground water.

Senthilnathan (2004), studied the micro level environmental status report of river Noyyal basin. Most of the industries are located on either side of the Noyyal river bank at Tiruppur. These industries especially dyeingand bleaching units are the water consuming One. Nearly 9,000M^3T of effluent from these Industries are released directly into the river Noyyal with Incomplete Treatment. This ultimately affect the water surface water system Severely. The characterization of the water quality of the surface water samples of the river Noyyal is found higher and well above the threshold limit. The chemical composition is likely to be greatly affected by the nature and amount of effluent dumped it as biotic and abiotic processes in the water body.

Results and Discussions

Agriculture yield Value loss - Before polluted yield Per Acre(Per Year) Table – 1,Income Earned Before Pollution

Amount Rs.	Long Term	Medium Term	Short Term	Yield per Acre Rs.
Rs. 25,000 - 50,000	48	50	94	45,000
Rs. 50,001 – 1,00,000	42	62	28	86,000
Above 1,00,000	60	38	22	1,45,000
Total	150			2,76,000

Source: Primary Data

Table 1 explains the income earned before pollution. 60 respondents have earned a long term income of above Rs.1,00,000, 62 respondents have earned a medium term income ranging between Rs.50,001- 1,00,000, 94 respondents have earned a short term income ranging between Rs. 25,000-50,000. 48 respondents have earned a long term income ranging between Rs. 25,000-50,000, 50 percent of the respondents have earned a medium term income ranging between Rs.25,000 – 50,000, 28 respondents have earned an agriculture income ranging between Rs.50,001- 1,00,000. 42 respondents have long term income ranging between Rs.50,001-1,00,000, 38 percent earned above Rs.1,00,000 and 22 respondents have earned above Rs.1,00,000.

After Polluted Yield Per Acre (Year)

Table-2,Income Earned After Pollution (decrease in yield)

Amount Rs.	Long Term	Medium Term	Short Term	Yield per Acre
Rs. 10,000 - 25,000	48	50	94	23,000
Rs. 25,001 – 50,000	42	62	28	46,000
Above 50,000	60	38	22	75,000
Total	150			1,44,000

Source: Primary Data

Table 2 explains the income earned before pollution. 60 respondents have earned a long term income of above Rs.1,00,000, 62 respondents have earned a medium term income ranging between Rs.50,001- 1,00,000, 94 respondents have earned a short term income ranging between Rs. 25,000-50,000. 48 respondents have earned a long term income ranging between Rs. 25,000-50,000, 50 percent of the respondents have earned a medium term income ranging between Rs.25,000 – 50,000, 28 respondents have earned an agriculture income ranging between Rs.50,001- 1,00,000. 42 repondents have long term income ranging between Rs.50,001-1,00,000, 38 percent earned above Rs.1,00,000 and 22 respondents have earned above Rs.1,00,000.

Table-3,Yield Loss Occurred Per Acre (Last Five Years)

Loss Value (in last five years)	No. of Respondents		
	Long Term	Medium Term	Short Term
Rs. 1,00,000-5,00,000	48	50	94
Rs. 5,00,001 – 10,00,000	42	62	28
Above 10,00,000	60	38	22
Total	150		
Loss Per Acre	4,55,000	2,25,000	90,000

Source: Primary Data

Table 3 depicts the yield loss occurred per acre in last five years. 60 respondents has faced a loss above Rs.10,00,000 in long term, 62 respondents has faced a loss ranging from Rs.5,00,001- 10,00,000 in medium term, 94 respondents has faced a yield loss ranging between Rs.1,00,000- 5,00,000 in short term. 48 respondents has faced a loss of Rs.1,00,000-5,00,000 in long term, 50 respondents has faced a loss ranging between Rs.1,00,000-5,00,000 in medium term, 28 respondents has faced a loss ranging between Rs.5,00,001-10,00,000 in short term, 42 respondents has faced a loss ranging between Rs.5,00,001-10,00,000 in long term, 38 respondents has faced a loss above Rs.10,00,000 in medium term,22 respondents has faced a loss above Rs.10,00,000 in short term.

Table – 4,Agriculture Land Value (Per Acre)

Land Value	No. of Respondents	
	Before Pollution	After Pollution
Rs. 5,00,000-10,00,000	57	85
Rs. 10,00,001 – 15,00,000	42	53
Above 15,00,000	61	12
Total	150	

Source: Primary Data

Table 4 portrays the agricultural land value before and after pollution. 61 respondents had a land value Above Rs.15,00,000 before pollution, 85 respondents had a land value between Rs.5,00,000- 10,00,000 after pollution, 57 respondents had a land value between Rs. Rs.5,00,000- 10,00,000 before pollution, 53 respondents had a land value ranging between Rs.10,00,001- 15,00,000 after pollution, 42 respondents had a land value ranging between Rs.10,00,001- 15,00,000 before pollution, 12 respondents had a land value Above Rs.15,00,000 after pollution.

Table-5,Pollution Averting Expenditure (Per Acre) Per Year

Amount	No. of Respondents	Percentage
Below Rs. 10,000	15	10.0
Rs. 10,001- 20,000	26	17.3
Rs. 20,001-30,000	42	28.0
Above Rs. 30,000	67	44.7
Total	**150**	**100.0**

Source: Primary Data

Table 5 depicts the pollution averting expenditure incurred by the respondents. 44.7 percent of the respondents expended above Rs.30,000 on pollution avertion, 28 percent of the respondents expended between Rs.20,001 to 30,000 for averting pollution, 17.3 percent of the respondents has expended between Rs.10,001-20,000 to avert pollution and 8 percent of the respondents has expended below Rs.10,000 on pollution avertion.

Table – 6,Crops Cultivated After Pollution

Crops Cultivated	No. of Respondents	Percentage
Coconut	82	54.7
Sapota	26	17.3
Whip tree	42	28.0
Total	**150**	**100.0**

Source: Primary Data

Table 6 explains the crops cultivated after pollution. 54.7 per cent of the respondents has preferred to cultivate Coconut after pollution, 28 per cent of the respondents has chosen Whip Tree for cultivation after pollution and 17.3 per cent of the respondents has chosen to cultivate Sapota after pollution.

Problems Faced due to the existence of Dyeing Industries

Table – 7,Garrett Ranking Analysis on Problems Faced due to the existence of Dyeing Industries

S. No	Reasons	Garrett's Mean score	Rank
1	Change in ground water level	41.73	2
2	Change in water quality and its colour	41.53	4
3	Environment is fully affected	41.88	1
4	New type of water borne diseases are found	38.38	8
5	No proper cultivation	41.29	6
6	Change in quality of crops	41.47	5
7	Change in soil quality	41.68	3
8	Cattle farming is affected	39.50	7

Source: Primary Data

The result from table 7 indicates the various problems faced due to the existence of dyeing industries in Tiruppur District. The study revealed that the environment is fully affected was ranked first, then change in groundwater level was ranked second and change in soil quality was ranked third, pointing out that these are the major problems faced due to the existence of dyeing industries whereas no proper cultivation was ranked sixth, cattle farming is affected was ranked seventh and new type of water borne diseases are found was ranked last, pointing out that these are the least factors are the problems faced due to the existence of dyeing industries.

Future Perspectives

Table – 8,Garrett Ranking Analysis on Future Perspectives of Farming

S. No	Reasons	Garrett's Mean score	Rank
1	No idea on continuing agriculture	50.4	5
2	Government may provide financial support	50.705	4
3	Shifting of Dyeing and Bleaching industries to other places	55.281	1
4	Acidic/ Salty/ No Groundwater	50.878	3
5	Dyeing Industries should recycle the water fully	52.041	2

Source: Primary Data

The result from table 8 indicates the future perspectives of farming. The study revealed that shifting of dyeing and bleaching industries to other places was ranked first, then dyeing industries should recycle the water fully was ranked second and Acidic/ Salty/No groundwater was ranked third, pointing out that these are the major future perspectives of farming whereas Government may provide financial support was ranked fourth and no idea on continuing agriculture was ranked last, pointing out that these are the least factors of future perspective of farming.

Table – 9,Paired Sample T-test Analysis on Agriculture Land Value Loss Before and After Pollution

	T	df	Sig. (2-tailed)
Before Pollution – After Pollution	-6.359	149	0.000

Source: Primary Data

Table 9 shows the agriculture land value loss before and after pollution. It is clear from the result is that there is a significant difference between the agriculture land value before and after pollution.

Main Findings of the Study

1. The study found that majority of the agricultural communities were not depending on the well and fore well water for drinking, washing the cloths, bathing and live struck.
2. The farmer's potential yield of sorghum, coconut, vegetables productivity in the noyyal river effluent affected area. In noyyal river basin the crop sorghum does not produce any yield, farmers cultivated because of domestic animal fodder.
3. In the effluent affected village formers cultivate only wet crops like sorghum, Topico and sun flower they are most effluent tolerance crops.
4. 4. The another effects of this pollution was on coconut cultivation that has slumped

5. because of high, saline, sodium nature waste that hardens irrigation water.
6. The farmers have incurred pollution averting expenditure as additional cost of production. As the value of lands and their productivity have already dipped to low level, the farmers could not depend from their farms income
7. The farmers are not interested to cultivate the corps in their lands because the groundwater is completely affected.
8. The farmers procure water from outside source (Tanker lorry) and used to milch animals for household purpose
9. The study revealed that the environment is fully affected was ranked first, then change in groundwater level was ranked second and change in soil quality was ranked third, pointing out that these are the major problems faced due to the existence of dyeing industries / whereas no proper cultivation was ranked sixth, cattle farming is affected was ranked seventh and new type of water borne diseases are found was ranked last, pointing out that these are the least factors are the problems faced due to the existence of dyeing industries.
10. Correlation On Problems Faced Due To The Existence Of Dyeing Industries in Tiruppur District showed a significant ($p<0.001$) positive correlation among all constructs and the r values ranged from 0.187 to 0.559. Thus, it reveals that there is no problem of multicollinearity and indicating that there is a significant difference between the problems faced due to the existence of dyeing industries in Tiruppur District. Hence the null hypothesis is rejected.
11. Analysis of Variance on Agriculture Land Value Loss and Monthly Income of the respondents shows that all the variables namely Before Pollution, After Pollution, Yield Loss and Pollution Avertion Expenditure are significantly differed between the Monthly Income of the respondents.
12. Agriculture land value loss before and after pollution is that there is a significant difference between the agriculture land value before and after pollution.

Suggestions

- Recharge of freshwater through traditional as well as modern rainwater harvesting methods will help to reduce the level of pollution through dilution.
- construction of more check dams and percolation ponds, and reclamation of tanks and other degraded water sources, could help to overcome the problem.
- New eco-friendly textiles from algae, soya, milk, casein, bamboo, etc., may be developed as their duration is long and of high quality and also they are natural fibres that does not need any dyeing and bleaching.
- Tamil Nadu Pollution Control Board (TNPCB) constituted a local area environmental committee to monitor the polluting industries located in Tiruppur District should be made permanent to monitor the operation of the effluent treatment plants of the industrial units and their level of compliance with the prescribed standards, and suitably advise the Pollution Control Board to take the necessary action.
- The Pollution Control Board should regularly monitor the drains the join to the Noyyal River to trace any illegal discharge of effluent from dyeing industries.
- To take proper steps for ground water remedial measures through recognized organization to reclaim the ground water quality along the Noyyal river in Tirupur.

Conclusion

The use of untreated effluent water from the Noyyal River basing for the irrigation crops created adverse impact on forming lands as well as in increases pressure on environment by damaging the ecology The volume of industrial effluent will increase with economic growth; therefore, in future the land disposal option could be a serious environmental threat to agriculture and other uses of water. The economic stability of the farmers are at stake, because of the pollution, as they are highly affected with rapid change in cropping pattern, irrigation and agricultural land value. Hence, it is essential for the concerned authorities to consider the socioeconomic impact on farmers, as they are the backbone of the nation. For developing countries like India, it is imperative to follow the precautionary approach as it may lead to agricultural crisis as a whole in the long run. To make agriculture profitable and attract farmers to continue crop production activities. As an effort towards the direction, the Government should augment its investment and expenditure in the agriculture sector. The solution of the problem is not in few packages but in drastic changes in the present economic policies related to agriculture.

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