CAUSES OF WATER POLLUTION AND ITS IMPACT ON LAND VALUE IN SELECTED TALUK OF TIRUPPUR DISTRICT –HECKMAN HEDONIC MODELLING APPROACH

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Abstract
In India, when water is scarce, domestic waste and the industrial waste water is an option for the farmers to use for cultivation at low cost. It revealed that the domestic waste water has its resource value as water, as the demand for water for cultivation increases. As the demand for water had increased due to population, urbanization and industrialization, the farmers were forced to go for wastewater irrigation. In India, to avoid the costs of effluent treatment, small scale industrial units, disposed their untreated effluents in public sewers and in surface water bodies as a regular practice. In India, nearly 76 percent of the untreated waste water is used for irrigation. In this backdrop, an attempt was made to analyse the causes of water pollution and its impact on land value in selected taluk of Tiruppur district. Probit regression analysis and two stage regression analysis were applied to fulfill the objectives of the study. Among the significant factors, 'textile industrial waste disposal in the nearby water bodies' and 'distance of farm land to the main road' had negative relationship with land value. Area irrigated and distance of farm land from the Noyyal river had positive relationship with land value. Increase in area irrigated and distance of farm land from the Noyyal river had increased the land value. In the non polluted area, distance of farm land from the main road and distance of farm land from Noyyal river had turned out to be statistically significant to influence the land value. Among the significant factors, distance of farm land from the main road had negative relationship with land value. Distance of farm land from the Noyyal river had positive relationship with land value. Increase in the distance of farm land from the Noyyal river had increased the land value. The selectivity variable lamda was statistically significant for the non polluted area while it was statistically insignificant in the polluted area. It revealed the presence of selectivity bias in the non polluted area and absence of selectivity bias in the polluted area.
Keywords: Water Pollution, Soil pollution, Noyyal River Tamilnadu, India, Tiruppur district, Heckman Hedonic Modelling.

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Introduction
Waste Water Irrigation

In India, when water is scarce, domestic waste and the industrial waste water is an option for the farmers to use for cultivation at low cost. The waste water has nutrient content when domestic wastes are mixed in the industrial waste water. The farmers need not spend considerable amount on fertilizers. It revealed that the domestic waste water has its resource value as water, as the demand for water for cultivation increases. As the demand for water had increased due to population, urbanization and industrialization, the farmers were forced to go for wastewater irrigation. "In India, most of the urban local bodies are not able to invest in infrastructure for collection, treatment and disposal of wastewater. Therefore, wastewater is mostly used without proper treatment and adequate precautionary measures". "In developing countries such as in India, industrial effluents are mixed in a larger quantity with domestic and hospital wastes without proper treatment". To dilute industrial pollutants and toxicants for better/easier treatment, industrial sewage effluents are mixed with domestic wastes in developed countries. In India, to avoid the costs of effluent treatment, small scale industrial units, disposed their untreated effluents in public sewers and in surface water bodies as a regular practice. In India, nearly 76 percent of the untreated waste water is used for irrigation. (River Water Quality, 2020). The use of waste water for irrigation necessitates proper treatment and several precautionary measures (Priya, 2018). When the waste water is not properly treated and used for irrigation, it creates both surface and ground water pollution. (Abdulraheem, 1989).
"Ensink et al., 2002, Van der Hoek et al., 2002, Bradford et al., 2003, Minhas and Samra, 2004, Butt et al., 2005, Buechler and Scott, 2006, Priya, 2018). When untreated industrial and domestic waste water is used for irrigation, it might cause environmental degradation such as ground water pollution, soil pollution and contamination of crops grown in polluted water (McCornick et al., 2003, 2004, Scott et al., 2004 and Priya, 2018)".
Impact of Waste Water Irrigation (Without Treatment) on Agriculture

"The studies (Saha etal, 2014) had reported that the use of untreated industrial waste water for irrigation had increased the concentrations of Na in wheat leaf tissue to the extent of 58 percent and the concentration of Ca had declined to the extent of 13 percent. It caused poor calcium nutrition to the crop". The Pb concentrations had exceeded the safety limit in 24% of wheat grain samples.
Appasamy and Nelliyat (2007) "stated that water pollution was the major factor for the reduction in agricultural production. Khai and Yabe (2012) empirically proved that water pollution had significantly reduced the agricultural production". Akilan (2016), and Yuvasakthi and Kumar (2017) had proved water pollution due to untreated industrial effluent discharge was one of the reason affecting agricultural production and productivity.
"Though the treated waste water was suggested to use for irrigation, it could also affect the soil quality and the human health. Therefore, the Central Pollution Control Board (CPCB) (2019) has issued guidelines for the safe usage of treated sewage and effluents from industries in

agriculture". "The CPCB guidelines are a result of directions of the National Green Tribunal (NGT) which in May 2019, while hearing a case, held that "no industry can be permitted to dispose treated effluents on land for irrigation, plantation or horticulture/gardening by prescribing standards applicable without assessment of adequate availability of land and impacts of such disposal on agricultural/crops/plants and the recipient groundwater" (Central Pollution Control Board, 2019)".

The "Central Pollution Control Board stated that the treated effluent should meet the prescribed standard for irrigation under environment (protection) Rules, 1986. The effluent should also conform to Total Dissolved Solid (TDS)-

2100 mg/1 and Sodium Adsorption Ratio (SAR) - preferably less than 18 but not more than 26, depending on soil/ crop type, besides meeting any other parameters suggested by agricultural scientist or agricultural university/ institute in the IMP".

Need for the Study

"The demand for food will grow as India is expected to become the first populated country in 2050 in the world. The demand for food was expected to increase to 301 million tonnes by 2019-20 and to 330 million tonnes by 2029-30". "The total demand in 2029 - 30 will consist of 126.14 million tonnes of rice, 144 million tonnes of wheat, 20.57 million tones of coarse grains and 51.40 million tones of pulses". The "total food grains demand in 2029-30 would be by 63.18 percent over the base year's level". To meet the growing demand for food grains, it is not possible to increase the area under cultivation for food crops, which showed negative growth from the year 1970 onwards. The other option available to increase the food grains production to feed the population is to increase the productivity of food grains. Without protecting the environment and water resources, the agricultural production and productivity could not be sustained to meet the growing demand for food. Therefore, it is necessary to evolve appropriate policy measures for protecting water resources and increase the agricultural production. In this backdrop, an attempt was made to analyse the causes of water pollution and its impact on land value in selected taluk of Tiurppur district.

The following are the specific objectives of the study;

Objectives

- To identify the causes and consequences of water and soil pollution in the study area
- To study the impact of water and soil pollution on land value of farm households

Hypotheses

The following null hypotheses were tested

- Water and soil pollution were independent of causes of water and soil pollution
- Land value of farm households in polluted area is independent of pollution factors.
- Land value of farm households in non-polluted area is dependent of pollution factors.

Methodology

The present study was conducted in Tiruppur District.As the study was based on primary data, the sample farmers in Tiruppur district were selected through multistage sampling techniques. In the first stage, the nine revenue villages (taluks) in "Tiruppur district were selected. The nine revenue villages are Tiruppur North, Tiruppur South, Avinashi, Uthukuli, Palladam, Dharapuram, Kangayam, Udumalpet and Madathukulam". As the industrial wastes are mainly dumped into the Noyyal river and Noyyal river is the major pollutant of water and soil, the taluks located nearby Noyyal river were considered. "Noyyal river is flowing through Tiruppur North, Tiruppur South, Avinashi, Uthukuli, Kangayam and Madathukulam taluks". In the second stage, the above taluks were identified for the study. "Among the above taluks, the number of dyeing and bleaching units concentration was less in the taluks of Avinashi and Madathukulam compared to Tiruppur North, Tiruppur South Uthukuli and Kangeyam taluks. Therefore, the Avinashi and Madathukulam taluks were excluded from the study".

Among the above selected taluks, Kangeyam taluk was selected as the Noyyal river effluents are dumped in the Orathupalayam dam which is located in the Kangeyam taluk. In Kangeyam taluk, the pollution affected villages were Tammarettipalayam, Maravapalayam, Keranur and the pollution not affected villages were Mangala Patti, Nathakadiyur and Mullaipuram. In the next stage, the size of farmers cultivated in pollution affected area and non-polluted area were decided based on the proportion of farmers cultivated in polluted area to non-polluted area. Accordingly, in "Kangeyam taluk, 52.94 percentage of farmers in polluted area and 47.06 percentage of farmers in non polluted area were decided. In total, 63 farmers in polluted area and 56 farmers in non-polluted area were selected based on proportionate sampling technique".

Period of the Study and Theoretical Approach

The period of the study was confined to the crop year of 2019-20. The present study is based on the theory of externality and imperfect market given by Pigou in his book 'The Economics of Welfare'. Based on the theory, it was assumed that water pollution factors would affect production and consumption decision of farmers in polluted area alone. In non-polluted area, pollution factors were assumed to be independent of production and consumption of farmers. The empirical model of present study is constructed based on the theoretical assumptions of imperfect and disequilibrium market condition and selectivity bias.

Five point rating scaling technique was used to measure the causes and consequences of water pollution. The causes of water pollution, identified in the study area were based on the earlier studies (Dhivya 2016 and Priya, 2018) and survey responses of farmers. They are listed below.

1. Textile industrial waste disposal in the nearby water bodies
2. Textile industrial waste disposal in the underground
3. Mixing of domestic waste in the water bodies.
4. Pumping the industrial waste in the farm land
5. Partial treated waste water mixed in water bodies

For measuring the above causes of water pollution, the score values were allotted as under
Strongly agree – 5, agree – 4, neutral -3, disagree -2 and strongly disagree –1

Water and Soil pollution equation

Earlier studies (Akilan, 2016, Dhivya, 2016 and Priya, 2018) identified 'textile industrial waste disposal in the nearby water bodies', 'textile industrial waste disposal in the underground', 'mixing of domestic wastes in the Noyyal river', 'pumping of industrial waste in the farm land'

and ‘partial treated waste water mixed in water bodies’ as the reasons for water pollution. They reported that the above mentioned factors were the determinants of water pollution. In the present study, the above factors were included as the determinants of water and soil pollution and the above factors were included in the water and soil pollution equation.

The water and soil pollution equation was specified as probit model. The form of the water and soil pollution equation specified in the study was

$$G^* = \gamma z + \varepsilon$$ (Federet al., 1990 and Foltz, 2004)

where G = probability of land holding being water and soil polluted

γ = parameter co-efficient

Z = ‘Textile industrial waste disposal in the nearby water bodies’, (Score value), ‘textile industrial waste disposal in the underground’(Score value), ‘mixing of domestic wastes in the Noyyal river’ (Score value) ‘pumping of industrial waste in the farm land’ (Score value) and ‘partial treated waste water mixed in the water bodies’(Score value). □ is a random disturbance term.

If G*>0, the land holding of farmers is water and soil polluted. With the above formulation, the probability that the land holding became water and soil polluted (G*>0) can be written as

$$\text{prob}(G^*>0) = \text{probability}(\gamma^1 z + \varepsilon > 0).$$

Assuming □ has a standard normal distribution [N(0, 1)], the log likelihood function for a probit model is

$$\ln L = \sum_{G_i=0} \ln(1-\phi_i) + \sum_{G_i=1} \ln \phi_i$$

where □ is the standard normal distribution evaluated at □ ' z (Foltz, 2004).

The probit model was also used by He and Perloff, (2016), Dhivya, (2016) and Priya, (2018) to measure the probability of land holding being water and soil polluted.

A positive estimated co-efficient, □ signifies a characteristic which increases water pollution. The factors such as ‘textile industrial waste disposal in the nearby water bodies’, ‘textile industrial waste disposal in the underground’, ‘mixing domestic wastes in the water bodies’, ‘pumping of industrial waste in the farm land’ and ‘partial treated waste water mixed in the water bodies’ were the industrial factors causing water and soil pollution. They were expected to have positive relationship with water pollution (He and Perloff, 2016, Dhivya, 2016 and Priya, 2018).The above analysis was carried out through LIMDEP 7.00 computer package.

Two stage Hedonic Model

The earlier studies such as Devi, et al. (2008) and Appasamy and Nelliyat (2001) reported that the dyeing industrial wastes polluted the water. The polluted water affected the land in which the crops could not grow. Therefore, the value of land had come down. Hedonic model was used to assess the value of agricultural land based on prices of attributes (Sekar, 2001). In the current study, the land value equation was specified as the hedonic model to assess the value of land attributed by the buyers based on the selected economic and environmental factors. In the land value equation and hedonic model, the factors such as pollution factor area irrigated, distance of farm land to main road and distance of farm land to Noyyal river were included as the determinants of value of land based on the earlier studies (Deviet al., 2008, Devi and Gandhimathi, 2015). Pollution factors such as 'textile industrial waste disposal in the nearby water bodies', 'textile industrial waste disposal in the underground' were expected to influence the land value of farmers in polluted area and not expected to influence the value of land in non-polluted area based on the assumption of the theory. The above assumption created market imperfection and disequilibrium market condition. It caused sample selection problem to analyze the impact of water pollution on land value.

According to Madalla (1983), Heckman model is more suitable for analyzing the problem of disequilibrium market condition and sample selection. In the current study, Heckman model was specified in two regimes of polluted and non-polluted area. When the Heckman model was specified in land value equation of both polluted and non-polluted area, the model became endogenous switching regression model which was estimated based on two stage least square method. The endogenous switching regression model could also be a solution for the problem of selectivity bias. Koundouri and Pashardes (2000) also specified the land value function with selectivity bias and assessed the impact of environmental factors on land value. According to them, Hedonic valuation of quality attributes can be misleading when the assumption that attributes are exogenous to sample selection is violated.

Following the discussion in Maddala (1983), the relevant structure of the Heckman model with self-selection specified to estimate the land value equations for the farmers in polluted and non-polluted area were

$$y^p_{ii} = \beta^p x_i + \delta^p pf_i + V^p_i \text{ if } y'Z_i + \varepsilon > 0$$

$$y^n_{ii} = \beta^n x_i + V^n \text{ if } y'Z_i + \varepsilon = 0$$

where the above equation is the standard probit estimation of whether the land is water polluted and non-polluted. The above equations were the reduced form land value equations. The parameters of the probit equation can only be estimated up to proportionality constant. Hence it was assumed that the variance of the random disturbance terms would be one: variance (□i) =1.

The specified land value equation for the farmers in polluted area was

$$y^p_{1i} = a^p x_i + \delta^p pf_i + \beta \sigma_{p\varepsilon} \lambda_p(\alpha).$$

The land value equation for the farmers in non- polluted area was

$$y_1^n = a^n x_i + \delta^n pf + \rho_{n\varepsilon} \sigma_n \lambda(\alpha)$$

where Y_1 = value of land (in Rs.), X_i =area irrigated (in hectares), distance of farm land to main road (in kilometers), distance of farm land to Noyyal river (in kilometers). pfi = pollution factors 'textile industrial waste disposal in the nearby water bodies' (Score value), 'textile industrial waste disposal in the underground' (Score value) in Tiruppur north, Uthukuli, Kangeyam and all taluks and industrial wastes in the underground(Score value) in Tiruppur south taluk. The land value equation in the non-polluted area was estimated as counter factual equation. The pollution factors such as 'textile industrial waste disposal in the nearby water bodies' and 'textile industrial waste disposal in the underground' were expected to influence the land value in polluted area and were not expected to influence the land value in non-polluted area. Other factors such as area irrigated, distance of land from the main road and distance of land from the Noyyal river were expected to influence the land value of farmers in both polluted and non-polluted area.

ρ_{p_ε}= correlation between error terms in land value equation of farmers in polluted area and probit equation.

$\rho_{n\varepsilon}$ =correlation between error terms in land value equation of farmers in non- polluted area and probit equation.

σ_p =st andard deviation of land value equation associated with farmers in polluted area

σ_n = standard deviation of land value equation associated with farmers in non-polluted area

λ = Inverse mills ratio evaluated at α

The combination of the variables such as the area irrigated, distance of farm land to main road, distance of farm land to Noyil river and pollution factors, 'textile industrial waste disposal in the nearby water bodies', in Tiruppur north, Uthukuli, Kangeyam and all taluks and 'textile industrial waste disposal in the underground' in Tiruppur south taluk gave optimum solution to the model. The above equations were estimated with double log specification. Along with water and soil pollution equation, the land value equation was estimated (probit equation) simultaneously.

Results and Discussion

Causes of Water and Soil Pollution

The "earlier studies had identified the determinants of water pollution. Akilan, (2016), Dhivya,(2016) and Priya, (2018) identified 'Textile industrial waste disposal in the nearby water bodies', 'Textile industrial waste disposal in the underground', 'mixing of domestic wastes in the water bodies', 'pumping the industrial wastes in the farm land' and 'partial treated waste water mixed in the water bodies' , as the causes of water pollution". The above factors were responded as the causes of water pollution in the study area in the pilot study.

I. Causes of Water and Soil Pollution

The causes of water pollution were given in the form of statements based on the earlier studies (Akilan, 2016, Dhivya, 2016 and Priya, 2018) and pilot study. The statements were

- Textile industrial waste disposal in the nearby water bodies
- Textile industrial waste disposal in the underground
- Mixing of domestic wastes in the water bodies
- Pumping the industrial wastes in the farm land
- Partial treated waste water mixed in the water bodies

The farmers were asked to respond their opinion in a five point rating scale on the causes of water and soil pollution. The following score values were assigned to measure the opinion of the farmers;
Strongly agree-5, agree-4, neutral-3, disagree-2, strongly disagree-1.

The scores assigned by the farmers on the causes of water pollution are given in Table 1.

Table-1
Causes for Water and Soil Pollution
(Scores)

Taluks / Causes	Kangeyam	
	Polluted	Non-Polluted
Textile industrial waste disposal in the nearby water bodies	4.1881	3.2772
Textile industrial waste disposal in the underground	3.6337	3.2871
Mixing of domestic wastes into the water bodies	4.2673	3.3069
Industrial wastes in the farm land	3.6832	2.9109
Partial treated waste water mixed in the water bodies.	4.5248	3.3860

Source: Field Survey, 2019-20.

The findings revealed that in polluted area, the farmers strongly agreed the causes of water pollution such as ‘mixing of domestic wastes in the water bodies’ and ‘partial treated water mixed in water bodies’. Moreover, the farmers in the polluted area agreed the causes ‘textile industrial waste disposal in the nearby water bodies’, ‘textile industrial waste disposal in the underground’ and ‘pumping of industrial wastes in the farm land’ as the causes of water pollution. In non-polluted area, the respondents ‘did not agree’ the above causes of water pollution in their area and viewed their area was free from water pollution.

Causes of Water and Soil Pollution – Probit Regression Analysis

Probit regression equations were estimated to identify the causes of water and soil pollution. The following causes of water pollution were selected and put into the probit regression analysis.

- Textile industrial waste disposal in the nearby water bodies
- Textile industrial waste disposal in the underground
- Mixing of domestic waste in the water bodies
- Industrial wastes in the farm land
- Partial treated waste water mixed in the water bodies

The results of probit regression analysis showing determinants of water and soil pollution are shown in Table 2.

Table-2

Determinants of Water and Soil Pollution in Kangeyam Taluk – Probit Regression Analysis

Causes	Probit Regression co-efficients	t-value
Constant	6.2221***	5.911
Textile industrial waste disposal in the nearby water bodies	0.7968**	1.985
Textile industrial waste disposal in the underground	0.5072*	1.876
Mixing of domestic wastes in the water bodies	0.7257	1.162
Pumping the industrial wastes in the farm land	0.2695	0.656
Partial treated waste water mixed in the water bodies	0.8500***	2.956
Log likelihood function	41.58706	
Chi-square	81.3829**	
Model Prediction	84.03 percent	
N	119	

Source: Field Survey, 2019-20. Note: * Significant at 10percent level, ** Significant at 5 percent level, *** Significant at 1percent level

Among the selected factors, 'textile industrial waste disposal in the nearby water bodies', 'textile industrial waste disposal in the underground and 'partial treated waste water mixed in the water bodies' turned out to be statistically significant to influence the water pollution in Kangeyam taluk. The estimated probit regression co efficient turned out to be positive which showed that increase in 'textile industrial waste disposal in the nearby water bodies', 'textile industrial waste disposal in the underground and 'mixing of partial treated waste water mixed in the water bodies' would increase the probability of water pollution in Kangeyam taluk. The estimated probit regression equation was statically significant (chi square

81.3829) and the water and soil pollution equation in Kangeyam taluk was predicted by 84.03 percentage by the selected causes.

II. Impact of Water Pollution on Land Asset – Hedonic Model

The dyeing industrial wastes polluted the water and land reported by Devi et al. (2008) and Appasamy and Nelliyat, (2001). Water pollution adversely affected the growth of the crops and the value of land. In this section, an attempt was made to analyse the impact of water pollution on land value. In the present study, the value of land was assessed based on the selected socio economic factors and the land value equation was specified as hedonic model. The pollution factors viz., 'textile industrial waste disposal in the nearby water bodies', in Tiruppur North, Uthukuli, Kangeyam and all selected taluks, 'textile industrial waste disposal in the underground', in Tiruppur south taluk, 'area irrigated', 'distance of farm land to main road' and 'distance of land to Noyyal river' in which dyeing industrial wastes are disposed, were reported as the determinants of the value of land based on the earlier studies (Chandrasekaran, 2007, Devi,et al., 2008 and Devi and Gandhimathi, 2015). Therefore, the above factors were included in the land value equation of hedonic model. They gave optimum solution to the model.

The factors such as 'distance of farm land to Noyyal river' and 'area irrigated' were expected to be positively related with value of land among the above selected factors. The 'distance of land to main road' was expected to be negatively related to the value of land. The pollution factors were expected to influence the land value in polluted area. The same pollution factors in non polluted area were not expected to affect the value of the land. In the present study, the hedonic models in both polluted and non-polluted area were specified as Heckman sample selection model (Detailed discussion is given in Chapter III Methodology) based on the study of Koundouri and Pashardes, (2000). He specified the land value equation as Heckman sample selection model with selectivity bias and assessed the impact of environmental factors on land value. According to them, hedonic valuation can be misleading when the assumption of exogenous to sample selection is violated. In the current study, the land value function was specified as Heckman sample selection endogenous switching regression model. The land value equation was estimated based on two stage least squares method. Both the land value equation and water and soil pollution equation were estimated simultaneously.

Table -3

Estimated Hedonic Model on Land Assets in Kangeyam Taluk– Two Stage Least Squares Regression Analysis

Variables	**Two stage least squares regression Coefficients**	
	Polluted Area	**Non – Polluted Area**
Constant	13.8040*** (147.966)	14.2012*** (14.220)

Textile industrial waste disposal in the nearby water bodies	- 0.6620** (2.462)	-0.5643 (-0.886)
Area irrigated	0.1572* (-1.623)	0.2543 (0.309)
Distance of farm land to main Road	-0.2770*** (23.178)	-0.5573*** (4.648)
Distance of farm land to Noyyal river	0.4275** (-2.155)	0.2989** (-2.215)
Lambda	-0.4245 (-1.185)	-0.4759** (-2.147)
Correlation between error terms in land value equation and water and soil pollution equation (Rho)	-0.5212	-1.0000
N	63	56

Source: Field survey 2019-20. Note: *** - Significant at 1 percent. ** Significant at 5 percent. * Significant at 10 percent. Figures in parentheses denote t-values

In the polluted area of Kangeyam taluk, among the selected factors, all the selected variables such as 'textile industrial waste disposal in the nearby water bodies', (at 5% level), area irrigated (at 10% level), distance of farm land to main road (at one percent) and distance of farm land to Noyyal river (at five percent) were statistically significant to influence the land value in Kangeyam taluk. Among the significant factors, 'textile industrial waste disposal in the nearby water bodies' and 'distance of farm land to the main road' had negative relationship with land value. Area irrigated and distance of farm land from the Noyyal river had positive relationship with land value. Increase in area irrigated and distance of farm land from the Noyyal river had increased the land value in Kangeyam taluk.

In the non polluted area of Kangeyam taluk, distance of farm land from the main road and distance of farm land from Noyyal river had turned out to be statistically significant to influence the land value. Among the significant factors, distance of farm land from the main road had negative relationship with land value. Distance of farm land from the Noyyal river had positive relationship with land value. Increase in the distance of farm land from the Noyyal river had increased the land value.

The selectivity variable lamda was statistically significant for the non polluted area while it was statistically insignificant in the polluted area. It revealed the presence of selectivity bias in the non polluted area and absence of selectivity bias in the polluted area.

Conclusion

Among the significant factors, 'textile industrial waste disposal in the nearby water bodies' and 'distance of farm land to the main road' had negative relationship with land value. Area irrigated and distance of farm land from the Noyyal river had positive relationship with land value. Increase in area irrigated and distance of farm land from the Noyyal river had increased the land value. In the non polluted area, distance of farm land from the main road and distance of farm land from Noyyal river had turned out to be statistically significant to influence the land value. Among the significant factors, distance of farm land from the main road had negative relationship with land value. Distance of farm land from the Noyyal river had positive relationship with land value. Increase in the distance of farm land from the Noyyal river had increased the land value.

The selectivity variable lamda was statistically significant for the non polluted area while it was statistically insignificant in the polluted area. It revealed the presence of selectivity bias in the non polluted area and absence of selectivity bias in the polluted area.

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