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Agricultural Pollution Visualization under Multilevel Grid

Khadiah Mansour*

Jimma University, Ethiopia

**corresponding author*

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Abstract: At present, the pollution of rural industries is serious, the development of rural industries is more harmful to the rural environment and agricultural resources, and the sustainable, healthy and stable development of rural areas is threatened. This paper aims to study the visualization of agricultural pollution under the multi-level grid. The research of this paper starts from sorting out the theories related to the rural environment, summarizes and analyzes the survey results of the current situation of rural industrial pollution, and summarizes the reasons for the increasing rural industrial pollution on the basis of the investigation and analysis of the damage to farmers' environmental rights. and in-depth analysis. On the basis of previous research, this paper takes discourse analysis and social network analysis as the theoretical support, and uses the visualization method as the method for presenting the analysis results. On the basis of understanding the pollution situation of agricultural waste discharge, emission intensity, pollution sources, etc., analyze the factors affecting farmers' pollution behavior and willingness to pay, and put forward some suggestions for residents' life, management measures, livestock and poultry, aquaculture, agricultural production, etc. Experiments have shown that the annual COD pollution factor in a certain province has been greatly reduced to about 1.4 million tons in recent years.

1. Introduction

With the attention and control of point source pollution, more and more attention has been paid to the harm caused by agricultural non-point source pollution to the water environment. Compared with point source pollution, non-point source pollution has the characteristics of wide pollution range, hidden harm, and complex production process, so it is more difficult to monitor and control. In the United States, the surface water pollution caused by agricultural production reaches more than 60%, and the contribution rate of total nitrogen and total phosphorus from agricultural non-point source pollution in Denmark, Sweden, Finland and other countries to the water environment pollution has reached more than 50%. The research on local water bodies such as Huaihe River Basin, Three Gorges Reservoir Area and Poyang Lake in my country shows that agricultural production contributes greatly to water environment pollution. According to the "First National Pollution Source Census Bulletin", the total nitrogen and total phosphorus emissions from agricultural sources accounted for 57.2% and 67.3% of the national total nitrogen and phosphorus emissions, respectively. Therefore, the breadth and intensity of agricultural non-point source pollution have to attract attention [1-2].

In the research of agricultural pollution visualization under the multi-level grid, many scholars have studied it and achieved good results. For example, Biswas G has carried out related research and applications, and the technical level of visualization is changing from post-processing to post-processing. The progress of interactive control and real-time tracking, combined with virtual reality, optical fiber high-speed network, high-performance graphics workstation, supercomputer, etc., is an important direction of technology development in this field [3]. The theories related to environmental rights described by Menossi and Matías mostly start from the ecological environment [4].

The research of this paper starts from sorting out the theories related to the rural environment, summarizes and analyzes the survey results of the current situation of rural industrial pollution, and summarizes the reasons for the increasing rural industrial pollution on the basis of the investigation and analysis of the damage to farmers' environmental rights and in-depth analysis. The research of this paper starts from sorting out the theories related to the rural environment, summarizes and analyzes the survey results of the current situation of rural industrial pollution, and summarizes the reasons for the increasing rural industrial pollution on the basis of the investigation and analysis of the damage to farmers' environmental rights and in-depth analysis. On the basis of previous research, this paper takes discourse analysis and social network analysis as the theoretical support, and uses the visualization method as the method for presenting the analysis results. On the basis of understanding the pollution situation of agricultural waste discharge, emission intensity, pollution sources, etc., analyze the factors affecting farmers' pollution behavior and willingness to pay, and put forward some suggestions for residents' life, management measures, livestock and poultry, aquaculture, agricultural production, etc.

2. Research on Agricultural Pollution Visualization under Multi-Level Grid

2.1. Research on the Behavior of Farmers

Farmers are not only the main body of agricultural production, but also the direct executors of agricultural non-point source pollution. In recent years, research on farmers' behavior has gradually received attention. The impact of policy measures, etc. on source pollution.

The research on the behavior of farmers in my country started relatively late. The investigation of farmers' production materials (pesticides, fertilizers, agricultural film, etc.) and farmers' living habits in the Danjiangkou Reservoir area showed that farmers' cognition is affected by factors such as their educational level and political outlook. The influence of farmers' awareness of organic fertilizer, excessive application of chemical fertilizers, and agricultural non-point source pollution on their willingness to control is a negative standardized path, which is mainly related to the fact that farmers in the study area pay attention to economic interests and ignore the environment [5-6].

2.2. Quantitative Accounting Method of Agricultural Non-Point Source Pollution

The methods of quantitative accounting of agricultural non-point source pollution mainly include model simulation method, quantitative analysis method based on comprehensive investigation, and index substitution method. For the model simulation method, ANSWERS, CREAMS, CNS, SWAT and other models are widely used in China. The mechanism of agricultural non-point source pollution is related to the terrain, vegetation, soil types, rainfall runoff, land use methods, etc. in the study area. Therefore, the model's It is supported by a large amount of data such as experimental detection data, meteorological and hydrological data, and land use methods. Most of the models are suitable for research on farmland areas and small watersheds. For large-scale area research, the use of mechanism models for monitoring costs is high, and most basic data are difficult to obtain. Feasibility is low. Based on the quantitative analysis method of comprehensive survey, domestic scholars have applied this method to agricultural non-point source pollution surveys in key watersheds and small watersheds, and this method has been further extended to the analysis of agricultural non-point source pollution across the country. The disadvantage of non-point source pollution is that the uniform loss coefficient is applied to different regions under different natural conditions, and the accuracy is not high. The index substitution method, such as the use of pesticides, chemical fertilizers, agricultural film and other application rates to replace agricultural non-point source pollution, ignores the impact of agriculture and non-point sources on the water environment [7-8].

2.3. Model Construction

In this paper, a total of four treatment methods, such as domestic waste water, domestic waste, straw, livestock and poultry manure, etc., are respectively established to establish regression models to analyze the behavioral factors of farmers. The dependent variable of the model is the treatment methods of waste water, domestic waste, straw, livestock and poultry manure, etc. by farmers. In order to make the model comparable, a certain treatment method needs to be defined as a control. The independent variables of the model are individual characteristics of farmers and economic variables [9-10].

The multinomial logistic regression model formula is:

$$LogitY\sum_{i}=\left[\frac{p(Y=iX)}{p(Y=0X)}\right]=b_0+\sum_{i=1}^{n}b_j x_j, i=1,2,3,4K \tag{1}$$

Logistic regression model linear mode:

$$In\left(\frac{p_i}{1-p_i}\right)=\alpha+\sum_{i=1}^{m}\beta_i x_i \tag{2}$$

2.4. Visualization System Construction

During the development process using Flex+Java+BlazeDS, the current data information in the client is out of sync with the database, and when it needs to be updated, the refresh technology usually used is:

Server push method: After the server side receives the request that the client needs to update, the server side pushes the data to the client side, and the client side refreshes passively when listening to the data. This method avoids the defect of the client's active polling and refresh, so that the data can be updated in real time; and this refresh strategy will only occur in the local part of the client that needs to be updated, which largely maintains the original view. stability, so that the updated parts that generate updates can be clearly and strikingly reflected on the client. The data push process of this refresh method is shown in Figure 1 below [11-12]:

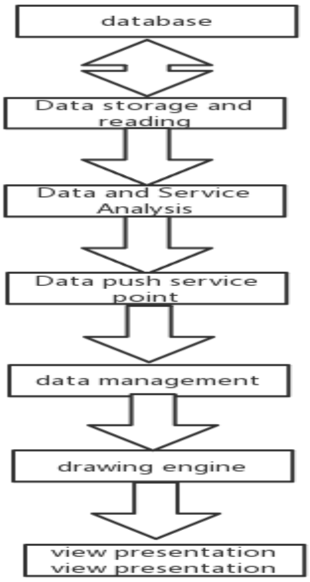

Figure 1. System flow diagram

3. Design Experiment of Agricultural Pollution Visualization Research under Multi-Level Grid

3.1. Factors Affecting Farmers' Willingness to Pay

The control and governance of agricultural non-point source pollution is inseparable from the guarantee of funds. For example, in order to prevent farmers from randomly dumping or incinerating domestic waste, it is necessary to provide necessary garbage collection equipment, so that farmers can centrally dispose of garbage, and rural garbage is collected in villages and transported in towns. The implementation of the "county handling" policy is inseparable from the support of human and financial resources. It is not enough to rely on the strength of the government. It is necessary and responsible for farmers to make contributions to rural environmental governance. Consciousness three aspects, using the binary logistic regression model combined with the survey data of 1720 households in Henan Province, to analyze the influencing factors of farmers' willingness to pay. Agricultural non-point source pollution has a wide range of sources, and it is not enough to inquire farmers about governance as a whole. Therefore, this paper starts with the willingness to pay for domestic waste treatment in non-point source pollution.

3.2. Experimental Design

This paper conducts experiments on the visualization of agricultural pollution under the multi-level grid constructed in this paper. The first is to carry out statistical analysis on the overall pollution situation of agricultural pollution. The main purpose is to count and analyze the annual emissions of the three pollution factors. The second is to conduct statistical analysis on farmers' perception of pollution, and conduct visual research on agricultural pollution from multiple perspectives.

4. Experimental Analysis of Agricultural Pollution Visualization Research under Multi-Level Grid

4.1. Total Pollution Discharge

This paper makes statistics on the emission of agricultural non-point source pollution in a province in the past five years, mainly on the annual emissions of COD, TN, and TP3 pollution factors. The data are shown in Table 1.

Table 1. Changes of the discharge of the three pollutants over the years

	2016	2017	2018	2019	2020
COD	160.34	157.67	155.77	154.08	147.23
TN	77.36	76.51	74.82	75.84	74.05
TP	8.38	8.42	8.36	8.43	8.35

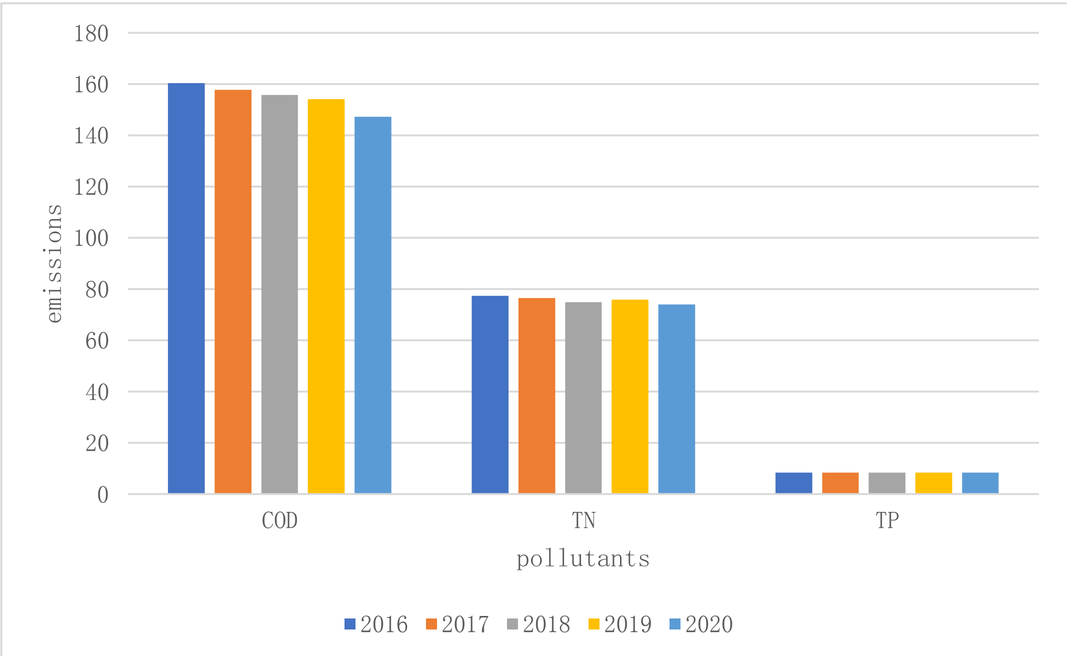

Figure 2. Total emission of agricultural non-point source pollution in the past five years

As can be seen from Figure 2, from the perspective of the emission of agricultural non-point source pollution in the past five years, the average annual emissions of the three pollution factors of COD, TN, and TP from 2005 to 2014 were 1.5837 million tons, 764,800 tons, and 82,700 tons, respectively. Ton. From the overall change trend, COD and TN showed a decreasing trend, and TP showed an increasing trend.

4.2. Farmers' Perception of the Current Situation of the Environment

Environmental cognition and attitude are people's subjective perception and active response to changes in the ecological environment. In this paper, villagers in a certain place are invited to evaluate the pollution degree of the village where the enterprise is located, and they are arranged according to the different educational backgrounds of the farmers. The data are shown in Table 2.

Table 2. The awareness of the overall water environment among farmers with different educational levels

	Illiterate or semi-illiterate	Primary school	Junior middle school	Senior middle school	College degree or above
Very clean	10	25	40	20	2
More clean	20	70	160	80	20
Some pollution	30	80	140	70	5
Severe contamination	5	20	20	10	1

As can be seen from Figure 3, from the perspective of the educational level of the farmers, the farmers with the education level of junior high school and above are more optimistic about the surrounding water environment than the farmers of primary school and below. The reasons for this trend can be analyzed from two aspects: one is It is because the residents with higher education choose to develop in the city and pay little attention to the rural environment, while the residents with lower education mostly choose to work at home and can deeply feel the changes in the environment; The understanding of water environment pollution is simple, and the degree of pollution is only judged from the surface garbage. The higher the education, the more knowledge about the environment, and the deeper the understanding of environmental pollution, not only from the analysis of water quality, but also through the correlation with the general environmental trend. In comparison, they are optimistic about the water environment in their own area.

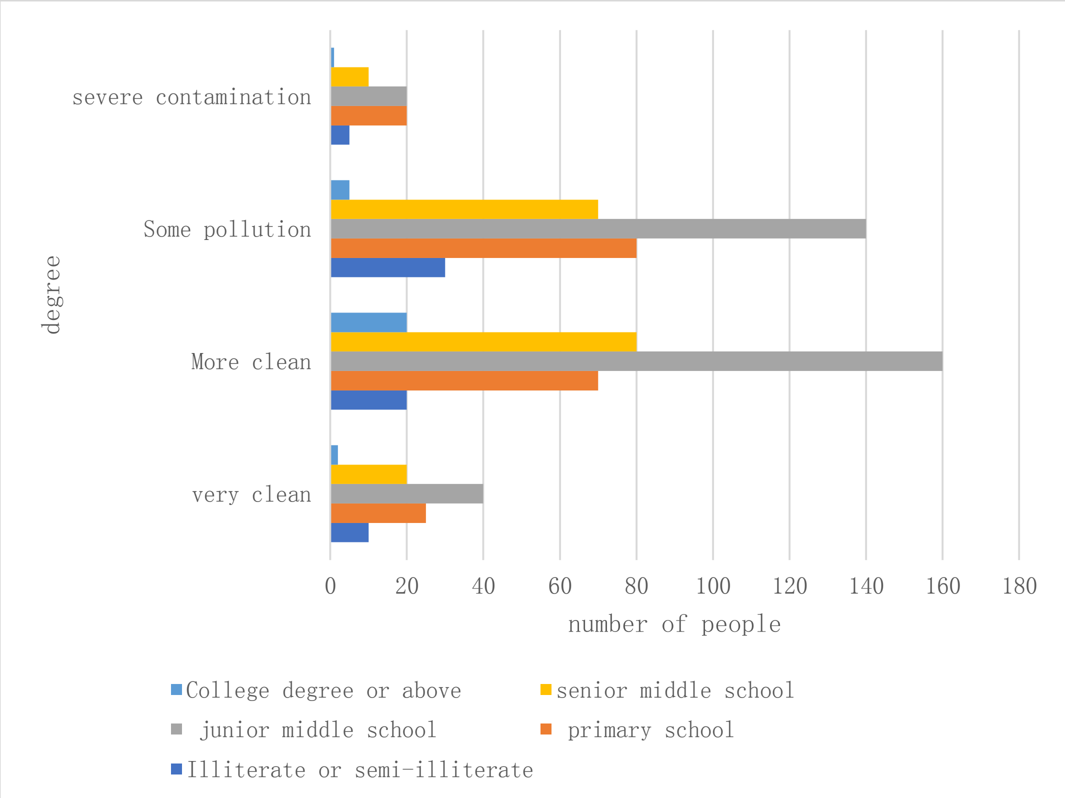

Figure 3. Pollution perception of villagers with different cultural levels

5. Conclusion

With the continuous deepening of informatization construction, the process of business networking has penetrated into all walks of life. The main work and research significance of this paper are reflected in the following aspects: Flex + JAVA + MySql integrated development environment, using its good application in view display, design a set of agricultural pollution visualization model, according to the model to achieve a monitoring, management, control system. In the past, research on agricultural non-point source pollution was mostly concentrated in small watersheds and key water areas. This paper takes a large agricultural province as the research object, not only quantitatively accounting for agricultural non-point source pollution, but also conducting field investigations to understand the real pollution behavior and environmental protection intentions of farmers. Provide suggestions for the control and management of non-point source pollution, and provide theoretical basis for the prevention and control strategies. This paper studies the agricultural pollution visualization system. However, due to personal ability and time issues, the system needs further optimization and improvement. The main points are as follows: There is a certain delay during data update, and it is necessary to further reduce the delay to ensure that real-time. The system currently only opens the clients of the commonly used Windows system, and the clients of Linux and Unix operating systems in the client/server model can be launched in due course.

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Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

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