ISSN: 2710-0170

Study on the Treatment of Rural Wastewater Discharge under the Target of "Double Carbon"

-- Taking Xiaogang Village in Fengyang County as an Example

Tonghan Lin *, Yifan Zhou, Tingyu Zhang, Gaoyuan Zhang, Jia Liang

Anhui University of Finance and Economics, Bengbu 233000, China

*1303786484@qq.com

Abstract

Under the dual carbon background, energy scarcity has become a key factor restricting China's economic development. However, in China's rural areas, there are also problems such as the discharge of farmers' domestic sewage and agricultural production wastewater. In order to solve this problem, Xiaogang Village in Fengyang County is taken as an example to study the current situation and methods of local sewage treatment. Through field investigation and existing rural sewage treatment technologies, we find energy treatment methods that are truly suitable for local use, analyze the reasons and influencing factors that hinder rural sewage treatment in Xiaogang Village, and effectively promote it to sewage and wastewater treatment in other villages in China, Put forward targeted countermeasures and suggestions for the future rural sewage treatment in China. This research is of great significance for promoting the research process of rural sewage treatment, realizing the revitalization of rural agricultural economy and promoting the sustainable development of rural areas.

Keywords

Rural Sewage Treatment; Governance Countermeasures; Bicarbon.

1. Introduction

During the "Fourteenth Five Year Plan" period, emission reduction under carbon constraints has become the focus of future policies. At the end of 2021, the Central Committee of the Communist Party of China and the State Council issued their opinions on the complete, accurate and comprehensive implementation of the new development concept to do a good job of carbon peak and carbon neutralization, and made a comprehensive deployment to promote the realization of carbon peak and carbon neutralization goals. In economic construction, green low-carbon and energy conservation and emission reduction can improve the operational efficiency of different fields and promote their development, thereby enhancing China's international competitiveness. Therefore, the realization of the dual carbon target is of great significance for China's future development and construction.

The 14th Five Year Plan period is also a critical period to accelerate the construction of a modern and beautiful Anhui with strong economy, new pattern, excellent environment, sufficient vitality and rich people. The rural form and pattern have entered a period of rapid evolution and differentiation. Building a beautiful village suitable for living and working is the expectation and requirement of the majority of farmers. According to incomplete statistics, the discharge of domestic sewage in rural areas of China has reached 23 million t/d, and because there is no sewage collection and sewage treatment system, most villages discharge sewage like the outside world at will, seriously affecting the water environment. [1] Therefore, the implementation of the guidance on the implementation of simple approval of village

ISSN: 2710-0170

construction projects jointly issued by relevant national departments and the improvement of rural sewage discharge mechanism are conducive to further promoting rural water pollution control in Anhui Province and other regions.

In recent years, China has made great efforts to control the discharge of sewage. However, in the promotion of urban-rural integration, the poor discharge mechanism of agricultural production wastewater and agricultural domestic sewage in rural areas, the mismatch between the governance mode and the local governance environment, and the lax management mechanism have become the key factors restricting the development of agricultural economy and hindering energy conservation and use under the dual carbon background. The study of rural sewage discharge and treatment is of great significance for achieving rural agricultural economic revitalization and further building a beautiful countryside, as well as promoting the sustainable development of rural areas, which is conducive to the achievement of China's dual carbon goals.

According to the survey, the rural water pollution control in Anhui Province was carried out later than that in other regions, and the control work is still in the construction stage. There are many difficulties in the selection of control methods and the operation and management of facilities. For example, there are blind choices in the control methods, and the control processes do not match the local environment; In terms of facility operation management, there are problems such as lax supervision and lack of professional and technical ability of supervisors. This paper studies these two problems, and puts forward suggestions to solve the above problems and governance optimization programs.

2. Literature Review

There are two aspects of the literature related to the research content of this paper: one is the methods, technology and technical principles for rural water pollution treatment currently available in China; The other aspect is the current domestic and foreign specific facility methods for rural water pollution construction management mechanism under different environments.

With regard to the first aspect of literature, China has made many researches on the treatment of contemporary rural water pollution, and the specific treatment process and technology are still improving and progressing towards green, low energy and high efficiency. At present, the rural sewage and wastewater treatment technologies are ecological treatment technology, biological treatment technology and other treatment technologies. Ecological treatment technologies mainly include artificial wetland technology, stabilization pond technology and land treatment technology. As for constructed wetland technology, up to now, this technology has been widely applied to rural sewage treatment in different regions, and its treatment effect has been confirmed by many scholars. He Juan (2010) studied the feasibility and effectiveness of the application of constructed wetland technology, which was implemented and certified in some southern cities and towns, and has a promising development prospect. [2] Huang Jian (2010) found that in some northern areas, the constructed wetland technology has the advantages of high governance efficiency, good treatment effect, easy operation and management [3]. Zeng Chunxia (2011) found that the simple capillary wetting process, one of its technologies, and stable decontamination effect are also its advantages compared with other processes. [4] Li Jianhua (1922) believed that for stabilization pond technology, one of its types is aerobic stabilization pond, which removes sewage through aerobic microorganisms brought by photosynthesis of algae. The current research shows that the removal rate of ammonia nitrogen in the pond reaches 87.5%. [5] Zhao Xuemin (2010) improved the technology of stabilization pond. The removal rates of major pollutants in water, such as COD and TP, reached 71.25% and 48.68%, which proved that the new stabilization pond system was effective. [6] Duan Qiangqiang and other scholars (2012) believe that for land treatment technology, current

ISSN: 2710-0170

research shows that this technology is technically feasible, cost control is effective and management is convenient, and the water quality after sewage treatment can meet the national Class A standard. [7] Li Nan (2012) found that the purification degree and effect of land treatment technology on phosphorus, COD are good, among which the removal rate of COD reaches 82.9%, which has a good application prospect. [8] Biological treatment technology mainly includes aerobic biotechnology and anaerobic biotechnology. Zhang Qianqian (2014) believes that for aerobic organisms, the technical principle is that microorganisms treat the components of organic pollutants as nutrients for oxidative decomposition. [9] Some scholars have studied the treatment of urban and rural sewage by biological turntable and found that the pneumatic biological turntable can effectively remove pollutants in the water, and the COD of its effluent can even meet the national first-class A standard. As far as anaerobic biotechnology is concerned, Huang Haifeng et al. (2015) believed that compared with traditional aerobic organisms, it has the characteristics of small floor area, low operating cost and less excess sludge, and the removal rate of major water pollutants is also high. [10] Other treatment technologies include micro electrolysis, membrane biotechnology, purification tank technology, etc. For micro electrolysis, Chen Yuefang (2012) studied the degradation of pesticide wastewater by enhanced micro electrolysis, and the removal effect of COD is good. [11] Zhang Yiwen (2015) studied the removal of nitrate from drinking water by ferric carbonate electrolysis, and found that the concentration of nitrate can be reduced by 64%, with good effect and good development prospects. [12] As for membrane biotechnology, Liu Lin et al. (2005) studied the effect of two-stage biofilm membrane bioreactor on wastewater treatment, and the results showed that the COD removal rate could reach 95%, the effect was stable and the removal rate was very good. [13] As for the purification tank technology, it originated in Japan, so some Japanese scholars are relatively rich in this research. Deng Furong (2013) found that the soil purification tank technology occupies a small area, which is 2/3 of the constructed wetland technology, so it is very suitable for China's wastewater treatment situation. [14] The above are the current sewage treatment methods in China, and better rural sewage treatment technologies and processes need to be found.

With regard to the second aspect of the literature, there have been several models for the rural sewage construction management mechanism in China and abroad, and the management methods that conform to the national conditions and geomorphic environment are also being used for reference. He Haiyan (2018) introduced that China's rural sewage treatment operation modes are mainly divided into three types: first, the government construction mode; Second, the government purchase model; Third, the government and social capital cooperation model, referred to as PPP model. The first mode meets the needs of rural sewage treatment operation in terms of technology and management, but it is very difficult for most rural governments to have financial capacity. The second mode of rural sewage treatment cannot mobilize social labor to participate in the treatment. The third mode has a large demand for funds and a high tolerance requirement for the return period of investment, which is difficult for ordinary enterprises to bear. Generally, only enterprises with strong capital are willing to bear, and the risk is also high. [15] Shen Zhe et al. (2013) found that government agencies, some enterprises and organizations, and users were jointly responsible for wastewater treatment in Japan. They will adopt different management and subsidy methods for different types of sewage treatment modes. At the same time, the stepped charge for sewage discharge volume is regularly and compulsorily checked and supervised the sewage discharge status, thus ensuring the quality and efficiency of rural sewage treatment in Japan to a large extent. [16] Yan Yan et al. (2008) found that there are also five management models for rural sewage treatment in the United States: first, the household head system; Second, the maintenance contract system; The third is the operation permission system; Fourth, management entity operation and maintenance system; Fifthly, the management entity ownership system. The five management modes are

ISSN: 2710-0170

enhanced with the complexity of sewage treatment and management and the increasing sensitivity to the surrounding environment. [17] Whether it is the past rural sewage treatment management mechanism of China or the management mechanism of Japan, the United States and other countries, it will become an inspiration for the future rural sewage treatment of China.

To sum up, this paper conducts an online and offline survey on the rural sewage treatment in Xiaogang Village, Fengyang County, Anhui Province, using case law and field investigation. Combining the existing rural sewage treatment process, it matches the treatment method of Xiaogang Village, analyzes and solves the obstacles and factors affecting the sewage treatment in Xiaogang Village, finds the most suitable local process technology, and promotes this method to other villages in China, let other villages find methods and paths suitable for local sewage treatment. First of all, this paper starts from the villages with distinctive characteristics, takes them as the starting point, and extends to other village related issues, with clear, specific and other advantages, providing reference for rural water pollution control. Secondly, this paper aims to solve the "optimal" problem of rural sewage treatment, so that different villages can find the most suitable technology for their application, so as to promote green, energy-saving and efficient rural water pollution treatment in China, and implement the dual carbon goal. Finally, this paper integrates the rural sewage treatment management mechanism and management methods of foreign countries with the management mechanism of our country. According to the national conditions of our country, it puts forward comprehensive countermeasures and suggestions for the rural sewage treatment of our country, which is of great significance to help solve the problem of rural water pollution treatment

3. Status Quo of National Rural Sewage and Wastewater Treatment and Analysis of Current Application Technology

3.1. Current Situation of National Rural Wastewater Treatment

With the development of global industry, the level of urbanization and modernization of the country has been continuously improved, and the rural and rural lifestyle has also changed: industrial wastes continue to be generated, and domestic garbage, agricultural wastes and livestock breeding emissions have caused serious water pollution of the rural environment. With the progress of society, the lifestyle of rural farmers is also changing. All kinds of household appliances that will produce sewage are introduced into the countryside, which makes the discharge of rural domestic sewage increase rapidly. In addition, the industrial wastewater discharge of urban enterprises in China shows a growing trend, and a large amount of industrial wastewater is discharged into nearby rivers and farmland without treatment. At the same time, a large number of heavy metal elements and water pollutants exceed the standard, seriously affecting and polluting rural surface water and even groundwater. [18] According to statistics, China's rural areas produce more than 8 billion tons of domestic sewage every year, accounting for half of the country's major pollutants, while 96% of villages do not have drainage channels and sewage treatment systems, causing serious water environment problems. At the same time, about 320 million people have unsafe domestic water. [19] Therefore, rural water pollution has become a key factor restricting rural construction, achieving sustainable development and affecting the health of rural population.

3.2. Current and Popular Rural Wastewater Treatment Technology

The current popular and traditional rural wastewater treatment technologies mainly include ecological treatment technology and biological treatment technology. The following is a brief analysis of the two main technologies.

3.2.1. Ecological Governance Technology

(1) Constructed wetland technology

ISSN: 2710-0170

Constructed wetland is the ground constructed and controlled by people. Its appearance is similar to that of a marsh. Its principle is to transfer rural domestic sewage and wastewater to the corresponding constructed wetland, and the sewage will flow in one direction accordingly. It is mainly a technology that uses the chemical, physical and biological effects of microorganisms to treat rural sewage. The mechanism of action includes precipitation, filtration, adsorption, conversion, etc., so as to achieve the desired effect. The advantage of this process is that it is cheap to build and operate, convenient to maintain and low in technology, and can be replaced by impact on water power and pollution load; Its disadvantage is that it is easy to be interfered by pests and diseases and affected by seasons, and the phosphorus removal rate will gradually decline after a long operation time.

(2) Stabilization pond technology

Before the change of name, the stabilization pond was called an oxidation pond or a biological pond. As the name implies, it uses the oxidation of microorganisms in the pond to treat sewage. The main microorganisms are bacteria and algae. The purification process of this technology is similar to that of natural water bodies. Generally, the land is modified manually to build ponds or ponds, and dikes and impervious layers are set to treat rural sewage. There are many types of stabilization ponds, which can be divided into anaerobic ponds and aerobic ponds according to the types of microorganisms in the ponds and the ways of oxygen supply. The utility model has the advantages of simple structure, low operation cost, realizing water circulation and saving water resources. Its disadvantage is that the area is too large, which is easy to produce odor, and the climate has a great impact on the treatment effect of stabilization pond technology.

(3) Land treatment technology

Land treatment technology is an artificial sewage ecological engineering technology. Its principle is to filter and purify rural sewage by using soil microorganisms in the soil, nutrients and functions in plant roots, and the physical and chemical characteristics of soil to purify sewage. Compared with the former two technologies, it belongs to a relatively small treatment system technology. According to different processing processes, it can be divided into slow filtering and fast filtering. The utility model has the advantages of low investment cost and operation cost, good treatment effect, convenient management and maintenance; Its disadvantage is that it covers a large area, easily pollutes groundwater, and can block the system if not designed properly.

3.2.2. Biological Treatment Technology

Biological treatment technology is a process that uses the metabolism of microorganisms to convert the organic pollutants of aerobic and anaerobic microorganisms in sewage into inorganic substances, and transform harmful pollutants into harmless substances. Microbial species resources are relatively extensive and have strong adaptability to the environment and reproductive capacity, which is one of the advantages of biological treatment technology.

(1) Aerobic biotechnology

Under the condition of sufficient oxygen, aerobic microorganisms treat organic pollutants as nutrients for oxidative decomposition, which is a treatment method to reduce the concentration of pollutants. At present, the methods of aerobic biotechnology for sewage treatment include oxidation ditch, biological rotary table and SBR method. Its advantages are that the process is relatively mature and the general treatment effect is good; Its disadvantage is that the management and maintenance are complex and constant, and the energy consumption is large.

(2) Anaerobic biotechnology

Under the condition of very insufficient oxygen or no oxygen, anaerobic microorganisms can decompose organic matters in rural wastewater and produce carbon dioxide and methane. Its advantages are low operation cost, small floor area and less sludge surplus; Its disadvantages

ISSN: 2710-0170

are strict requirements on ph value, temperature and other environmental conditions, and peculiar smell of effluent. [20]

4. Analysis of Sewage Treatment Schemes in Some Villages in China -- Taking Xiaogang Village as an Example

4.1. Current Situation of Rural Sewage Treatment in Fengyang County

In 2018, Fengyang County implemented the construction of sewage treatment systems in 6 towns and 4 villages, including Xiaogang Village. At the same time, three sewage treatment stations and one sewage lift pump station were built. By 2018, a total of 46 sewage treatment stations and 5 sewage lift pump stations have been built in Fengyang County, with a total scale of 23000 tons/day. According to statistics, the total sewage treatment rate in Fengyang County has reached 96%. By 2021, Fengyang County will further promote rural sewage treatment and decide to open PPP projects, including 33 new sewage treatment plants, with a scale of 9590m3/d; Six sewage pump stations will be built, with a scale of 3900m ^ 3/d. The increase in the number of sewage treatment plants and sewage pumping stations in Fengyang County will help Xiaogang Village achieve the optimization of rural sewage treatment.

4.2. Selection of Sewage Treatment Technology in Xiaogang Village

Xiaogang Village in Fengyang County is located in Chuzhou City, Anhui Province. geographically, Chuzhou City is located in the middle of Anhui Province. The temperature is high in winter, and the climate is cold and hot at the same time. At the same time, Xiaogang Village in Fengyang County, as an advanced development village since the reform and opening up of the People's Republic of China, has better economic conditions, feasible scale and treatment plan than other villages. The following is an analysis of several rural sewage treatment schemes that are suitable for the local geographical environment and economic conditions.

4.2.1. Sewage Treatment Technology of Biogas Digester Stabilization Pond

The technical principle is to purify and treat rural domestic sewage, such as human and livestock fecal sewage, in a biogas digester. After treatment, the supernatant can be filtered by the stabilization pond oxidation pond technology and discharged. It can also be transformed into agricultural crops. The remaining biogas residue can be transformed into long-term fermentation solids after passing through the biogas digester. On the one hand, it can be used for feeding fish in the village pond, and on the other hand, it can be used as compost to transform into agricultural products. When using this technology, attention should be paid to the feces put in and the liquid in the biogas digester should be extracted regularly to ensure the flow environment of the treatment system. The effluent quality of the process technology can reach Lever I Class B of the urban sewage discharge standard.

4.2.2. Anaerobic Tank - High Load Land Infiltration Sewage Treatment Technology

Here, the land infiltration sewage treatment uses the principle of oxidation and decomposition of microorganisms in the soil to decompose sewage into purified water. First, the sewage will be transmitted to the designated artificial infiltration land through a specific underground conduit, then the sewage will pass through the designated land, after a series of adsorption, oxidation and decomposition, and finally the pollutants will be removed to achieve the purpose of purifying sewage. After removal, the water can be recycled by the water pump, and further advanced treatment can also be carried out. This technology is less affected by climate and other environmental factors, and is easy to adjust relevant conditions manually. Its advantages can not only convert rural sewage into clean water, but also save operating funds, beautify the environment and save water resources. During operation and management, the water pump is automatically switched on and off, so manual maintenance is not required. This treatment process technology can also reach Lever I Class B of the pollutant discharge standard.

ISSN: 2710-0170

4.2.3. Solar Micro Power - Constructed Wetland Treatment Technology

This technology requires the energy conversion of solar energy, and is used by villages with rich economic conditions and high requirements for water purification and pollution removal, including nitrogen and phosphorus. According to the survey, the economic conditions of Xiaogang Village are better than other villages in Fengyang County with the help of various national policies, and photovoltaic projects such as new solar energy have been put into production as early as 2021, so Xiaogang Village meets the conditions for the use of this technology.

Firstly, the domestic sewage is collected and passed through the inlet grid well in the sewage treatment station and the internal filter grid to remove the suspended solids in the sewage. Secondly, the treated sewage is transferred to the anaerobic tank, and the organic matters in the sewage are degraded by the oxidation and decomposition of anaerobic microorganisms. At this time, phosphorus will be generated from sewage and sludge containing phosphorus in sedimentation, and released under anaerobic conditions. When ammonia nitrogen is converted into ammonia nitrogen in the solar aerobic tank, it returns to the anoxic tank, and then uses the oxidation decomposition reaction of denitrifying bacteria to reduce nitrogen into nitrogen and release it into the atmosphere, so as to achieve the purpose of removal. Finally, in order to improve the water purification rate and water quality, it is necessary to use the constructed wetland technology to adsorb and filter impurities in the water for discharge. The advantage of this technology is that solar photovoltaic power generation requires no manual management and no electricity. This technology can also reach Lever I Class B of the pollutant discharge standard.

To sum up, the above three sewage treatment technologies are a combination of multiple traditional treatment processes, which are obtained through the investigation of Xiaogang Village's geography, economy, feasibility and decontamination effect. The advantages of the three process technologies are different, but the pollutant emission standard level reached by the system devices is Lever I Class B. Only by selecting the most suitable process with the highest water purification rate can the rural sewage and wastewater problem be treated better. Therefore, these three technologies can be extended to other villages with similar conditions in Anhui Province.

5. Analysis on the Problems Hindering the Promotion of Sewage Treatment in Rural Areas such as Xiaogang Village

5.1. Lack of Supporting Infrastructure for Sewage Treatment

Compared with urban sewage treatment, many rural areas are still difficult to solve the problem of supporting infrastructure for sewage treatment. Most rural areas have a basic understanding of the theoretical knowledge of sewage treatment, but due to the lack of infrastructure such as water purification devices, it is impossible to implement the relevant sewage treatment system. Xiaogang Village is no exception. Although as an advanced village in the country, many sewage treatment technologies have been strongly supported by the country, due to the remote location and lack of resources, many full-time technicians with technical needs are hard to find, and many full-time technical management personnel are unwilling to come to the village to do relevant work. Even if they have water purification devices and cannot maintain them well, they only use the villagers' unprofessional maintenance and management knowledge, not only will the service life of the facilities be shortened, but also the sewage cannot be well treated. Some sewage treatment technologies have good decontamination effect and high efficiency, but most of them require high funds to maintain and operate, and many villages, including Xiaogang Village, are also difficult to accept.

ISSN: 2710-0170

5.2. Poor Awareness of Conservation and Environmental Protection among Rural Villagers

Because people in rural and urban areas have different environments and education since childhood, many villagers are not aware of the impact of rural water pollution on their lives and environment, so they have no awareness of protecting the environment and saving water. Some villagers in Xiaogang Village will use or even waste a large amount of groundwater and surface water, resulting in unreasonable use of groundwater and surface water. Others do not realize the seriousness of the situation, and do not have a sense of prevention. They discharge domestic sewage and human and animal excrement into nearby rivers and farmland at will, but they do not know that they have gradually caused water pollution to the environment. Some villagers use excessive amounts of pesticides and fertilizers in their farming, it not only brings harm to crops but also causes rural water pollution imperceptibly. The sewage discharge is not constructed from the root, which hinders the progress of rural water pollution treatment, and the effect is not satisfactory.

5.3. Unreasonable Selection of Sewage Treatment Technology Mode

With the progress of science and technology in China, more and more rural sewage treatment technologies have been developed, and the water purification rate and effluent quality of sewage purification are getting higher and higher. However, it is not the treatment technology with high purification rate and good effluent quality that is the best technology, but the best technology that best meets the local economic conditions and other comprehensive considerations. For example, the sewage treatment mode does not adapt to the villagers' living habits. In some places, pipe networks and facilities have been built, but villagers often use the yard to sweep and water the vegetable fields, resulting in incomplete sewage collection or even failure to collect sewage. [21] For another example, the technology of combining solar micro power and constructed wetlands has high requirements for rural economic level. Villages with good conditions like Xiaogang Village can accept it, while other villages with poor economic conditions cannot follow suit. The improper choice of these technologies not only failed to manage rural sewage well for a long time, but also brought a lot of burdens to themselves.

5.4. Insufficient Management Level and Overall Planning of Sewage Treatment

The management level of most rural areas, including Xiaogang Village, is lower than that of urban sewage treatment. The sewage treatment industry in China is still in the development stage, and there is no systematic or targeted management method. Moreover, the technical quality of the management personnel for the operation and maintenance of the sewage system needs to be improved, which has become one of the factors hindering sewage treatment. Secondly, the overall planning of rural sewage treatment by cities and counties is not enough, and some regions have not designated special plans and schemes for sewage treatment according to the work instructions of provinces. At the same time, there are also problems such as chaotic treatment sequence and unclear treatment sequence. There is even a lack of project library construction, and some projects are hastily implemented without testing, resulting in poor governance effect. [22]

5.5. Lack of Sewage Treatment Policies, Specifications and Planning Guidance

At present, according to the survey, the implementation standards of local rural sewage treatment are not unified and instructive in all cities in Anhui Province, which is unfavorable for unified supervision, guidance and assessment of the operation and maintenance of facilities. A few regions do not even have governance policies, and blind governance may lead to twice the result with half the effort. At the same time, in some areas, there is no standardized planning guidance document on construction, operation and maintenance, file review and other management, which has caused problems such as slow construction, difficult operation and

ISSN: 2710-0170

difficult maintenance in sewage treatment. Although some cities in some regions have prepared relevant governance and supervision documents, they have not been inspected on the spot and cannot be applied to all villages according to local conditions. Finally, the governance results are uneven and cannot achieve the desired effect. [23]

6. Conclusion and Suggestions

Taking Xiaogang Village in Fengyang County as an example, this paper analyzes the selection of treatment technologies and the obstacles and causes in the process of rural sewage treatment under the background of "dual carbon". Firstly, the current situation of rural sewage treatment in China and some traditional treatment technologies that have been popularized are analyzed; Secondly, in terms of process technology, based on the comprehensive investigation of local economic conditions, geographical environment and other factors, three processes suitable for rural sewage treatment in Xiaogang Village were selected, namely biogas digester stabilization pond sewage treatment technology, anaerobic digester high load land infiltration sewage treatment technology and solar micro power artificial wetland treatment technology. Their governance principles and advantages are analyzed, so that they can be extended to other villages. Finally, the obstacles and influencing factors in the process of sewage treatment in Xiaogang Village and other rural areas were analyzed, and five sewage treatment problems were found, including lack of supporting infrastructure for sewage treatment, weak awareness of saving and environmental protection among rural villagers, unreasonable choice of sewage treatment technology model, insufficient management level and overall planning of sewage treatment, and lack of sewage treatment policies, norms and planning guidance.

Based on the problems that hinder the progress of rural sewage treatment in Xiaogang Village, the following countermeasures are proposed in this paper.

First, strengthen the infrastructure and supporting construction of sewage treatment. Each village can cooperate with agricultural related companies to jointly invest in the purchase of more advanced sewage treatment infrastructure with better water purification effect. The way of selling agricultural products or agricultural service labor in rural areas makes profits for the company, and the company invests part of it to maintain the rural agricultural environment. At the same time, the state should issue corresponding policies to help support the construction of beautiful villages, whether by reducing taxes or granting subsidies, subsidies and other ways to allow rural areas to purchase infrastructure. Introduce full-time technical personnel, encourage college students to work in the countryside, conduct regular training for rural technical personnel engaged in relevant industries, and invite experts to visit the village for guidance. Let the advanced sewage treatment infrastructure play a better role at the same time.

Second, improve farmers' sense of environmental protection and conservation through multiple ways. We should fundamentally improve the environmental protection awareness and saving awareness of rural villagers, make them aware of the severity and irretrievability of environmental pollution consequences, and reasonably restrict villagers' water resource use and discharge behavior. It can be publicized through television, radio or blackboard newspaper, or it can regularly hold practical activities to save water resources and protect the environment, so that villagers can participate in them. Social professionals can also come to the village to give lectures, teach villagers some professional knowledge about protecting water resources and reducing water pollution, and also improve villagers' ideology.

Third, improve the construction of sewage prevention and control management mechanism in many aspects. It can be carried out from two aspects: (1) formulating emission standards. Controlling sewage discharge and discharge standards can reduce water pollution at the end of sewage treatment. The formulation of discharge standards shall comprehensively consider the local geographical environment, ecological environment, sewage generation and other factors,

ISSN: 2710-0170

and the corresponding hierarchical discharge standards shall be divided into implementation areas. (2) Learn foreign management system. Japan has a special regulatory mechanism for sewage discharge, and adopts a ladder charging mode for sewage discharge, so as to improve villagers' consciousness. The sewage treatment in the United States adopts a multi-level management model, and strives to play the role of the government in sewage treatment, so as to improve the efficiency of sewage treatment.

Fourth, select sewage treatment technology according to local conditions. The introduction and use of the most advanced technology and the technology with the best governance effect may not be the process technology that villagers are willing to accept or can accept. The process shall be selected according to the local rural ecological environment, living habits and geographical location. It is also not allowed to blindly copy and use the sewage treatment technology of local cities, so as to reduce the cost incurred in the treatment process as much as possible,Also try not to expropriate agricultural land, and find the "optimal" governance path based on the suggestions of professionals.

Acknowledgments

Supported by Anhui University of Finance and Economics Undergraduate Scientific Research Innovation Fund (XSKY22122).

References

[1] Technical Guide for Construction and Investment of Rural Domestic Sewage Treatment Projects (draft for comments) prepared by the preparation team [R]. 2012.

[2] He Juan. Application of Constructed Wetland Technology in Sewage Treatment of Small and Medium Towns in South China [J]. Wind of Science and Technology, 2010, (19).

[3] Huang Jian, Du Shaowen. Artificial wetland technology and its research progress in northern China [J]. Journal of Ocean University of China, 2010, 40 (11).

[4] Zeng Chunxia. Research on the Application of Constructed Wetland Technology in Rural Domestic Sewage Treatment -- Taking Hengyang City, Hunan Province as an Example [J]. Journal of Chongqing Three Gorges University, 2011, 27 (01).

[5] Li Jianhua, Wang Baozhen. Removal of nitrogen and discs from oxidation ponds [J]. China Environmental Science, 1992, 12 (04).

[6] Zhao Xuemin, Guo Qingwei, Zhou Guangjie, et al. Purification effect of improved biological stabilization pond on polluted rivers in Dianchi Lake basin [J]. Lake Science, 2010, 22 (01).

[7] Duan Qiangqiang, Duan Jingjing, Geng Chenguang, et al. Garden land slow infiltration system for rural decentralized domestic sewage [J] Journal of Agricultural Engineering, 2012, 28 (23).

[8] Li Nan. Study on the purification of decentralized domestic sewage by land treatment technology and phosphorus adsorption by new fillers [D]. Tai'an: Shandong Agricultural University, 2012.

[9] Zhang Qianqian. Pilot test study on biological rotary table for urban sewage treatment [D] Huainan: Anhui University of Science and Technology, 2014.

[10] Huang Haifeng, Yang Kai, Wang Hui. Anaerobic biological treatment technology and its application in urban sewage treatment [J]. China Resources Comprehensive Utilization, 2005, 35 (06).

[11] Chen Yuefang, Cao Lixia, Yu Lulu, et al. Pretreatment of refractory pesticide wastewater by enhanced micro electrolysis [J]. Journal of Environmental Engineering, 2012,6 (07).

[12] Zhang Yiwen. Research on iron carbon micro electrolysis to remove acid salts from drinking water [D]. Guangzhou: Guangdong University of Technology, 2015.

[13] Liu Lin, Song Biyu. Experimental study on two-stage biofilm membrane bioreactor [J]. Environmental pollution and prevention, 2005, 17 (3).

ISSN: 2710-0170

[14] Deng Furong, Liu Dongsheng, Wang Hui, et al. Comparison of rural domestic sewage treatment by constructed wetlands and soil purification tanks [J]. Environmental Chemistry, 2013, 32 (02).

[15] He Haiyan. Discussion on Innovative PPP Mode of Rural Domestic Sewage and Garbage Treatment [J] China Engineering Consulting, 2018 (11).

[16] Shen Zhe, Huang Jie, Liu Pingyang. International experience in rural domestic sewage treatment - comparison based on the models of the United States, the European Union and Japan [J]. Price Theory and Practice, 2013 (02).

[17] Yan Yan, Sun Yufei, Dong Zhengju, et al. Experience of rural sewage management in the United States and its inspiration to China [J]. Environmental Protection, 2008 (15).

[18] Qiu Ting, Ma Mei. Research on Current Situation, Problems and Countermeasures of Rural Water Environment Pollution Control [J]. Energy Conservation and Environmental Protection, 2021 (05).

[19] Xiao Qin. Current Situation of Rural Water Environment Pollution and Countermeasures [J] Animal Husbandry and Feed Science, 2009, 30 (01).

[20] Liu Weicai, Ding Feng. Current Situation and Treatment Methods of Agricultural Sewage Treatment Technology in China [J]. Journal of Hunan Ecological Science, 2015, 2 (04).

[21] Yuan Zhuqin. Current Situation of Rural Water Pollution and Countermeasures [J]. Chemical Design Communication, 2021,47 (12).

[22] Gao Shengwang, Huang Zhiping, Xia Xunfeng, Liu Ping, Wang Hongliang, Li Yun. Investigation on rural domestic sewage treatment and countermeasures [J]. Journal of Agricultural Resources and Environment, 2022,39 (02).

[23] Jiang Shan, Li Xiang, Qiu Liqing, Jiang Caihong, Li Fanghong, Ma Xiaorui. Analysis of problems in rural domestic sewage treatment in East China and countermeasures [J]. Anhui Agricultural Science, 2020, 48 (05).

[24] Yang Yutong. Water environment pollution in rural areas of Jiangsu and its prevention and control measures [J] Shanxi Architecture, 2018, 44 (32).