



Research Article

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Study on water pollution causes and prevention of Jiangsu rural areas

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ABSTRACT

With the rapid development of social economy, the water pollution problem has been given more attention to all work of the country, and has seriously hampered the healthy and sustainable development of the rural economy. Exploring the causes of water pollution in rural areas and finding a solution to pollution countermeasures have become the important issues now. In this paper, taking Jiangsu Province as an example, we analyze the causes of pollution of rural water environment, and put forward suggestions include: through strengthening the legal construction, increasing the input of environmental protection, and developing ecological agriculture, we can protect the safety of drinking water and promote the integration of urban and rural development. At last, It presses for sustainable development of Jiangsu rural areas in terms of carrying out water pollution control and guaranteeing safe water quality.

Key words: rural areas; water pollution; Jiangsu; suggestion

INTRODUCTION

Jiangsu, one of the most developed economic provinces in China, has a large population and relatively less land. In case of less arable land, Jiangsu's rural economy continues to improve agricultural productivity. In this way, Jiangsu fully rely on the township enterprises, and successfully blazed a path of industry-driven agriculture. In 2010, the per capita net income of farmers in Jiangsu reached 9118 yuan, an increase higher than urban residents for the first time. In recent years, the level of agricultural material technology and equipment continue to improve. Because of rural industrialization, Jiangsu rural water pollution situation was increasingly serious [1-3]. About 611 sections (in 449 key water functional zones) were better than (including) type III of water standard, according to the December 2012 bulletin of key water functional zones in Jiangsu. The rate was 59.1%. And 274 sections achieve Jiangsu's water quality objectives, the rate of reaching the standard was 61% (table 1 to table 3).

Table 1: Major pollution projects of water quality in Jiangsu province

Major pollution projects	COD	Ammonia & nitrogen	BOD	Permanganate index
over standard rate (%)	43.7	25.2	16.2	15.1

Table 2: The main basin's standard condition in Jiangsu Province

River basin	Huaihe River Basin	Taihu Lake Basin	Yangtze River Basin
rate of reaching the standard (%)	65.7	54.2	59.3

Table 3: The rivers and lakes' standard condition in Jiangsu Province

Evaluation of river length	Total river length (km)	Standard length (km)	rate of reaching the standard (%)
	6807	4273	62.8
Evaluation of lake area	Total area of the lake (km ²)	Standard area (km ²)	rate of reaching the standard (%)
	7364	2836	38.5

Sources: Hydrology and Water Resources Survey Bureau of Jiangsu Province: <http://www.jssw.gov.cn>

2. Causes of water pollution in Jiangsu Province

2.1 Agricultural pollution

(1) Excessive or unreasonable use of fertilizers and pesticides

In 2011, Jiangsu's crop sown area was 7663.25×10^3 hectares. The amount of chemical fertilizer (net weight) was 337.21×10^4 t, about 48.83 kg per acre. And the amount of pesticides was 8.65×10^4 t. The unit area sown fertilizer use intensity was higher than the national average level. In agricultural production, fertilizer utilization rate was only 30% ~ 40%. The other following the farmland drainage or rainwater entered the ditch, river, lake. Then it increased the content of nitrogen, phosphorus and other nutrients in water, resulted in deterioration of water quality. Excessive fertilizer and irrational fertilization not only increased the risk of soil heavy metals and toxic elements, but also aggravated pollution of soil and water. In 2011, the amount of ammonia nitrogen emissions in Jiangsu's agriculture was 3.99×10^4 t, accounting for 25.4% of total amount[4].

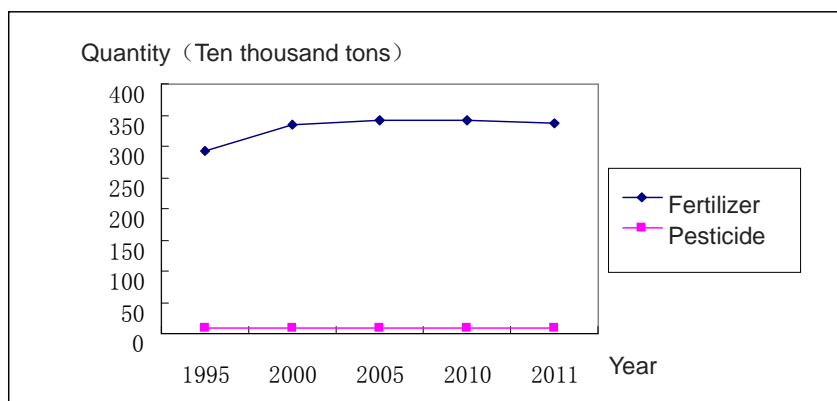


Fig. 1: The usage of fertilizers and pesticides in Jiangsu rural area (1995 -2011)

(2) Aquatic products and livestock breeding pollution

Pollution of the water environment in rural aquaculture mainly come from two aspects: farm wastewater and animal body. Currently, the enthusiasm of farmers to build biogas digesters is not very high, most of the aquaculture wastewater directly discharged into the ditch, drainage, causing the river eutrophication. In 2011, the aquaculture area of Jiangsu province was 769.40×10^3 hectares. Among them, the fresh water aquaculture area was 568.33×10^3 hectares, mariculture area was 201.07×10^3 hectares. If the fish, shrimp, shellfish, in accordance with the calculation of average emissions COD was 100kg per acre per year, Jiangsu aquaculture areas total annual emissions of COD reached 11541t. In addition, dead animals in the farms sometimes were not centralized processing, discarded in a ditch, river, polluted large areas of water.

(3) Irrigation water pollution

With the development of Jiangsu economy, industrial water, city and rural life-water quantity increases constantly. Meanwhile the corresponding emissions of waste water are high. In 2011, total emissions of Jiangsu province were 59.18×10^8 t. Waste water for irrigation was inevitable, it had brought serious water pollution for farmland. Due to the large amounts of untreated waste water used for farmland irrigation directly, water exceed the standard, causing serious pollution of the soil, crops and underground water. Sewage irrigation had become one of the main reasons for the rural water pollution in Jiangsu, directly endangered the water and food security in sewage irrigation area.

2.2 Township enterprises pollution

As we all know, Jiangsu is the cradle of township enterprises. And the scale of township enterprises in Jiangsu is growing after 30 years of development. By the end of 2011, the total number of township enterprises in Jiangsu was approximately 697,920. The enterprises employed more than 1635 million, their output value realized 10.047783 trillion yuan. These enterprises involved in metallurgy, machinery, chemicals, textiles, electronics and many other fields. And a considerable part of them were heavy polluters. These low efficiency township enterprises consumed lots of energy due to the limitation of technical and economic conditions. Many factors led to the river water pollution, such as part of the township enterprise leaders and staff's environmental consciousness, poor overall techniques of environmental management and unreasonable industrial layout. In addition, inadequate anti-pollution facilities was also a vital reason. All these factors seriously affected the surrounding residents' drinking water safety.

2.3 Rural life pollution

At present, the urbanization rate of Jiangsu is about 61.9%, nearly 40% of the population live in rural areas. In 2011, Jiangsu's sewage discharge volume was 34.20×10^8 t, accounting for 57.79% of the emissions of waste water. Rural residents live in scattered and rural sewage treatment plant construction investment was not enough. So it was

difficult to collect and deal with the sewage. Many farmers' environmental awareness was not high, they didn't know the source and the degree of harm to the environment. They preferred recent economic benefits than the potential environmental hazards. With the improvement of the living standard, many rural residents still follow the traditional way of life. They dump domestic wastewater everywhere.

Table 4: The industry orientation of some parks in Jiangsu coastal areas

Name	Location	Industry Orientation
Lianyungang Guannan Chemical Industry Park	Duigougang, Guannan	Fine production, Pharmaceutical intermediates
Guanyun Yanweigang Lianyungang Chemical Industry Park	Yanweigang, Guanyun	Fine production, New materials
Yancheng Ecological Dyeing Industrial Park	Linhai, Sheyang	Textile, New materials
Jiangsu Binhai Chemical Industry Park	Touzeng, Binhai	Fine chemical industry, Pharmaceutical intermediates
Jiangsu Xiangshui Ecological Chemical Industrial Park	Chenjiagang, Xiangshui	Fine chemical industry

3 Water Pollution Control Measures of Rural Areas in Jiangsu Province

The question of water pollution in rural areas not only affects the crop irrigation and aquaculture development, but also directly affects the safety of drinking water in rural places. In addition, water pollution in rural places can also be translated into towns and cities through agricultural inputs, which will do harm to the urban residents. Therefore, the question of water pollution in rural areas not only relates to the construction of new countryside, but also relates to the overall economic development and the improvement of living environment. During the period of "Twelve Five Project", Jiangsu is the first one who proposes to build a well-off society and realize basic modernization goal. Therefore, water pollution control seems to be a rather urgent subject[5].

3.1 Strengthen laws and regulations construction & Improve the citizenship

Firstly, try to establish and improve legal system of rural water environmental protection. We must enact specific and non-point measures in rural pollution prevention, and establish clear idea that "who pollute, who control" and "if there is pollution, we shall reign immediately". As there will be laws to abide by, we can take control of rural water environment problems from the source. Secondly, we should enhance citizens' quality. Because rural residents can not reach high level of knowledge, environmental awareness is relatively weak. Most of them mainly affect by lower levels of education, rural water environment protection is becoming more and more difficult. Rural residents play an important part in the construction and protection of rural environment, good environmental governance in rural areas must closely rely on the majority of rural residents. Through education and promotion, we try to raise awareness of rural residents to participate in the environment protection program. In addition we can make full use of the function of rural grassroots organizations and advocate a civilized and healthy lifestyle and environmental production. Last but not least, we must strengthen accountability and supervision. Try to improve the appraisal system of leaders environmental performance assessment, and never regard GDP as the only indicator of rural development. At the same time, we should strengthen the construction of rural environmental management team, make full use of the public oversight role of public opinion, strengthen civil liability, increase illegal cost and solve water pollution incidents occurred in rural areas promptly.

3.2 Increase investment in environmental protection & Improve sewage treatment capacity

Under practical conditions water pollution in rural areas should follow a general principle which means low construction investment, less cost of operation and management and good treatment effect. First of all, we should increase the government investment, especially in Fengxian, Suining, Guanyun, Lianshui, Huaiyin, Guannan, Huaian, Xiangshui, Shuyang, Siyang, Sihong and so on. And pay attention to the establishment of special rural water pollution control fund. We had better to broaden the financing channels, to establish a investment mechanism leading by government, and enterprise, individual, social participate in. Focus on investment in the construction of rural sewage treatment equipment, including the drainage network pipeline and centralized sewage treatment plant (station). Actively carry out an ecological compensation pilot, in accordance with the principle of "who protect, who benefits", we should try to increase finance armrest in agricultural production and ecological protection zone. Secondly, increase the technical inputs and guidance. Now there are a lot of pollution control technology is developed based on the present situation of city pollution. So that these techniques will not be suitable to the countryside. Therefore, according to different pollution sources, rural pollution control should take for the local rural technology. It requires us to design the special equipment, technology, process, project, actively introduce new techniques with the new technology, make distributed processing combined with intensive processing, engineering treatment combined with ecological treatment. So that we can ensure the normal operation of sewage treatment system which has been built, and improve the capacity of sewage treatment and reclaimed water transport.

3.3 Strengthen the protection of water sources, ensure the safety of drinking water

The project of rural water pollution prevention must put drinking water safety in the first place, which regarded as a "red line". Firstly, we should do a good job in the new round of rural drinking water safety planning, clear the objectives and sub-year implementation plans, increase the regional water supply construction, focus on the centralized water supply rate in rural areas, so that we can solve the rural drinking water problem fundamentally. Secondly, we'd better pay attention to strengthen management and protection in the drinking water zones. According to the adjustment and development of township enterprises in the rural town, we need to make appropriate adjustments to the original source area. Our purpose is to develop a water supply system which focuses on the surface water and supplemented with underground water. Strengthen the control of non-point source pollution in the drinking water protection area, clean-up chemical concentration area completely, shut down or relocation chemical production enterprises in order to improve the industry concentration degree. The third one is to increase monitoring efforts on the water quality. We can strengthen water quality testing and monitoring of the source water, finished water, peripheral water. And try to improve drinking water quality, in order to ensure the quality can reach the sanitary standard for drinking water. At last ,we can establish and improve the water supply technical system of county (city) level, to ensure the long-term and continuous operation of drinking water project[6].

3.4 Vigorously develop ecological agriculture, to realize recycling of resources

Actively developing ecological and circular agriculture to achieve less waste and higher resource utilization efficiency is the key to protecting the water environment in rural areas. First, accelerate the popularization of pollution-free, green production technology. For example, promoting soil testing fertilization and integrated pest management and approving the number of fertilizers and pesticides used in per acre of land are both good ways for a more security, ecological and efficient modern agriculture. Secondly, Vigorously develop the circular agriculture and promote the typical cycle mode represented by Ganyu's "Pig - marsh – vegetables and Yixing's "Pig - marsh - tea".

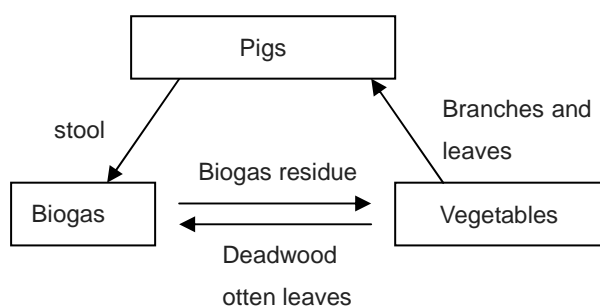


Fig. 2 :“Pig - Biogas – vegetables” circular agriculture mode

In this mode, pit entry fermentation to produce biogas, which results in a cleaner environment of piggery .At the same time, Biogas residue can also provide organic fertilizer for a vegetable garden. In this way, energy within the agricultural ecosystem forms multilevel utilization and virtuous cycle of material. Thirdly, optimize the industrial structure, and actively develop agricultural tourism and leisure agriculture. For example, the promotion of JianHuXian's Wind - Light - fishing complementary industrial model is a good way to improve the value of agricultural products and achieve intensive use of resources.

3.5 Overall planning & Actively promote the integration of urban and rural construction

Firstly, strengthen the integration of urban and rural planning. Break the natural and administrative boundaries of the urban-rural dual structure, and promote the coordinated development of urban and rural areas as a whole. Secondly, speed up the construction of rural infrastructure, and promote the equalization of public products and services. So that urban transportation, water supply, power supply, communications, garbage and sewage treatment can extend to rural areas.Thirdly, optimize the structure of urban system, and make rational distribution of large, medium and small cities. In addition, giving full play to the influence and leading role of the central city is also useful for a harmonious urban-rural relationship. Fourth, accelerate the construction of a new countryside. Change “village ignition, smoke everywhere”, the extensive development mode of township enterprises. Focus Industrial enterprises on parks while residents to community as a way to create beautiful countryside and better living environment.

CONCLUSION

Our study shows water pollution in Jiangsu rural areas has seriously hampered the healthy and sustainable development of the economy. Many facts cause the serious pollution, such as agricultural pollution, township enterprises pollution and rural life pollution. So we should take steps to protect the water environment. We put forward suggestions include: through strengthening the legal construction, increasing the input of environmental

protection, and developing ecological agriculture. In this way, we can protect the safety of drinking water and promote the integration of urban and rural development.

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