Research on Environmental Risk Control of Highly Intensive Agricultural Land Use Based on Computer Technology and Landscape Scale

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Abstract. Under the background of China's rigid population growth and the reduction of cultivated land area, the degree of agricultural intensification has been increasing. Pesticides and fertilizers have greatly increased crop yields. However, the large amount of agricultural chemicals input leads to the decline of soil and environmental quality. The environmental pollution caused by agricultural activities is increasing, especially in the high intensive agricultural areas with high land use intensity and a large amount of agricultural chemicals input. Agricultural land use is facing the dual challenges of ensuring food security and ecological environment security, which is an arduous and urgent task to realize the sustainable and healthy development of China's agricultural countryside. High intensive agriculture gains higher economic benefits, but it also leads to serious environmental consequences. In the face of the increasingly serious problems of agricultural ecological environment, how to guarantee the economic development and control the environmental risk of agricultural land use is an urgent practical problem. Based on this, this paper uses computer technology to analyze the environmental risk control strategy of highly intensive agricultural land use based on the landscape scale.

Keywords: Environmental Risk Control, High Intensive Agricultural, Land Use, Landscape Scale, Computer Technology

1. Introduction

At present, intensive production and management mode is widely used in China's agriculture, which not only ensures the food security of China, but also provides an effective way for farmers to increase their income[1-2]. The productivity of traditional rural society is low and the extension of agricultural technology is slow. High intensive agricultural production mode still relies on a large number of labor, pesticides and chemical fertilizers, which achieves the purpose of increasing production and income, especially in the main grain production areas and suburban agricultural areas[3-4]. However, when excessive pesticides and fertilizers are applied for a long time, it will lead to many problems, such as soil quality degradation, heavy metal pollution, river eutrophication, etc., which will affect food and food safety and directly harm human health. Agricultural environmental risk control is a complex and
systematic process. Our country has been improving and harnessing agricultural environment from many aspects, such as taking the best management measures (BMPs), establishing constructed wetland system, establishing ecological compensation system, agricultural water tax system, etc. Intensive agricultural land use increases environmental risk\textsuperscript{[5,6]}.

2. Impact of intensive agricultural land on environmental risk

2.1. Increased environmental risk

China's agriculture has generally implemented the intensive production and management mode. However, the overall productivity of rural society is low, so the extension of agricultural high-tech is relatively slow. Agricultural intensive management is mainly through labor-intensive, large-scale use of chemical fertilizers and pesticides to increase production and income, especially in some highly intensive agricultural areas, such as the main food production areas, urban suburbs, coastal economic developed areas with more people and less land. The long-term overuse of nitrogen not only aggravates the environmental pollution, but also destroys the population balance of soil microorganisms, which makes the total nitrogen content of soil in China much higher than that in Europe and America. In addition, the use of a large number of pesticides has led to an increasing amount of chemical residues in soil and groundwater. The function of self-regulation and self-purification of farmland ecosystem is weakened, which greatly reduces the ability to resist environmental risks.

2.2. Impact on ecological environment safety

Unreasonable land development and utilization make the degradation of land resources in China more and more serious. According to the results of the investigation and assessment report on the ten-year change of the national ecological environment (2000-2010) issued by the Ministry of environmental protection and the Chinese Academy of Sciences in 2016. In China, the ecological environment is fragile and artificial, and the problems of ecological environment are still prominent. The land degradation caused by agricultural production and development is still serious, such as soil erosion, land desertification, rock desertification, etc. Most of the degraded land in China is distributed in the arid and semi-arid areas in the West. Among them, the desertification land area of Xinjiang, Inner Mongolia, Tibet, Gansu and Qinghai accounted for 95.48% and 93.69% of the whole country. According to the fifth communique on China's desertification and desertification situation, China's desertification land area is 26116000 square kilometers, and the desertification land area is 17212 square kilometers. Land degradation makes the fragile ecosystem of these areas more fragile, which to some extent affects the regional ecological environment security.

3. Environmental risk management based on landscape scale

3.1. Basic framework of landscape scale method

The standard landscape scenario method is a kind of landscape scenario design, which can more accurately apply the knowledge of landscape ecology in policy analysis. Compared with the traditional trend extrapolation method, the standard landscape scenario method is more flexible, which can set a variety of variables. This method allows us to imagine the corresponding scenarios when one or more factors change dramatically, which is very suitable for the prediction of severe land use change. Compared with other scenario analysis, this method integrates multi-disciplinary domain knowledge, and carries out multi-faceted comprehensive effect evaluation. It has strong pertinence, which is suitable for urban and rural planning, new rural construction and protection, environmental planning, natural resource management and other aspects. The future prediction itself is a very complex process, so the standard landscape scenario method must also be a complex process. Based on the method of scenario analysis, this paper puts forward a systematic standard landscape scenario construction method. The main design process is shown in figure 1.
3.2. **Environmental risk management of agricultural land use system**

The environmental risk management of agricultural land use system should focus on the input and output of pollutants in the system. In the stage of risk identification, we must build the framework of environmental risk identification of agricultural land use from a systematic perspective, which is the badge to realize the analysis and identification of all pollution sources. At the same time, we need to analyze the input characteristics of risk sources and the output characteristics of pollutants. In the risk assessment stage, in addition to the total emissions of different pollutants, we also need to analyze the spatial distribution. In the risk mapping stage, we need to evaluate the comprehensive pollution status of different pollutant outputs and the vulnerability of environmental receptors, which will achieve the integrated environmental risk mapping. In the stage of risk management and control, we should control land use from three aspects of system input, process and output. The Flowchart of environmental risk management for agricultural land use systems is shown in Figure 2.

![Flowchart of environmental risk management for agricultural land use systems](image)

**Figure 2.** Flowchart of environmental risk management for agricultural land use systems.

4. **Environmental risk management and control of agricultural land use**

4.1. **Guide scale operators to optimize land investment**

The spatial distribution pattern of agricultural land in China has resulted in the decentralized production of farmers in China, which is one of the important factors that make it difficult to control the non-point source pollution of agricultural land. The decentralized management of farmers increases the cost of environmental supervision of agricultural production, which makes them in a "free" state without supervision for a long time. Land fragmentation and decentralized management of farmers have become an important bottleneck in improving agricultural productivity and technical efficiency. The large-scale management of agricultural land overcomes the disadvantages of small-scale management of agricultural land. Large scale management concentrates the right of land management from dozens to hundreds of households to individuals. By improving the environmental protection awareness of scale operators, we can strengthen the guidance of land safety utilization,
which can effectively reduce the environmental risks caused by the application of chemical fertilizer, pesticide and agricultural film. At the same time, by effectively controlling the direction of straw, we can reduce or even eliminate the burning of straw on the spot. By strengthening the technical guidance of fertilization, application and irrigation, we can improve the supervision mechanism, which is of great significance to control the environmental risk of regional agricultural land use.

4.2. Guide farmers to make rational use of livestock manure
The farmers mainly engaged in animal husbandry are small in scale and lack of treatment facilities. Therefore, a large number of livestock manure is directly discharged into the environment without treatment, which not only pollutes the water body, but also spreads pathogens, and poses a threat to human health. Some farmers use manure as fertilizer directly, which is easy to cause secondary pollution. The government should guide farmers to establish bio compost treatment facilities, which can reduce the environmental risk caused by the unreasonable use of livestock manure. In addition, the investment of agricultural farmers in pesticides and fertilizers is relatively small. As a result, the age of pure agricultural farmers is relatively large, health problems and the lack of agricultural labor force have become the main obstacles to their livelihood. The livelihood mainly depends on extensive crop cultivation. How to solve the livelihood source, social security and efficient land use of such low-income people should be highly concerned by the government.

5. Conclusion
With the increasing contradiction between human and land, land resources will become more and more valuable. Under the influence of land use control of different departments, some cultivated land reserve resources development will be more difficult. For example, the development of grassland is often limited by the forestry department, while the development of beach will conflict with the land use control of water conservancy department. Therefore, how to realize the efficient integration of high-quality cultivated land and its reserve resources requires an effective land consolidation mechanism. How to achieve "top-down" interest coordination and "bottom-up" public participation model in land remediation needs more in-depth discussion. The risk control strategy based on landscape scale is to show different policies, environmental control methods, planning, etc. to the decision-makers, which can bring different land use effects. And by using computer technology as an auxiliary analysis method, it provides a scientific reference for the future development direction.

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