Review of Economic Evaluation on Environmental Damage of Agricultural Non-point Source Pollution

Zhenzhen Qiu

Research Center for Environment and Health, Zhongnan University of Economics and Law, Wuhan 430073, China

1069236142@qq.com

Abstract

Implementing economic evaluation on environmental damage of agricultural non-point source pollution, and quantitating the comprehensive loss of farmers' health, property and the environment damage, is of great importance to promote the rural environmental management with economic instruments. This paper, with the methods of analyzing the economic evaluation research progress on environmental damage of agricultural non-point source pollution at home and abroad, found out that although foreign environmental damage assessment made some progress in the legislation and accountability, there still has not been an accepted unified assessment system and methods; in addition, there is no specific study carried out on the agricultural non-point source pollution. On the other hand, the assessment of environmental damage in China, has been faced with the problems both in terms of laws, technical guidelines and working mechanisms. And there is few study on economic evaluation of agricultural non-point source pollution at home. Throughout the domestic and foreign research on agricultural non-point source pollution, implementation of economic evaluation on environmental damage will be a new development direction in the future.

Keywords

Agricultural non-point source pollution, economic evaluation on environmental damage, development.

1. Introduction

At present, agricultural non-point source pollution is the main cause of water pollution, which has aroused wide attention from all over the world. Research on agricultural non-point source pollution began in 1960s, which was first carried out by Europe, America and other developed countries. Until 1970s, it had received widespread attention in the world. The research scope of agricultural non-point source pollution in foreign countries was very wide, including agricultural non-point source pollution migration and transformation mechanism, pollution status survey, pollution prevention and control measures; while domestic research mainly focused on agricultural non-point source pollution control and current situation investigation. However, for the study of agricultural non-point source pollution started late in China, its' theoretical research lags was behind the developed countries, and the practical application was insufficient. Although the research at home and abroad of agricultural non-point source pollution has made some fruitful results, it just mainly focused on control technology, laws and regulations, economic policies, and ignored the damage on environment itself, which is not conducive to the ecological sustainable development. Therefore, grasping domestic and foreign research status and dynamic of agricultural non-point source pollution timely and accurately, has great significance to agricultural non-point source pollution control, ecological civilization construction, and people's health protection.

2. Foreign Research Progress

The research on agricultural non-point source pollution in foreign countries started early, and the research scope was wide, including migration and transformation mechanism, pollution status survey,

pollution load estimation, pollution discharge model establishment, environmental impact assessment, pollution prevention and so on. America was the country with the longest history and the largest research of agricultural non-point source pollution. Maofang Gao et al. studied the development trend of agricultural non-point source pollution at home and abroad based on bibliometrical, and the research results indicated that the attention of agricultural non-point source pollution control in foreign countries was the highest, followed by the simulation of pollution model and the assessment of environment impacting [1].

Early environmental pollution damage mainly included personal damage and direct property damage, which was called "traditional damage". For the traditional damage, it had already formed perfect system abroad, which pursued the damage to human and property losses, conducted economic evaluation and compensation caused by environmental pollution through the civil liability under property right system [2].

Following the further research and understanding of environmental resources and ecological health, the connotation of environmental pollution damage has been gradually expanded. Environmental pollution and damage as the source of personal and property damage [3], has been ignored for a long time due to the publicity and economic externality of environment. Until the outbreak of the global environmental pollution events in recent years, people really realized the importance of the environment and resources protection. Subsequently, environmental damage itself has also been included in the scope of environmental pollution damage. It refered to the damage to ecological environment because of the improper discharge of pollutants. Because the objective of environmental damage was environment itself, it was difficult to solve the problems by civil liability like human damage and property losses, therefore a series of pertinent laws and regulations have been set up for this kind of damage. For example, in international convention, the *International Convention on Oil Pollution Compensation Fund* of 1969 and 1971 both didn't take environmental damage into consideration, however, after the 1980s, most international compensation conventions took environmental damage into account [4].

At the national level, due to the differences of main environmental problems and countermeasures in the development process among countries, environmental damage assessment also existed great difference, which was mainly reflected in the definition of the scope and the counter measures.

America was the first country in the world to study the assessment of environmental damage, but also the first to establish a comprehensive system of environmental damage assessment and compensation. In the early stage, the problem of environmental damage was solved by common law, but with the frequent occurrence of environmental events, the common law had been unable to meet the increasingly prominent environmental problems [5]. So beginning in 1970s, America began to develop the law for environmental damage, and in the next 20 years gradually established a perfect assessment and compensation system for ecological environmental damage, among which the most representative were *Clean Water Act, Comprehensive Environmental Response, Compensation and Liability Act*, and *Oil Pollution Act*. In addition, to the federal level, the states of America also formulated the relevant laws and regulations in accordance with their actual situations [6].

The research on environmental damage in European Union started later than America, and it fully drew lessons from the experience of America. In order to strengthen the importance of environmental damage, EU standardized the relationship between traditional damage and environmental damage in *Environmental Civil Liability White Paper* promulgated in February 9, 2000. The paper made it clear that "Environmental damage includes not only the damage to the person, property, and contaminated sites, but also the damage to the nature, especially which defined as important natural resources from the perspective of biodiversity conservation. Obviously, the "damage to the nature" aforementioned means the damage to the environment itself.

The research on environmental damage abroad has been extended from the traditional damage to environmental damage itself, and the solution has been upgraded from civil law to targeted laws and regulations. However, there has not been an accepted uniform system about how to quantify the

amount of environmental damage, and to quantify the environmental damage of economic evaluation. Due to the differences of main environmental problems and countermeasures in the development process among countries, environmental damage assessment also existed great difference, especially in the scope and responses to environmental damage. In addition, current studies on environmental damage mainly aimed at the whole environment. There was no special study carried out on the agricultural non-point source pollution, besides, the existing researches haven't clearly defined the relationship between the agricultural non-point source pollution and the economic evaluation of environmental damage.

3. Domestic Research Progress

The literatures about agricultural non-point source pollution published domestic, mainly focused on pollution control, followed by the investigation and research on the current situation [1]. The main involved pollutants were nitrogen, phosphorus, pesticides, persistent organic pollutants and heavy metals. However, with the deepening understanding of agricultural non-point source pollution and the need for environmental protection, present research status was far from meeting the needs. The study about how to manage and control the pollution, analyze the driving factors and influence factors, evaluate the influence on environmental pollution, still remained elusive. Moreover, domestic research on the model was not enough, it mainly drew lessons from foreign models and converted them, which was lack of independent innovation. Current research on agricultural non-point source pollution was mainly based on the typical watershed and large water body pollution control. In terms of environmental damage assessment, compared with the developed countries, China started fairly late. Until 1990s, Chinese environmental pollution and economic losses on ecological damage have got the attention of some government departments. There was still not a universally acknowledged understanding of the connotation on environmental damage in China. Even in the existed literature, there were many different names for environmental damage, such as "environmental pollution hazard", "environmental damage", "pollution damage". In terms of damage category, China was still in the stage of traditional damage. And the current laws and regulations were mainly for property damage assessment and compensation of environmental pollution, ignoring environmental damage itself. But environmental damage in our country has gradually transited to public welfare damage, which was a good start of concerning about environmental damage. Chinese current laws and regulations which did better on environmental damage areas were the agricultural pollution and fishery pollution. Both of them had a detailed assessment criteria and assessment methods, though the evaluated object was mainly for property damage, not considering of environmental damage; besides, these were only principle regulations without accessional regulations to implementation. Only the *Marine Environmental Protection Law* published in 2004 has clearly pointed out that responsible who caused the marine environmental pollution should be responsible to remove harmfulness and compensate for the losses.

As for the environmental damage assessment method, since the concept of environmental damage assessment has been put forward, various types of assessment methods were constantly trying to applied to assess the damage, including direct market method, reveal preferences method, stated preference method, benefit transfer method and equivalent analysis method [7].

Overall, Chinese environmental damage evaluation system, no matter in laws and regulations, technical guidance, or in work mechanism, were faced with inadequate. China has not established a systematic legislation for ecological environment pollution liability, although the environmental damage had a relatively clear higher-level law, nevertheless, it lacked specific operational substantive law and procedural law regulation, which caused the practice of environmental damage assessment can't be carried out [8].

Throughout the domestic research status, there was few study on economic evaluation on environmental damage of agricultural non-point source pollution. The current understanding and research of agricultural non-point source pollution, to a great extent, ignored the comprehensive loss brought by farmers' health, property and environment itself, which led to the result that

corresponding damage compensation was not sufficient to compensation for the actual damage. So one of the research directions in the future is to establish a perfect economic evaluation system on environmental damage of agricultural non-point source pollution.

4. Prospects of Economic Assessment on Environmental Damage

With the development of agricultural non-point source pollution, it has obtained a series of achievements on migration and transformation mechanism, pollution situation investigation, pollution load estimation, pollution discharge model establishment, pollution prevention and control measures. Throughout the domestic and foreign research on agricultural non-point source pollution, implementation of economic evaluation on environmental damage will be a new development direction in the future. It mainly presents the following development trends:

(1) Building a perfect economic evaluation index system

Building an economic evaluation index system on environmental damage of agricultural non-point source pollution, putting forward construction principles of the index system, elaborating the construction ideas including construction objectives, assumptions and logical framework, and determining the type of the index system. The index system should be established from four aspects: pollution source assessment, migration and transformation, agricultural direct economic loss assessment and environmental damage assessment.

(2) Establishing a proper and unified economic evaluation method

Establishing an evaluation method is the basis of the evaluation efforts. The proper method choice can improve the accuracy of the evaluation results. Studing the key technologies such as the investigation and causality judgment on the basis of defining the connotation and process of the economic evaluation on environmental damage. Finally determining the principles, framework and method of economic evaluation.

(3) Combining economic evaluation of environmental damage with computer

Combining the economic evaluation environmental damage of agricultural non-point source pollution with computer, using C++ Technology, building a computer model to rapidly assess direct economic loss and environmental damage based on the established economic evaluation index and method, which will improve the evaluation efficiency.

References

[1] M.F. Gao, J.J. Qiu, S.C. Liu, et al. Status and Trends of Agricultural Diffuse Pollution Research Based on Bibliometrics, Scientia Agricultura Sinica, vol. 06 (2014), 1140-1150. (In Chinese)

[2] Z.T. Zhang: Research on Environment Legal Liability (The commercial Press, China 2004), p.90-94. (In Chinese)

[3] .J. Fu, Z.H. Ding. Research Progress on Wetland Ecosystem Service and It's Valuation, Chinese Journal of Applied Ecology, vol. 18 (2007), 681-686. (In Chinese)

[4] J. Zhao, K. Yang. Valuation of Natural Resources and Environment: Contingent Valuation Method and It's Application Principles in China, Journal of Natural Resources, vol. 21 (2006) 834-843.

[5] YJ Litwin, AS Donigian. Continuous Simulation of Nonpoint Pollution, Journal, vol. 50 (1978), 2348-2361.

[6] J Cho, S Mostaghimi. Dynamic Agricultural Non-point Source Assessment Tool: Model development, Biosystems engineering, vol. 102 (2009), 486-499.

[7] H.H. Zhao, Y.B. Zhang, M.X. Wang. Research Progress of Environmental Damage Assessment Methods in China, Environmental Science and Management, vol. 07 (2015), 27-30.

[8] X.Q. Tang, T.Z. Zhang. Key to Environmental Damage: Causality Judgment. China Population, Resources and Environment, vol. 08 (2012), 172-176. (In Chinese)