ISSN: 2688-8645

Research on Pollution Status and Resource Utilization of Livestock Manure

Luyao Wang[1, 2, 3, 4], Xiao Xie[1, 2, 3, 4]

[1]Institute of Land Engineering and Technology, Shaanxi Provincial Land Engineering Construction Group Co., Ltd., Xi'an, 710075, China

[2]Shaanxi Provincial Land Engineering Construction Group Co., Ltd., Xi'an, 710075, China

[3]Key Laboratory of Degraded and Unused Land Consolidation Engineering, the Ministry of Natural Resources of China, Xi'an 710075, China

[4]Shaanxi Provincial Land Consolidation Engineering Technology Research Center, Xi'an 710075, China

Abstract

The rapid development of large-scale and intensive aquaculture has led to a large increase in the amount of livestock and poultry manure, resulting in environmental problems of varying degrees in some areas of our country. Research on the resource utilization potential of livestock and poultry manure is essential to realize the resource utilization of livestock manure and realize the sustainable development of the livestock and poultry breeding industry. This article summarizes the amount of livestock and poultry manure produced, pollution status and different resource treatment methods, in order to provide theoretical guidance for the resource utilization and low-cost recycling of livestock and poultry manure.

Keywords

Aquaculture; Livestock and poultry manure; Organic fertilizer.

1. Introduction

After nearly 40 years of reform and development, livestock and poultry breeding industry has made remarkable achievements in China, reversing the chronic shortage of livestock and poultry products, and ensuring effective market supply. At present, livestock and poultry breeding industry is in an important period of transition from traditional to modern. The breeding of livestock and poultry is constantly advancing towards regionalization, intensification, industrialization and modernization. Large-scale development has become an irreversible trend in the development of China's livestock and poultry breeding industry. In the process of large-scale development, environmental pollution caused by pollutants such as livestock manure, sewage, sick and dead livestock, livestock and poultry feathers has restricted the development of the livestock and poultry breeding industry. It has a large amount and many pollution points, and it has become the main source of pollutants in livestock and poultry breeding and the most difficult target for prevention and control [1].

2. Livestock and Poultry Farming Manure Production

China has been the world's largest livestock and poultry farming country for many years. In 2012, the country's annual slaughter of live pigs reached 698 million, and the number of poultry slaughtered reached 12 billion. The total output value of animal husbandry accounted for about 30% of the total agricultural output value. With the increase in the total amount of livestock and poultry breeding, the amount of livestock and poultry manure sewage is also increasing.

ISSN: 2688-8645

According to the estimation of the pollution discharge coefficient of livestock and poultry production provided by the first national, the total amount of fecal sewage produced by beef cattle, laying hens, broiler chickens and sheep reached 5.5 billion tons, of which the amount of fresh manure production was about 1.08 billion tons, the amount of urine production was about 770 million tons, and the amount of COD production was about 215 million tons. The total nitrogen production is about 12.280 million tons, the total phosphorus production is about 2.025 million tons, and the amount of sewage generated by manure washing is about 3.65 billion tons. Among them, the total amount of manure and sewage produced by large-scale livestock and poultry breeding is about 1.78 billion tons, and the amount of manure sewage generated by decentralized breeding is about 3.52 billion tons, accounting for 36% and 64.0% of the total national livestock and poultry manure sewage respectively.

3. Pollution Sources and Types of Livestock and Poultry Breeding

3.1. Pollution Sources of Livestock and Poultry Breeding

With the acceleration of the large-scale development of the livestock and poultry breeding industry, the resulting environmental pollution problems have become increasingly serious. The pollution sources of livestock and poultry farming mainly include manure, sewage, and sick and dead livestock and poultry.

a. Livestock and poultry manure.

Large-scale livestock farms produce a large amount of livestock and poultry manure, which is the main source of pollution in the livestock industry. According to estimates, the livestock and poultry manure production exceeded 2 billion tons in 2013 in China and will exceed 3 billion tons in 2020. Because large-scale livestock and poultry farmers lack the corresponding harmless treatment facilities for manure, they often pollute the surrounding water bodies, royal soil, air and crops, and become the source of infectious diseases of livestock and poultry, parasitic diseases and zoonotic diseases [2].

b. Sewage

Sewage produced by livestock and poultry breeding mainly includes livestock and poultry urine, flushing water, and wastewater generated during the lives and production of workers. The livestock and poultry farming sewage have a large volume and high pollutant concentration [3]. If it is not handled properly, it will cause serious deterioration of surface water or groundwater quality.

c. Livestock and poultry died of illness

The number of dead livestock and poultry in China is very large. Taking laying hens as an example, there were about 167 million dead laying hens in 2013. Sick and dead livestock and poultry carry pathogenic microorganisms, which not only pollutes the environment, but also poses a serious threat to the healthy development of livestock and poultry breeding

3.2. The Types of Livestock and Poultry Breeding

Most farms do not treat and utilize livestock and poultry manure, effectively, and pile up untreated manure and other waste at will, resulting in the loss of a large amount of nitrogen and pollution of water, soil and air. The livestock and poultry breeding industry has become one of the main targets of rural environmental pollution control.

a. If livestock manure is not effectively treated, the discharge of high-quality organic wastewater from livestock and poultry into rivers will cause eutrophication of the water and cause a large number of deaths of sensitive aquatic organisms [4].

b. The excrement of livestock farming contains a large amount of undigested nitrogen and phosphorus compounds, heavy metals and drug residues. The excrement is directly discharged

ISSN: 2688-8645

to the surface and combines with the calcium, copper, chromium and other elements in the soil to form insoluble compounds, causing soil compaction and the decreases of water and air permeability [5].

c. Most of the livestock and poultry breeding houses are dark and humid, with poor ventilation, and the waste produces a large amount of toxic and harmful gases through complex reactions. If it is not handled in time, it will cause sudden diseases of livestock and poultry, increase the rate of death, and decrease production performance [6].

4. The Resource Utilization Method of Livestock Manure

If livestock manure is discharged directly without treatment, it will harm the environment. However, after "reduction, harmlessness, and resource utilization", it can be converted into fertilizer, feed or energy, which can not only eliminate its impact on the environment, but also produce greater economic value and social benefits. Livestock manure is rich in organic matter and nutrient elements such as nitrogen, phosphorus, potassium, etc. It is a high-quality source of organic fertilizer. Therefore, turning livestock manure into fertilizer can not only turn waste into treasure, but also reduce agricultural production costs. Appropriate use of organic fertilizer can improve soil structure, increase soil organic matter and crop yields, etc. [7]. Since livestock and poultry manure is rich in crude protein, crude fiber and mineral elements, it is also a way of resource utilization to use it as feed for ruminants, fish, fly maggots and other animals. However, due to the residue of various additives used in the production process of livestock and poultry manure, the use of livestock and poultry manure for feed is prone to excessive harmful substances or even poisoning. Therefore, the use of livestock and poultry manure for feed is controversial. At present, some developed countries no longer advocate the use of livestock manure as feed. Livestock manure is a kind of biomass energy, and it is also a kind of renewable energy. The energy utilization of livestock manure can not only solve the problem of environmental pollution, but also solve the problem of energy shortage and promote the development of a resource-saving and environmentally friendly society.

5. Conclusion

The livestock and poultry breeding industry has increased substantially in the past years in China. The number of large livestock, pigs, sheep and poultry at the end of the year has increased by 2.4, 6.8, 7.2 and 25.6 times respectively compared with 1950. The total amount of livestock and poultry raised in all provinces, cities and regions has shown an increasing trend. At the same time, the range of change has been further increased. Therefore, the livestock and poultry breeding industry has become one of the most important sources of agricultural non-point source pollution. There are many ways to prevent and control livestock and poultry pollution and the comprehensive utilization of waste resources and involve multiple industries. Therefore, support for technology research and development, transformation of supporting facilities for livestock and poultry farms, and organic fertilizer and biogas processing should be further increased. At the same time, attention should be paid to the risk prevention and control of pollutants such as heavy metals and antibiotics in the resource utilization of livestock and poultry manure.

References

[1] Research Report Project Team of Sustainable Development Strategy of China's Animal Husbandry Industry. Research on the sustainable development strategy of aquaculture industry in China [M]. Beijing China Agriculture Press, April 2013.

ISSN: 2688-8645

[2] Lin Y, Ma J, Qin F. The Structure Distribution and Prospects of China manure Resource [J]. Chinese Agricultural Science Bulletin, 2012(32):7-11.

[3] Ding JH. The Pollution of Poultry and Feces and the Countermeasures in Guangzhou. Research of Environmental Science, 2000,13 (3): 57-59

[4] Erdal K, Mustafa C, Mehmet Y. An artificial neural network model for the effects of chicken manure on ground water [J]. Applied Soft Computing, 2012, 12(1):494-497.

[5] Moore PA, Daniel TC, Edwards DR, et al. Effect of Chemical Amendments on Ammonia Volatilization from Poultry Litter [J]. Journal of Environmental Quality, 1995, 24(2):293-300.

[6] Fraison JB, Guilpain P, Schiffmann A, et al. Pulmonary cryptococcosis in a patient with Crohn's disease treated with prednisone, azathioprine and adalimumab: Exposure to chicken manure as a source of contamination [J]. Journal of Crohns & Colitis, 2013(1):11-14.

[7] Geng W, Hu L, Cui JN, etc. Biogas Energy potential for livestock manure and gross control of animal feeding in region level of China [J]. Transactions of the Chinese Society of Agricultural Engineering, 2013(01):179-187+303.