Circular Economy and Bioeconomy Embodied in Agricultural Waste

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Abstract: In recent years, with the expansion and development of the scale of planting, processing and breeding of agricultural products, the pollution of agricultural waste in some areas is far beyond the load carrying capacity of the environment. Among them, the circular economy and bio-economy embodied in agricultural waste are also worth focusing on, so as to make enterprises profitable while effectively improving environmental problems. In this paper, the current situation of agricultural waste pollution and its economic model are briefly summarized, and the sustainable loop body is effectively analyzed from the aspects of the agricultural waste sources, waste treatment methods, and economic benefits brought by waste utilization.

Keywords: Circular Economy; Bioeconomy; Recycling of Agricultural Wastes

1. Introduction

Circular economy, also known as circulation of material economy, is a kind of industrial model which aims to achieve the balance of investment and waste by reducing the discharge of waste resources with the help of waste recycling technology, in order to achieve sustainable development. Bioeconomy is based on the distribution of technological products, and the sustainable use of biological resources through biological technology.

Nowadays, with the development of national agriculture and the expansion of the scale of agricultural products processing, agricultural waste has gradually increased, but the unsustainable consumption of agricultural resources not only poses a huge threat to the environment, but also has a huge impact on human life. Through relevant research, it is found that the mixed application of circular economy and bioeconomy in the treatment of agricultural waste resources. It can not merely improve the ecological environment, but also promote the quality of products at the same time to promote the country and especially the rural employment development, improving the level of per capita income, so as to enhance people's happiness and promote the construction of a better society. This approach has been practiced in places such as the European Union, and policies are being put in place to consolidate this mixed economic model. Likewise, China is working on policies to ensure that this model works.

2. Agricultural Waste

Agricultural waste is the general name of the waste produced by agricultural production, agricultural products processing, animal husbandry and other aspects, and is a part of the inevitable waste produced by agricultural production and people's lives.

With the continuous growth of the population and the increasing demand for agricultural production, agricultural waste also increases. The continuous destruction of environment and life caused by agricultural waste has become an urgent problem to be solved. As a large agricultural country, China produces about 900 million tons of agricultural waste every year[1]. However, due to the lack of research on recycling technology, and the low utilization rate of the waste, so the waste will pollute the soil and water sources, also further damage the ecological environment[2].

2.1 Utilization of Waste Generated from Processing of Agricultural Products

With the rapid development of agriculture, the raw materials of feed and agricultural bedding are in short supply, which leads to the rise of prices. Studies have shown that the remaining waste residues of agricultural products still contain more nutrients and effective components, which can effectively improve the growth performance and product quality of animals [3].

According to a certain proportion, all kinds of residues can be made into more effective unconventional feed and livestock litter by mechanical grinding, enzyme preparation addition, filling and mixing. The production method is simpler and the raw material cost is lower. At the same time, for feed processing plants and farms, it can also improve the product quality and obtain the same or better profit as the conventional feed.

Combined with the local agricultural characteristic resources, the use of its agricultural waste to make livestock feed and litters has played a profitable role in the planting and aquaculture industries. In the aspect of planting industry, enterprises can obtain a considerable amount of income through surplus trading. In aquaculture, the acquisition of residues with higher nutritional value than conventional feed at low prices can not only save enterprises' investment in cost, but also improve product quality and breeding effect through processing. At the same time, by comparing with other listed products, we can also improve the sales price of livestock and poultry products through high quality product quality.

2.2 Utilization of Livestock Waste

In recent years, animal husbandry has become the most dynamic factor in the agricultural economy, and the scale of breeding has also grown rapidly. However, due to the low acceptance of advanced breeding technology by farmers, the feces generated by breeding are directly discarded, which wastes resources and causes environmental pollution and has a negative impact on the social environment.

Studies have found that livestock and poultry manure contains a large amount of organic matter and the key elements needed to make organic fertilizer. Enterprises through the combination of feces and bedding products for composting, adding enzyme preparation, made into organic fertilizer used in the planting industry, can achieve the dual improvement of ecological benefits and economic benefits.

Therefore, the use of sewage resources and innovation can make it a win-win market. For the aquaculture industry, while solving the problem of manure pollution, profits are obtained through the sale of organic fertilizer. Compared with ordinary fertilizer, organic fertilizer has more nutritional value for planting industry, and it can reduce the irreversible damage to land and crops caused by mineral substance pollution, drug additive pollution and nitrogen and phosphorus pollution.

3. Economic Model Architecture

3.1 The Reflects of Circular Economy Model

In the current context, the development of circular economy can not only achieve sustainable development of resources, but also help to protect the ecological environment, and build a harmonious and beautiful society. Through the recycling of agricultural waste resources can reflect the 3R principle, that is, the mode of reduction, recycling and reuse, which can achieve the low consumption, low emission and high efficiency application of agricultural waste resources, so as to achieve the agricultural goal of sustainable development.

Enterprises need to use the closed-loop economic model of "waste - transformation and utilization - resources - waste" to achieve a win-win situation of society, economy and environment. At the same time, there is also a need for cooperation between different enterprises, through the cooperation of planting, proces+sing and aquaculture, to integrate the comprehensive utilization of waste and sustainable consumption. This model helps to maximize the value of agricultural waste.

3.2 The Reflects of Bioeconomic Model

Compared with the international average, the amount of chemical fertilizer applied in China in recent years is three times that of the world average, but the total grain output only accounts for one fifth of the world. Although agricultural production has increased gradually, the cost of agricultural products and their processed products has also generally increased due to serious pollution. Bioeconomy is a new economic form in the field of life science, which is mainly focused on the industrial economy of products. It is an important way to utilize renewable biological resources and an important economic model to obtain industrial products through sustainable biological production and conversion.

Bioeconomy mainly uses the development mode of "natural biomass - biological development process - enterprise material industry chain" to improve agricultural ecology[4], provide a sustainable development path for energy and environmental issues, and

then provide a sustainable integrated platform for the green transformation of agricultural development.

The new agricultural system under the bio-economic model is also an important trend in the future development, through the integration of biology and biotechnology, the bio-renewable raw materials into various bio-based products, using biological methods to solve environmental problems.

4. Conclusion

The efficient recycling of agricultural waste is of great strategic significance to solve the bottleneck of resources in China. By making agricultural waste feed, fertilizer and base material, it can enhance ecological and economic benefits and improve social environment. At the same time, in order to ensure that the technology can be effectively landed, we should set up typical bases, encourage multi-party cooperation, strengthen demonstration and guidance training, achieve industrialization and large-scale development, enhance the subjective initiative of enterprises and farmers to adapt to new technologies, and improve resource utilization.

References

[1] Mujtaba Muhammad et al. Lignocellulosic biomass from agricultural waste to the circular economy: a review with focus on biofuels, biocomposites and bioplastics[J]. Journal of Cleaner Production, 2023, 402.

[2] Yu B. et al. Greenhouse gas mitigation strategies and decision support for the utilization of agricultural waste systems: A case study of Jiangxi Province, China[J]. Energy, 2023, 265.

[3] Ebeid, Hossam Mahrous et al. Nutritive value of quinoa (Chenopodium quinoa) as a feed for ruminants: in sacco degradability and in vitro gas production[J]. Environmental Science and Pollution Research, 2022: 1-12.

[4] Parry Hazel. Economic benefits of conservation biocontrol: A spatially explicit bioeconomic model for insect pest management in agricultural landscapes
[J]. Frontiers in Ecology and Evolution, 2022,.