

Application of Biodiversity in Ecological Agriculture

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Abstract: Agriculture is the foundation of China's national economy and plays an important role in the development of national economy. China's agriculture occurred in the Neolithic Age, and with the development of social economy, China's agriculture from primitive agriculture, experienced traditional agriculture, and then slowly developed to today's modern agriculture. However, modern agriculture not only improves labor productivity and crop yield, but also brings serious ecological crisis and environmental pollution. Therefore, the new model of agricultural development ecological agriculture came into being. As an important element of ecological agriculture, biodiversity is of great ecological significance to the sustainable development of ecological agriculture. This article mainly expounds the development of ecological agriculture, the application of biodiversity in ecological agriculture, the loss of biodiversity and the protection countermeasures.

Keywords: Ecological Agriculture; Biodiversity; Biodiversity Loss; Protection Countermeasures

1. Ecological agriculture

Under the guidance of ecology and system engineering theory, ecological agriculture is an integrated agricultural production system with intensive management following the principles of ecology and ecological economics. Ecological agriculture pays attention to adjusting measures to local conditions, making rational use of natural resources, promoting the all-round development of agriculture, forestry, animal husbandry, sideline occupations and fishery industries, so as to realize the unity of economic, social and ecological benefits^[1]. In order to make full and rational use of resources, steadily improve agricultural productivity and obtain high-yield and high-quality agricultural products, ecological agriculture should generally have the basic characteristics of integrity and controllability, stability, efficiency, persistence and regionality.

With the productivity of traditional agriculture no

longer meet the needs of society, and petroleum agriculture is constrained by resources and environment, its exposed disadvantages are increasingly obvious. Also because of the requirements of sustainable development, ecological agriculture began to take the world stage. The concept of "ecological agriculture" was first put forward by W. Albreche, a soil scientist in the United States in 1970. Its central idea is to guide agricultural production with ecological principles. And the definition of eco agriculture was first given by M. Worthington, a British agronomist. He defined eco agriculture as a small-scale agriculture that is ecologically self-sustaining, low input, economically viable and acceptable in terms of environment, ethics and aesthetics^[2].

The development of ecological agriculture in China can be roughly divided into three stages: the initial stage, the exploration stage and the steady development stage. From the late 1970s to the early 1980s, for the initial

stage of ecological agriculture in China, the concept and basic principle of ecological agriculture were put forward and expounded, and the pilot work of ecological agriculture in China was started. From 1984 to 1992 was the exploration stage of the development of ecological agriculture in China. A group of experts represented by Professor Luo Shiming, as the pioneers of ecological agriculture in China, made important contributions to the formation of the theoretical system of ecological agriculture in China. At the same time, the pilot scale of ecological agriculture was further expanded. Since 1993, the development of ecological agriculture in China has entered a steady development stage, and the pilot work of ecological agriculture in China has been carried out all over the country. In May 2015, China's Ministry of Agriculture issued "The National Agricultural Sustainable Development Plan" (2015-2030), which proposed to promote the development of ecological circular agriculture, promote water-saving, fertilizer saving, medicine saving and other saving agricultural technologies according to local conditions, as well as ecological circulation agricultural modes such as "rice-fish symbiosis", "pig-raising, methane-generating, fruit-growing", and forest economy. By 2020, the national modern agricultural demonstration area and the main grain producing counties basically realized the circular utilization of agricultural resources in the region. By 2030, the agricultural wastes had basically been reduced to zero.

2. The roles of biodiversity in ecological agriculture

Biodiversity is animals, plants, microbes and their genes, and the complex ecosystem formed by them and their living environment^[3]. Biodiversity is the result of the evolution of life on earth, which provides the material basis for human survival and development. In agricultural ecosystem, agricultural biodiversity, as an important part of biodiversity, plays an irreplaceable role in ensuring food security and sustainable and healthy development of agriculture. The three main levels of biodiversity are species diversity, genetic diversity and ecosystem diversity. In addition, landscape diversity at the landscape level is also increasingly concerned by the community.

2.1 Improve the quality of agricultural

products

Species diversity refers to species richness and its sustainable degree, which is an objective index to measure the richness of biological resources in a certain area. Species diversity is the most commonly used indicator when describing the biodiversity richness of a country or region. Species diversity is the key to biodiversity, which not only reflects the complex relationship between organisms and the environment, but also reflects the richness of biological resources^[4]. The diversity of species shows the diversity of genes, which leads to the diversity of species. Therefore, the wide application of biodiversity in ecological agricultural production, such as the "pig-raising, methane-generating, fruit-growing" ecological agriculture model in the south, not only improves the quality of agricultural products, but also meets the consumers' pursuit of green, healthy and nutritious food.

2.2 Reduce the occurrence of diseases and insect pests

In the modern agricultural ecosystem, due to the large use of highly toxic pesticides, not only the main pests have been killed, but also a large number of other organisms have been killed or killed, resulting in the reduction of biodiversity. In addition, because of the frequent use of drugs, pests and weeds produce resistance, so that when the pest occurs again, there is no corresponding natural enemy to suppress, which often leads to its outbreak, thus forcing human to use higher virulence or greater dosage of pesticides to suppress, so as to enter the vicious cycle. In the ecological agriculture, the species competition and restriction in the ecosystem and the relationship of the food chain are used to control the species composition in farmland artificially, and the natural enemies of harmful organisms are used to control and reduce the harm of pests, weeds and bacteria. For example, raising ducks and fish in paddy fields^[5], duck and fish will eat weeds and some small pests in the paddy field, and the excrement can also be used as organic fertilizer to increase soil fertility, reduce the use of chemical fertilizers, herbicides and pesticides, but achieve the purpose of reducing the occurrence of diseases and insect pests, and achieve the unity of economic, social and ecological benefits.

2.3 Realize efficient utilization of resources

The “pig-raising, methane-generating, fruit-growing” mode in ecological agriculture^[6], as a circular economy, is an ecological agricultural mode with biogas production as the core, extending the food chain and production chain, and driving the joint development of animal husbandry, forestry and fruit industry and other related industries. The model combines toilet, pigsty and biogas digester. After a series of biochemical reactions of human and livestock feces, biogas, biogas residue and biogas slurry are comprehensively utilized. Biogas fertilizer is a kind of efficient and cheap fertilizer, which not only improves soil fertility, but also improves green and healthy agricultural products. This mode makes the waste of one kind of organism become the nourishment or raw material of another organism, turn the waste into resource, improve the recycling utilization of material and energy, and realize the efficient and rational utilization of agricultural resources.

2.4 Maintain ecosystem regulation

Biodiversity has the function of regulating and stabilizing ecosystem. In the areas of soil salinization, desertification and soil erosion, a series of comprehensive control measures should be taken according to local conditions, such as planting trees to prevent wind and sand fixation, using legumes to improve soil, replacing chemical fertilizer with organic fertilizer, reducing soil hardening and increasing soil fertility. Thus, agricultural pollution can be controlled, water and soil conservation be regulated, regional microclimate is adjusted, ecological environment is improved, and biodiversity is restored, and then form a virtuous cycle of the ecosystem.

3. The loss of biodiversity

3.1 The causes of biodiversity loss

With tens of thousands of years, natural conditions have changed, leading to the loss of biodiversity. In addition, the rapid increase of population and unreasonable human activities are the main factors of species extinction^[7]. With the rapid development of modern human society and economy, all kinds of ecosystems have been destroyed by human beings, and the area of tropical rainforest, grassland and forest has been greatly reduced, resulting in the loss or fragmentation of a large number of wildlife habitats. Driven by the interests of mankind,

over exploitation and utilization of various biological resources have broken the ecological balance and reduced the biodiversity. The discharge of rural agricultural sewage without treatment, unreasonable use of chemical fertilizers and the simplification of planting varieties lead to environmental pollution, soil fertility decline and crop resistance to insect and disease^[8]. In addition, human beings consciously or unconsciously bring alien species into their suitable habitat and breeding areas, which leads to the proliferation of alien species, encroachment on the living space of local species, reduce biodiversity, and destroy or disappear the original ecosystem^[9].

3.2 Protection countermeasures of biodiversity

The protection of biodiversity can be roughly divided into four categories: one is on-site protection, the establishment of basic farmland protection area, the establishment of ecological transition zone at the boundary of cultivated land and farmland, and the design of habitat corridor between the reserve and other habitats; the second is ex situ protection, in which species are moved to places suitable for habitat and reproduction, such as botanical gardens and zoos; the third is to carry out biodiversity protection; the fourth is to formulate laws and policies for biodiversity protection, and conduct publicity and education on biodiversity conservation.

4. Expectation

China’s ecological agriculture is a new agricultural production mode gradually formed under the requirements of agricultural sustainable development. It is the inevitable choice of China’s agricultural modernization and an important measure to promote the construction of ecological civilization. Biodiversity has the functions of soil and water conservation, reducing diseases and insect pests, regulating the ecosystem, and ensuring food security and sustainable and healthy development of agriculture. Therefore, according to China’s national conditions, China’s ecological agriculture should widely apply and protect biodiversity, vigorously develop modern ecological circular agriculture, promote the transformation of agricultural development mode, give consideration to economic, social and ecological benefits, and promote the sustainable development of ecological agriculture.

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