Research on the Countermeasures of Promoting Green Development of Agriculture in China by Drawing Lessons from Foreign Experience

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Abstract. Since the reform and opening up 40 years ago, China's agricultural green development has made some achievements, but also faces serious challenges. In order to improve the quality and safety of agricultural products, the United States, Germany, Japan and other countries are systematically expounded in this paper. A variety of policies and measures have been formulated, and feasible green technologies have been studied and promoted. Based on the comparative analysis of green agricultural development at home and abroad, this paper puts forward some countermeasures and suggestions on improving laws and regulations, strengthening scientific research innovation and market support for agricultural products, increasing financial input, and improving talent support, etc.

Introduction

With the improvement of agricultural planting and breeding level, the quantitative oriented extensive growth mode has seriously challenged the sustainable development of agriculture. There are some problems such as overexploitation of agricultural resources, degradation of ecological functions and aggravation of pollution from non-point agricultural sources. As people's demand for high-quality, safe agricultural products and a good ecological environment keeps growing, green agricultural development has become the common choice of all countries for agricultural development. In September 2017, the general office of the communist party of China central committee and the general office of the state council issued \textit{The opinions on innovating systems and mechanisms to promote green agricultural development}, it formally puts forward the concept of "green agricultural development". At present, under the background of China's in-depth transformation of agricultural development mode, it is of great practical significance to actively learn from the practical experience of the world, especially the developed countries, for the practical promotion of China's agricultural green transformation.

The Practice Experience of Green Development of Foreign Agriculture

The practice of green development of American agriculture

Putting legislation first

In the process of promoting green agricultural development, the United States adheres to the principle of legislation first. It has successively promulgated \textit{The farmland protection policy act}, \textit{The federal agricultural development reform act} and \textit{The agricultural food act}. It establishes and improves the green and sustainable agricultural system in the form of legislation. The United States has also enacted relevant laws on agricultural resource protection and input reduction, for example, the land conservation reserve plan was issued for the purpose of protecting and rationally utilizing land resources. In the 1930s, the United States implemented the system of rotation and fallow aimed at protecting the ecological environment and stabilizing food prices [1]. In terms of water resources protection, the United States has promulgated \textit{The water resources development act} and \textit{The clean
water act, which stipulate the principles of agricultural water use and water supply, and proposes specific prevention measures against water pollution to restore the water body. In the United States, the pesticide and fertilizer reduction legislation includes The federal pesticide act, The food quality protection act and The pesticide registration improvement act, which stipulates in detail the maximum residue of pesticides in food and the use of pesticides and fertilizers in agricultural production, so as to reasonably control and reduce the use of pesticides and fertilizers. In terms of crop straw utilization, the United States has The Biomass technology roadmap, Advanced energy plan and National biofuels action plan, which stipulate that crop straw should be actively and rationally used, and the utilization mode of crop straw should be defined to promote sustainable utilization of straw recycling; The United States has promulgated The federal water pollution act, farm safety and rural investment act and other laws and regulations on the treatment of livestock and poultry waste, which clearly stipulates the pollution treatment of livestock and poultry breeding and the form of subsidies for livestock and poultry breeding enterprises, so as to achieve the purpose of scientific treatment and rational use of livestock and poultry waste[2].

Developing and promoting green agricultural technologies

To promote green agricultural development, the United States actively researches and develops various applicable technologies to realize green and sustainable agricultural development. In terms of water-saving irrigation technology, the United States has changed the existing irrigation technology in irrigated areas to modern irrigation technologies such as sprinkler irrigation and drip irrigation, and applied automatic control technology in water distribution and dispatching in irrigated areas. At the same time, in the aspect of water-saving irrigation controller, many kinds of products such as electronic dc and ac are adopted, which greatly improves the water distribution efficiency of irrigation area [3]. In terms of reducing pesticide chemical fertilizer, such as the United States use of GPS and GIS technology to improve the accuracy of the fertilizer, using GPS to locate the information such as fertilizer, spraying pesticide data, analysis of soil, find out the factors influencing the production of high and low, then targeted for fertilizer, using GIS analysis the influencing factors of production at the same time, guiding fertilization, pest control and other activities, greatly reduces the pesticide applying fertilizer content; In addition, the United States also adapted fertilizer and pesticide application machinery to local conditions, promoted soil testing and leaf testing fertilizer technology, strengthened the unified defense system, and actively developed new fertilizers to reduce the use of pesticides and fertilizers.

The practice of green development of German agriculture

Germany has formed a certain scale and accumulated unique experience in promoting green agricultural transformation and development. In terms of agricultural legislation, Germany now has a complete set of modern agricultural laws and regulations, and with the support of the ministry of agriculture, Germany launched the certification system of organic products. In terms of support to farmers, Germany has set up agricultural compensation to encourage farmers to engage in green production, which has greatly increased the number of farmers engaged in green agriculture and continuously improved the quality of agricultural products.

Improving the legislation of ecological agriculture

Germany has formed a relatively complete legal system in promoting the development of ecological agriculture. It has promulgated Natural resources protection law, Ecological agriculture law and Organic agriculture law. Specifically, in terms of land protection, Germany began to implement The soil protection law at the end of the 20th century, which explicitly stipulated in the form of legislation that it was necessary to vigorously prevent and control soil erosion, improve soil fertility, and reduce the use of soil surface machinery by means of rotation and fallow as far as possible. In terms of the utilization of water resources, Germany has promulgated special laws and regulations such as The regulation on water resources management and The federal water law, which clearly stipulate the standards for the discharge of water and waste water and the methods for the management and protection of water resources. In terms of the reduction of pesticides and
fertilizers, Germany has promulgated The plant protection law and The pesticide regulation, and revised The renewable energy law to explicitly prohibit the use of specific pesticides in order to protect the ecological system from the harm of pesticides and fertilizers. In terms of pollution control of livestock and poultry breeding, Germany has promulgated The feces law and The fertilizer law, which stipulates the standards of feces recycling and utilization that cannot be discharged at will without treatment. In terms of the utilization of crop straws, The regulations on biomass energy and The biofuel quota law have been promulgated successively, which clearly stipulate the ways and means of new energy utilization of straws.

Increasing support for green agricultural products market

The German government has continuously increased its market support for green agricultural products to create a good market environment for green agricultural products. In 1999, the German government established the "organic agriculture and diversified agriculture department", which is mainly engaged in green and ecological agriculture subsidies, agricultural product certification and labeling [4]. At the same time, the German government is directly responsible for the inspection of organic agricultural products and the certification of organic agricultural products to ensure the authenticity of organic agricultural products. The government has also continuously increased financial support, improved the system of agricultural products market and strengthened the supervision of the circulation process of agricultural products market. In addition, Germany has also established a green ecological agriculture consulting agency, which has many professional and technical personnel, who can provide technical guidance to ordinary farmers and provide market information, so as to promote the development of German ecological agriculture.

The present situation and existing problems of agricultural green development in China

The results of green agricultural development in our country

Over the past 40 years of reform and opening up, under the strong leadership of the party and the government, remarkable achievements have been made in the development of agriculture and rural areas. However, at the same time, problems such as overexploitation of agricultural resources and degradation of ecological environment also exist to varying degrees, posing serious challenges to sustainable agricultural development. In 2015, Implementation opinions of the ministry of agriculture on the prevention and control of agricultural non-point source pollution was issued, it started the prelude of agricultural green revolution. In 2017, the general office of the communist party of China central committee and the general office of the state council continued to issue the opinions on promoting green agricultural development through innovative systems and mechanisms. It formally puts forward the "green agricultural development", and clears goals. Under this background, our country agriculture green development has obtained certain result.

First of all, the intensity of agricultural resource utilization has been alleviated. By the end of 2017, China had built 27 million hectares of high-standard farmland. China has carried out trials of a system of crop rotation and fallow, covering an area of more than 3.2 million hectares. Water-saving agronomy, water-saving engineering and other water-saving measures are widely promoted in agricultural production. The area of high-efficiency water-saving irrigation has reached 8 million hectares, which has greatly improved the effective utilization coefficient of agricultural irrigation water. The effective utilization coefficient reached 0.53 at the end of 2017. At the same time, trials of comprehensive reform of agricultural water prices were carried out in 80 counties, and total agricultural water consumption remained stable at about 380 billion cubic meters.

Secondly, producing area environment management begins to see result. Soil testing formula, green prevention and control, organic fertilizer replacement, professional control and control technology has been effectively promoted and applied. By the end of 2017, the application area of soil-testing fertilizing formula technology was nearly 107 million hectares, and the application area of organic fertilizer reached 25 million hectares. More than 34 million hectares of land were used for green prevention and control. Nationwide, the application of chemical fertilizers and pesticides
has maintained zero growth. Meanwhile, the comprehensive utilization ratio of livestock and poultry manure and crop straw was also improved. In 2017, the utilization rate of livestock and poultry manure in China has reached nearly 60%, straw utilization rate of about 80%. In addition, significant progress has been made in improving rural living environment. Most provinces and cities across China have set up rural environmental protection promotion mechanisms. By the end of 2017, more than 60 percent of household garbage in the country's institutional villages had been disposed of. More than 22% of the village sewage is treated.

**Problems in the green development of agriculture in China**

Although our country agriculture green development obtains certain result, but still faces many problems. First of all, China's land resource constraints are still very serious. China's per capita arable land area is only 38% of the world's average level, and more people and less land is still a hard constraint on agricultural development. At the same time, China's extensive mode of agricultural growth has not been fundamentally reversed, the quality of arable land is low, black soil thinning, soil acidification, shallow tilling layer and other issues become more prominent; Moreover, exogenous pollution, such as industrial wastes and municipal solid waste, continues to permeate into agricultural production areas. The over-standard rate of soil points is still around 16.1%. The overall utilization rate of chemical fertilizers and pesticides is less than 33%, far from the 50-60% utilization rate in developed countries. Second, water constraints are growing. The amount of water resources per capita in China is only 25% of the world average level. The effective utilization coefficient of farmland irrigation water is about 0.53, 0.2 lower than the average level of developed countries. At the same time, the situation of groundwater quality is not optimistic, and agricultural production mainly depends on groundwater irrigation, which affects the quality of agricultural products to a large extent. Finally, China's science and technology and talent support system is not complete. In general, China still has problems such as insufficient green technology innovation ability, imperfect technology research and development system and insufficient investment in research and development. In addition, China still has problems such as lack of high-quality scientific research personnel and agricultural extension personnel. Therefore, in the new era, China also needs to further strengthen efforts to promote green agricultural development

**Suggestions**

Based on this, this paper puts forward the following suggestions:

1. We will improve laws and regulations related to the green development of agriculture in China. From the practical experience of the United States, Germany and Japan, it can be seen that in the process of promoting green agricultural development, foreign countries adhere to legislation first, with complete laws and regulations as the premise and guarantee of all work. Therefore, China should learn from foreign experience and emphasize the specific work of promoting agricultural green development with legal thinking and methods. On the one hand, we will continue to improve the central and local systems of regulations and standards, and give full play to the role of legislation in ensuring green agricultural development. On the other hand to do strict law enforcement, this requires strengthening the construction of law enforcement team, strict implementation of agricultural resource conservation, environmental governance, such as soil and water conservation and ecological protection of various kinds of laws and regulations, in accordance with the law to punish all kinds of illegal behavior, in order to regulate all kinds of production operators in accordance with the rules in accordance with the production, make it really become the main body of green agricultural production. (2)We will increase financial input, intensify green scientific research and innovation, and improve the technology dissemination system. The us government has given strong financial support to the research, development and promotion of technologies for returning farmland to forests, fallow rotation, water-saving irrigation and reduction of pesticides and fertilizers. Germany and Japan have also encouraged farmers to engage in green production by increasing financial support [5]. In recent years, although the Chinese government has increased the financial investment in green agricultural development, there is still a big gap between China and
developed countries. The performance is the financial subsidy type is less, the subsidy strength is insufficient. The legislation is not perfect and so on. To this end, we want to be in draw lessons from foreign successful experience, on the basis of the formation of a sound financial subsidies for agricultural green development of laws and regulations, we will continue to increase financial input, constantly expanding the area of financial subsidies, innovative financial support to the development of green way, further optimize the structure of fiscal expenditure, to improve the efficiency of capital utilization, especially to intensify support for green technology research and development, financial input form stable growth mechanism.

(3) We will increase market support and create a favorable market environment for green agricultural development. Foreign governments have given strong support to the market construction of green and organic agricultural products, forming a good market environment with high quality and good price, and effectively stimulating the enthusiasm of producers to engage in green production. By contrast, problems such as "adverse selection" and "moral hazard" are still prevalent in China's high-quality agricultural product market, and the agricultural product market with high quality and high price is still not sound. Therefore, we should intensify support for green agricultural products market, on the one hand is to develop pollution-free agricultural products, green agricultural products and certification of organic agricultural products, in terms of organic certification, you can use for reference the experience of Germany, set up specialized certification, unified markets for agricultural products certification, to avoid confusion at present, the organic agricultural products certification, etc.

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References

[1] Zhu Guofeng, Li Xiucheng, Shi Yaorong. Practice comparison and policy enlightenment of farmland rotation and fallow at home and abroad [J]. Agricultural resources and regionalization of China 6(2018)35-41.

[2] Xu Jin. Legislative experience and enlightenment on pollution control of livestock and poultry breeding abroad [J]. World agriculture 6(2018)18-23.

[3] Guo Liang, Shao Liqun, Hui Rongrong. Analysis on the extension measures of agricultural water-saving irrigation technology based on foreign experience [J]. Shaanxi agricultural science 6(2013)117-119.

[4] Zhou Yuxin, Tang LuoZhong. Japan's agricultural environmental protection policy and its enlightenment to China [J]. Environmental protection 21(2009)68-70.

[5] Li Xuerong, Wang Huifang, Zhang Liguang. Foreign policy practice of pesticide reduction application and its enlightenment to China [J]. World agriculture 11(2016)74-79.