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Analysis of the General Situation of Organic Fertilizer in China

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Abstract

Organic fertilizers are crucial to China's agriculture, significantly enhancing soil fertility and sustainability. Derived from sources like livestock manure, crop residues, and green manure, these fertilizers improve soil structure, water retention, and nutrient availability, thus boosting crop yields and soil health. Despite their benefits, challenges such as variability in quality, application efficiency, and balancing with inorganic fertilizers remain. Government policies and ongoing research are addressing these issues to optimize the use of organic fertilizers and support sustainable agricultural practices.

Keywords

Organic Fertilizers; Soil; Sustainability; Agricultural.

1. Introduction

In China, the role of organic fertilizers has become increasingly prominent as the nation seeks to enhance agricultural sustainability and soil health. With its vast agricultural landscape, China faces the dual challenge of maintaining high crop yields while addressing soil degradation and nutrient imbalances. Organic fertilizers, which include livestock manure, crop residues, and green manure, offer a sustainable solution by replenishing soil organic matter, improving soil structure, and enhancing water and nutrient retention. Historically, the use of organic fertilizers has been influenced by traditional farming practices and resource availability. However, modern agricultural demands and environmental concerns have led to a renewed emphasis on their application. Government initiatives and research are focusing on optimizing organic fertilizer use to address soil quality issues and support sustainable farming practices. This evolving focus highlights the importance of integrating organic fertilizers into China's agricultural systems to ensure long-term soil health and productivity.

2. Definition of Organic Fertilizer

In a broad sense, organic fertilizers, also known as farmyard manures, are composed of various animal, plant residues, or metabolic by-products. These include materials such as human and animal dung, crop residues, animal carcasses, and abattoir waste. Organic fertilizers also encompass oil cakes (such as rapeseed cake, cottonseed cake, soybean cake, sesame cake, castor cake, and tea seed cake), compost, fermented manure, stable manure, biogas slurry, and green manure. The primary purpose of these fertilizers is to supply organic matter to improve the

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physical and chemical properties of the soil, promote plant growth, and enhance the cycling of soil ecosystems.

In a narrower sense, organic fertilizers specifically refer to those derived from animal waste (including animal dung and processing by-products) and plant residues (such as crop straw, fallen leaves, dead branches, and peat). These materials are processed using physical, chemical, biological, or combined treatment technologies. Through processing techniques such as composting, high-temperature treatment, or anaerobic digestion, harmful substances (including pathogens, pest eggs, and weed seeds) are eliminated to meet harmlessness standards. These fertilizers conform to national standards (NY 525-2012) and regulations.

3. Organic Fertilizer Industry Policy

From 2016 to 2021, various national and provincial authorities in China, including the State Council General Office, the Ministry of Agriculture and Rural Affairs, the National Development and Reform Commission, and the Ministry of Ecology and Environment, introduced several policies related to "agricultural circular economy," "promoting green and low-carbon development in agriculture and rural areas," and "zero-waste cities." These policies mandate the management of agricultural and forestry waste, such as straw and livestock manure, based on the principles of "local adaptation, priority for agricultural use, and proximity." Specifically, they emphasize achieving "full return to the field," "fertilizer application," "strengthening the construction of livestock manure treatment facilities," encouraging integrated crop-livestock systems, and promoting the local application of agricultural organic fertilizers.

In 2023, the Shaanxi Provincial Departments of Ecology and Environment and Agriculture and Rural Affairs called for continuous improvements in the utilization of agricultural solid waste. This includes "developing comprehensive straw utilization projects in key counties, such as Fuping, with at least four demonstration bases in each key county, aiming for a straw utilization rate of over 90%," and "selecting and recommending 1-2 key technologies for comprehensive straw utilization to broaden the utilization approaches and scale, thereby enhancing the level of straw utilization." Additionally, subsidies are offered to enterprises, farmer cooperatives, collective economic organizations, and social service organizations involved in the "five-material utilization" of straw and professional straw collection and storage, although specific subsidy schemes are yet to be detailed.

In 2021, the General Office of the Heilongjiang Provincial Government and the Harbin Municipal Government introduced implementation plans for comprehensive straw utilization, providing provincial and municipal subsidies of 10 RMB and up to 30 RMB per mu, respectively, for the treatment of residual straw after removal from the field. Thus, advancing the fertilization and commercialization of agricultural and forestry waste not only offers potential profitability but also provides opportunities to obtain government subsidies for straw removal and treatment .

4. Raw Materials for Organic Fertilizer Production

In China, organic fertilizer production materials are classified into four main types based on their characteristics. Crop residues primarily include straw from crops such as corn and wheat. Livestock manure comprises manure from poultry, cattle, and pigs. Processing by-products include materials such as rice husks, wheat bran, and oil cakes. Other agricultural waste refers to waste not included in the previous categories, such as biogas residues, tree branches and trunks, and wool processing by-products.

4.1. Straw

According to data from the Ministry of Agriculture and Rural Affairs, and based on parameters from the second national pollution source census[1], it is estimated that the total straw

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production in China is approximately 829 million tons, with about 694 million tons available for collection. Analysis of grain production statistics from the National Bureau of Statistics indicates that China's grain output has generally increased at a steady rate of around 1% in recent years. It is anticipated that the total straw resources will continue to rise steadily. By 2030, straw production is projected to reach approximately 916 million tons, with collectible resources estimated at about 767 million tons. By 2060, straw production is expected to be around 1.234 billion tons, with collectible resources reaching approximately 1 billion tons (Figure 1).

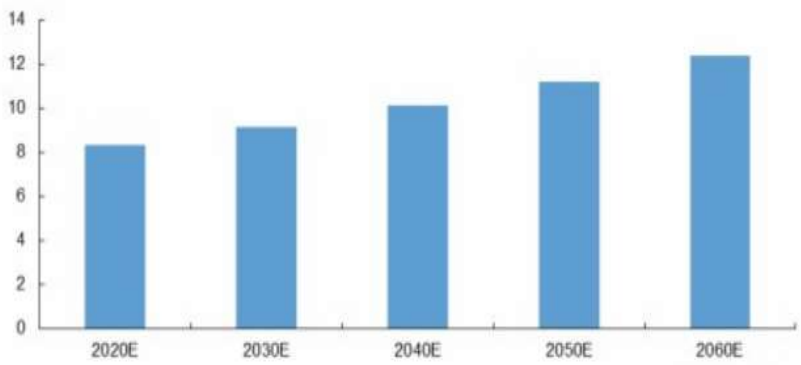

Figure 1. Forecast of total straw growth in my country (100 million tons)

4.2. Livestock and Poultry Excrement

In a broad sense, livestock and poultry manure primarily refers to the excrement and urine of livestock and poultry. According to data from the China Agricultural Yearbook[2], China Rural Statistical Yearbook[3], China Animal Husbandry and Veterinary Yearbook[4], and the latest livestock and poultry inventory data from the National Bureau of Statistics, the total amount of livestock and poultry manure in China is estimated at 1.868 billion tons (excluding washwater). Recent statistics indicate that the number of major livestock and poultry has fluctuated slightly in recent years. Although there was a significant rebound in 2019 following a low point due to increased pork supply, overall trends remain influenced by short-term market factors. It is expected that future meat, egg, and milk consumption will approach saturation, resulting in livestock and poultry manure resources remaining within a stable range and growing at a low rate of approximately 0.6%. By 2030, the total amount of livestock and poultry manure is projected to be around 1.983 billion tons, and by 2060, it is expected to reach approximately 2.373 billion tons (Figure 2).

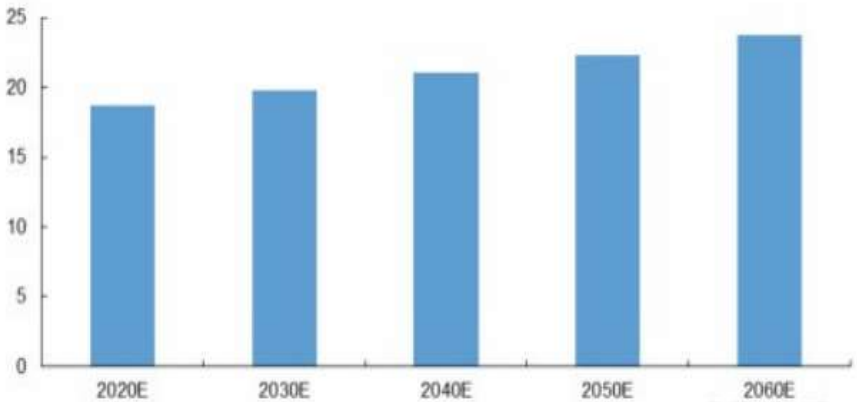

Figure 2. Forecast of the total growth of livestock and poultry manure resources in my country (100 million tons)

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4.3. Forestry Waste

According to data from the China Forestry and Grassland Statistical Yearbook[5] published by the National Forestry and Grassland Administration, the current forest area in China is approximately 17.988 million hectares, with a forest cover rate of 22.96%. The annual timber harvest amounts to 10.04585 million cubic meters, leading to an estimated forestry waste resource of around 350 million tons. Forestry carbon sinks are a critical method for carbon sequestration, and it is anticipated that the forest area in China will continue to grow steadily. Analysis of the past 20 years of data from the China Forestry and Grassland Statistical Yearbook indicates a 2% annual increase in total forestry harvest resources. Consequently, the amount of forestry residuals is expected to rise accordingly. By 2030, the total amount of forestry residuals is projected to reach 427 million tons, and by 2060, it is expected to increase to 773 million tons (Figure 3).

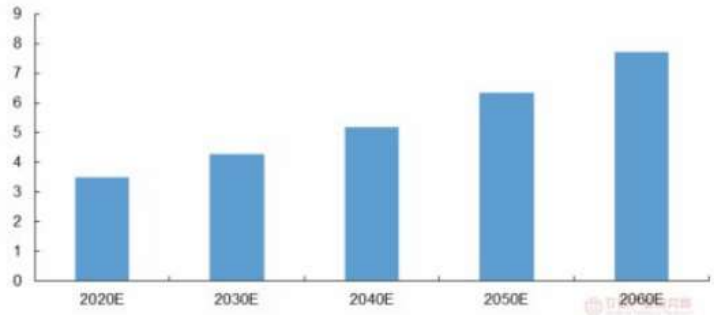

Figure 3. Forecast of the total growth of forestry residue resources in my country (100 million tons)

5. Conlusion

Organic fertilizers are essential for improving soil health and supporting sustainable agriculture in China. They are derived from a variety of sources, including crop residues, livestock manure, processing by-products, and other agricultural waste. Current data reveals significant quantities of straw and livestock manure available for organic fertilizer production, with projections indicating continued growth in these resources. Forestry residuals also play a crucial role, with an anticipated increase as forest areas expand. Government policies and initiatives aimed at enhancing organic fertilizer use, such as comprehensive straw utilization and subsidies for manure management, reflect a strong commitment to this cause. However, challenges related to fertilizer quality and application efficiency persist. Addressing these challenges through ongoing research and policy support will maximize the benefits of organic fertilizers, thereby enhancing soil fertility, crop productivity, and overall environmental sustainability.

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