

Promotion Strategies for Crop Straw Returning to the Field Technology

Hang Zhou^{1,2,3,4}, Juan Li^{1,2,3,4}, Tingting Cao^{1,2,3,4}

¹ Technology Innovation Center for Land Engineering and Human Settlements, Shaanxi Land Engineering Construction Group Co., Ltd and Xi'an Jiaotong University, China

² Shaanxi Provincial Land Engineering Construction Group Co., Ltd., China

³ Institute of Land Engineering and Technology, Shaanxi Provincial Land Engineering Construction Group Co., Ltd., China

⁴ Key Laboratory of Degraded and Unused Land Consolidation Engineering, Ministry of Natural Resources, China

Abstract

In current agricultural planting, returning straw to the field can effectively improve the physical properties of the soil, increase the organic matter content, enhance the soil's aggregate structure, and further improve soil fertility. This is beneficial for the sowing and production of the next crop, helping to increase yield and quality. However, currently in China, straw treatment is still mainly simple methods such as burning. Some people think that the straw returning to the field is cumbersome, so it has not been widely applied in the agricultural planting process. The article first analyzes the significance of the promotion and application of straw returning to the field technology, then explores the main factors affecting the application of crop straw returning to the field technology, and finally proposes several effective measures for technology promotion.

Keywords

Crop; Straw Returning to the Field; Technology Promotion.

1. Introduction

As a major agricultural country, China has a vast area of crop planting and a rich variety of crops. Therefore, the large quantity, variety, and wide distribution of crop straw are the main characteristics of China's agricultural planting. If the results can be comprehensively reused, it will produce significant economic benefits. However, the current situation is that most of the crop straw in China is still treated by traditional methods such as abandonment or burning, which is simple but has a large impact on environmental pollution and does not play the true role of straw. Therefore, the main task of China's agricultural production in the next step is to strengthen the promotion of crop straw reuse and realize the large-scale return of straw to the field.

2. The Significance of Promoting Straw Returning to the Field Technology

On one hand, according to incomplete statistics, in the past 20 years, the application of organic fertilizer in China's crop production process has relatively decreased [1], accounting for only about 1/4 of the total fertilizer application. Therefore, the quality of arable land has shown a relatively declining trend. Analyzing the causes, the input of organic resources such as crop straw, manure, and green fertilizer has gradually decreased, which has made the soil's ability to retain fertilizer and water worse. The fertility of the land and the yield of crops cannot

achieve balance and coordination, which also affects the large-scale production of grain and the steady increase in yield. In addition, there is an over-reliance on chemical fertilizers in the agricultural production process, and the use of chemical fertilizers is gradually increasing. The utilization rate of organic fertilizers such as nitrogen fertilizers is decreasing, which also affects the production of crops and sometimes causes significant resource pollution. If chemical fertilizers, especially physiologically acidic fertilizers, are used in large quantities for a long time, it will make the soil acidification and have a greater impact on crop yields. In summary, promoting the technology of straw returning to the field is currently a key task in China's agricultural production.

On the other hand, as a valuable industrial raw material and biological resource, the yield of crop straw in China is high, and nearly 40 million tons of crop straw can provide 1 million tons of pure nutrients for agricultural production, of which nitrogen, phosphorus, and potassium account for 370,000 tons, 50,000 tons, and 580,000 tons respectively. At the same time, crop straw also contains a large amount of medium and trace elements and organic matter. Promoting the use of straw returning to the field technology in the crop production process is one of the effective ways to improve resource utilization and promote the improvement of soil fertility, achieving an increase in the yield and quality of grain and agricultural products. If all the straw in China's agricultural production process is utilized every year, it will effectively reduce emissions of about 800 million tons of carbon dioxide, realizing the protection and improvement of the ecological environment, promoting the implementation of energy saving and emission reduction in China, and promoting the sustainable development of agricultural production.

3. Main Factors Affecting the Promotion of Straw Returning to the Field Technology

Firstly, in rural areas, most households currently use gas and coal. With the development of China's economy and the continuous improvement of social levels, the quality of life and living standards of China's residents have significantly improved [2]. As the gap between urban and rural development levels decreases, the living standards of Chinese farmers have also changed greatly compared to the past. Therefore, the reduction of rural labor force has also brought great difficulties to the collection and transportation of straw. Driven by economic development, the use of gas and coal has been fully popularized in most rural areas, so the utilization rate of crop straw has gradually decreased. Farmers no longer pay attention to the main role of crop straw as fuel, which has also greatly reduced its collection and utilization rates.

Secondly, at present, Chinese farmers' understanding of the role of straw returning to the field is not enough, and they cannot truly recognize the significance of straw returning to the field, and thus cannot regard straw as an effective agricultural production resource. Due to the lack of understanding, this has made the planning of crop straw in the agricultural production process not corresponding, and the lack of national policies and systems has made farmers more indifferent to the true role of straw, leading to the serious lag in the development of the straw industry, and the degree of commercialization is far behind the development of rural agriculture. In the long run, new technologies cannot be innovated and improved, and difficulties will arise in the promotion process.

In addition, most of China's agricultural production has been mechanized at present, so the wheat fields are mainly harvested by machines. After harvesting, the stubble is relatively high, and if it is not cleaned up in time, it will not be conducive to the next timely sowing. If other methods are used to deal with the straw, it is not only difficult but also costly. Although the method of burning straw is simple and cost-effective, it has a large impact on environmental

pollution and also consumes the fertility of the soil, which is not conducive to large-scale promotion and application.

Finally, the benefit of straw agricultural treatment in China is relatively low, which has also severely restricted the normal development of this work. For example, if crop straw is used for power generation by burning, due to the backward technology, the investment cost per unit capacity is high, and the heat efficiency is low, which cannot produce effective electrical energy resources; if straw is used for papermaking, then a large amount of alkaline substances and wastewater may be discharged during the production process, causing serious adverse effects on the ecological environment and rivers, polluting people's living environment [3]. Although China has achieved certain results in the comprehensive utilization of straw, it often requires a high cost, and the economic benefits obtained are limited. It is difficult to open up the market in a short time and cannot be accepted by farmers. It can be seen that the key work that needs to be solved at this stage is to innovate the reuse technology of crop straw, drive social development, and improve economic benefits.

4. Promotion Strategies for Crop Straw Returning to the Field Technology

4.1. Emphasize the Development of Publicity Work

Government and relevant agricultural departments can use media such as the internet, radio, and television to publicize the advantages and functions of straw returning to the field technology to the public. At the same time, make full use of village committees and other departments to actively carry out village representative meetings, or carry out related knowledge lectures in places where people gather in rural markets. During the off-season of farming, agricultural technicians can also go deep into the rural fields to promote the technology of straw returning to the field, regularly carry out knowledge lectures, and effectively promote and publicize the technology of straw returning to the field. To truly promote and implement the technology of straw returning to the field, the most fundamental thing is to actively change the thinking of farmers, guide them to abandon the long-term dependence on chemical fertilizers, enhance their environmental awareness, help them recognize the shortcomings of the traditional planting model, achieve the change and development of the traditional planting model, and gradually establish a comprehensive planting model, so that farmers can consciously practice the technology of straw returning to the field in the planting process [4].

4.2. Increase Financial and Policy Support

Government and relevant agricultural departments should strengthen leadership, increase financial and fiscal support, formulate corresponding laws and regulations, strictly stop and control the behavior of straw burning, and impose corresponding penalties when necessary. The behavior of straw burning is a serious environmental damage and does not make the straw play its true role. Local governments and agricultural departments should pay attention to the promotion and application of straw returning to the field technology, regard it as a key task in the process of local economic development, and with the help of the government, continuously improve the degree of application of straw returning to the field technology by farmers, and create a good agricultural environment for the promotion and application of straw returning to the field technology. Local government finance departments can establish a subsidy mechanism for the purchase of machinery for straw returning to the field. If farmers purchase straw returning to the field machinery, they can be given a certain financial subsidy; they can also organize local farmers to carry out paid straw returning to the field operations, broaden the channels for farmers' funds, and effectively stimulate the enthusiasm of farmers [5].

4.3. Utilize Advanced Production Equipment

With the progress and development of science and technology, mechanization has also been widely achieved in the agricultural field. For the technology of straw returning to the field, the realization of mechanization can promote the application and development of the technology to a certain extent. Local departments should analyze the actual situation and environment, introduce appropriate technical equipment according to the relevant data of the farmland, give full play to the role of advanced equipment, and achieve sustainable agricultural development. At the same time, on the other hand, in the process of implementing relevant national policies, it is also necessary to strengthen the environmental protection work in rural areas. The choice of mechanized technology should not affect the local environment and should be able to achieve a win-win situation. At the same time, it should also fully mobilize the enthusiasm of farmers for the application of corresponding technology, guide them to actively contact and learn about mechanized production technology, and consciously invest resources into the technology of straw returning to the field.

4.4. Do a Good Job in Technical Training Work

After the promotion of the technology of straw returning to the field, it is also necessary to do a good job in the technical publicity and training work for farmers. Local agricultural departments should use practical effects as a guide, educate local farmers, help them change traditional concepts, and require them to use specific measures for precise treatment of residual straw. Government propaganda departments and other departments should also use announcements and regulations to publicize the specific requirements of straw returning to the field technology, so that it becomes well-known. Make full use of news media and other media to do a good job in guiding public opinion on straw returning to the field, and at the same time, do a good job in supervising straw burning, popularize the economic benefits and social benefits of straw returning to the field technology within the region. Relevant departments should also regularly carry out training activities to guide the local people to deeply understand and learn the technology of straw returning to the field.

5. Conclusion

The promotion of the technology of straw returning to the field is an important task for the development of agricultural production. The realization of mechanization has had a positive impact on the development of this work. In the actual work process, local governments and agricultural departments should combine the actual situation of the countryside, formulate relevant promotion and development systems, ensure the stable development of the rural economy, fully mobilize the enthusiasm of farmers for production, guide farmers to strengthen the utilization of crop straw, realize the in-depth promotion and implementation of the technology of straw returning to the field, and promote the rapid and sustainable development of China's agricultural economy.

Acknowledgments

Fund projects: Funded by Technology Innovation Center for Land Engineering and Human Settlements, Shaanxi Land Engineering Construction Group Co.,Ltd and Xi'an Jiaotong University "Research and Demonstration Application of Ecological Effects of Urban Landscape" (2021WHZ0093); Funded by Key R&D Program of Shaanxi Province "Synthesis of Atmospheric Hydrogels and Their Performance in Photothermal Autonomous Irrigation in Arid Areas"(2024NC-YBXM-245).

References

- [1] Wang Yajie, Ni Shengya, Xue Minqi, et al. Current status, existing problems and countermeasures of comprehensive utilization of crop straw in Yancheng City [J]. Agricultural Science and Technology Communication, 2019, 576(12): 37-41.
- [2] Song Jia, Zeng Xiba, Wang Yanan, et al. The effect, problems and countermeasures of straw returning to the field [J]. Chinese Journal of Ecology, 2020, 322(5): 319-326.
- [3] Sun Shijun. Current status and countermeasures of comprehensive straw treatment development in Longkou City [J]. Shandong Agricultural Mechanization, 2019, 330(1): 34-35.
- [4] Yin Jiuze. Current status and countermeasures of efficient comprehensive utilization of crop straw in Changzhi Luzhou District, Shanxi [J]. Agricultural Engineering Technology, 2019, 39(20): 42-43.
- [5] Ruan Jiaping, Zhu Riqing, Yu Guangli, et al. Comprehensive utilization of crop straw and main countermeasures in Xiuzhou District, Jiaxing City [J]. Shanghai Agricultural Science and Technology, 2019, (6): 27-28.