Research on High-quality Agricultural Development

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Abstract: On the basis of discussing the necessary and sufficient conditions, connotation and extension of high-quality development, this paper deeply analyzes the new quality products, new quality production factors and new quality production methods of high-quality agricultural development, as well as the main driving forces of new quality agricultural productivity. Taking the concept of big food and the application of biotechnology and digital technology in agriculture as examples, this paper analyzes the development opportunities, challenges and ideas of high-quality agricultural development in three key areas: big agriculture, modern seed industry and smart agriculture. Finally, it is pointed out that scientific and technological innovation is extremely important to achieve high-quality agricultural development, but institutional innovation, market innovation and investment innovation are equally important.

1. The Connotation and Extension of High-quality Development

High-quality development is based on the leap of laborers, labor materials, labor objects and their optimal combinations. High-quality development has three basic connotations: the generation of new productive forces (i.e., new labor objects, referred to as new products), the use of new factors of production (i.e., new labor force and labor materials), and the adoption of new production methods (e.g., the optimal combination of labor objects, laborers, and labor materials, etc.) [1]. High-quality social and economic development includes the coordinated development of growth, equity and green, which means that the productivity that promotes fair and green development is also a new productive force. The new quality productivity is marked by a substantial increase in total factor productivity.

One of the necessary conditions for high-quality development is to meet at least one of the following three conditions. First, the production capacity has been improved, and the products include existing products, improved products, new products and products that promote high-quality development such as fairness and green. Second, new factors of production have been used in production, including workers whose capabilities have been improved, factors of production that have improved quality and safety, and new factors of production (e.g., data, information, knowledge, new technologies, etc.). In the process of production and application of factors of production, the factors of production that can achieve the goal of more equitable and greener development of society are also new factors of production, because these factors of production have a social premium of positive externalities [2]. Third, a new mode of production has been adopted in production, which is the embodiment of the "optimal combination" of "laborers, labor materials, and labor objects" and its "innovation in systems and mechanisms". The second necessary condition for high-quality development is that the new TFP must be higher than the old TFP. In practice, total factor productivity can be improved by promoting the adoption of new factors of production and new modes of production through "scientific and technological innovation, reform and innovation".

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2. The Connotation and Main Driving Force of High-quality Agricultural Development

2.1. New Agricultural Products

New agricultural products must significantly increase agricultural production and its total factor productivity. Under these two sufficient conditions, new agricultural products mainly include: first, agricultural products that have been improved in terms of quality and safety, that is, agricultural products that have been improved in terms of quality, nutrition and safety, and thus increase their market value. The second is new agricultural products, including emerging foods and emerging agricultural multifunctional products or services. The third is agricultural products with a positive externality premium that can enable society to achieve fairer and greener development.

2.2. New Factors of Production in Agriculture

The new quality production factors of agriculture mainly include: First, the agricultural production factors after improving the quality of the existing agricultural production factors. Such new agricultural production factors include farmers with higher quality and higher productivity, soil and water resources with higher productivity, new crop varieties with higher efficiency, ecology and low carbon, agrochemicals (fertilizers, pesticides, etc.) and machinery. The second is the new factor of agricultural production [3]. This kind of new agricultural production factors mainly include the following two factors: first, new biological fertilizers, biological pesticides, new machinery and other production factors in conventional agricultural production functions; Second, innovative technologies in data, information and knowledge, as well as biological, digital, equipment and ecological aspects.

2.3. New Quality Production Mode of Agriculture

The new agricultural production mode is the way to achieve high-quality agricultural development, which mainly includes the following four categories: (1) Optimization of the production structure of new agricultural products: The production structure of all agricultural products should be adjusted according to the changes in the respective weights of growth, equity and green development required by high-quality development, because this will affect the realization of common prosperity and green development goals. (2) Optimization of the spatial distribution of the new quality productivity of major agricultural products: According to the regional comparative advantages of agricultural products, especially the new agricultural products, the spatial distribution of all agricultural products, including new agricultural products, should be optimized. All localities should develop agricultural products suited to their local advantages in light of local conditions. (3) Optimization of the spatial distribution of new agricultural production factors: It is necessary to optimize the layout of the whole country and each region according to the different R&D levels, talent bases, geographical locations, and institutional mechanisms for the development of various agricultural production factors in various regions. (4) The optimal allocation of production factors in the agricultural production process should significantly reduce the misallocation of production factors through innovation in systems, policies and investments. For the production of each type of agricultural product, it is necessary to realize the optimal allocation of non-new quality production factors and new quality production factors and the optimal allocation between new quality production factors according to the production capacity and quality of peasants in various localities. With regard to the various new agricultural production factors, it is necessary to adjust the use and popularization of each new agricultural production factor in the production of different agricultural products according to the production attributes or characteristics of different agricultural products.

2.4. The Main Driving Force for the High-quality Development of Agriculture

Over the past 40 years, China's agricultural production growth and total factor productivity (TFP) growth have been driven by four major drivers: technological progress, institutional innovation, market reform, and infrastructure investment.

In terms of technological progress, China should pay more attention to the research and

development, application and spatial layout of agricultural technologies and cross-border technologies such as biology, digital, equipment and ecology, empower agriculture with science and technology, expand the space for agricultural development (develop new products) and improve the quality and safety of agricultural products, improve and innovate agricultural production factors, improve and innovate agricultural production methods, and provide technical support for the substantial increase in agricultural products, new production factors and new production methods, as well as agricultural product production and total factor productivity.

In terms of institutional innovation, China should pay special attention to the reform and innovation of the scientific and technological system, the innovation of the production system of new agricultural products and new production factors, and the optimization of the spatial layout of new agricultural products and new production factors, so as to provide institutional guarantees for the innovation of new agricultural products, new production factors and new production methods, as well as the high-quality development of agriculture.

In terms of market reform, China should deepen the reform of the domestic agricultural product market, take the initiative to adapt to the new development pattern and actively promote higher quality and higher level of opening up, open up the market for new agricultural products and new production factors, realize the market value of new quality products and new production factors, and the premium of fair development and green development, so as to provide market guarantee for high-quality agricultural development.

In terms of agricultural productivity input, China should actively respond to the demand for scientific and technological innovation, ecological compensation and infrastructure for the production of new agricultural products, the innovation of new production factors and the application of new production methods, and strive to improve the research and development capacity, production scale and quality of new products and new production factors, so as to provide financial guarantee for the high-quality development of agriculture.

3. Potentials, Challenges and Ideas for High-quality Agricultural Development in Important Areas

3.1. Big Food and Big Agriculture

China's vast territory and small population and land mean that it is extremely important to establish a big food concept and develop big agriculture for the high-quality development of agriculture. On the one hand, China's arable land production system is dominated by agricultural areas, and through long-term and continuous efforts, after getting rid of hunger, the food system has entered a stage of transformation from "eating better" to "eating more nutritious and healthy". On the other hand, in a country where China has only 5% of the world's fresh water and 8% arable land but 18% of the world's population, the successful transformation of the food system cannot rely mainly on the arable land production system of agricultural areas, but needs to look at the entire land resources, including arable land, grasslands, woodlands, lakes and oceans, and in the future, develop disruptive and rich and diverse new foods such as microorganisms and artificial foods.

Although establishing the concept of big food and developing big agriculture is a major opportunity for the high-quality development of agriculture, there are still a series of challenges in practicing the concept of big food in practice. First, the food production system in rural areas is faced with the problem of simultaneous development of food and high-value agriculture in the process of implementing the big food concept. At the same time, facility agriculture, which has greatly increased agricultural productivity, also faces many constraints in terms of land use. Second, grassland with good livestock production capacity can have a strong supply capacity of grassland ecological functions. However, the technology, policy and investment to support the green development of modern grassland agriculture need to be further improved. Third, although the development potential of forest food production systems is great, they also face institutional, policy and technological constraints. Fourth, the food production system of rivers, lakes and seas can provide people with aquatic products with rich nutrition, high feed conversion rate and great

development potential, but to promote the stable and healthy development of the aquaculture industry under the condition of ecological protection and sustainable development, it also requires innovation in technology, system, policy, investment and production mode. Fifth, microbial and artificial food production systems are disruptive food production systems and new agricultural productivity with high hopes, but there is still a long way to go in the research and development and industrialization of foods such as artificial proteins.

3.2. Modern Seed Industry

Over the past 20 years, China has made outstanding achievements in the fields of seed research and development and scientific and technological innovation: the coverage rate of improved crop varieties is more than 96%. The R&D capability and breeding technology of China's aquaculture industry are also in the international advanced ranks. The development of seed industry has played an important role in ensuring national food security and improving the productivity of major agricultural products. In order to make modern seed industry an important new factor of production industry for high-quality agricultural development, it is necessary to reform and innovate the system and mechanism. First, it is necessary to continue to deepen the reform of the system and mechanism of the seed industry innovation system, and establish a seed industry science and technology innovation system that adapts to the development of modern biological breeding technology. Second, it is necessary to increase the protection of intellectual property rights, improve the technology transfer mechanism, and enhance the enthusiasm of R&D investment and innovation in the seed industry. Third, it is necessary to strengthen the collection and protection of germplasm resources and improve the utilization rate of national germplasm resources. Fourth, it is necessary to determine the roadmap for reform and development, accelerate the integration of agricultural R&D enterprises, and make China's seed industry bigger and stronger.

3.3. Digital Technology and Smart Agriculture

Digital technology can provide new technologies, new elements and new business forms for high-quality development, which has had an important impact on social and economic development, but the application of digital technology in the agricultural sector lags significantly behind that of industry and service industry, showing the following characteristics in terms of overall development. First, in the early stage of development, many digital agriculture technology research and development and promotion lack attention to the actual needs of agricultural development, and mostly show the characteristics of top-down and outside-in. Due to the lack of understanding of agricultural production and the actual needs of farmers, few technologies have finally been promoted and applied outside the demonstration park. Second, after experiencing the lessons of many investments and pilot failures caused by the adoption of the "digital + agriculture" technology path, the "agriculture + digital" technology route has begun to show a good momentum in recent years. The objects of agricultural labor are plants, animals and other organisms, and the production of specific living crops and animal husbandry and aquatic products should be adapted to local conditions according to the growth law of each organism, and the production and management level of different production stages should be improved to improve quality and efficiency. Third, the widely adopted digital technologies often have the characteristics of saving costs and increasing efficiency, and responding to the real needs of farmers. For example, in Weifang City, Shandong Province, the digitalization of transactions in many rural vegetable markets can be popularized and applied because it saves daily manual bookkeeping costs and transaction time, and solves the problem of daily transaction disputes, so it is welcomed by local vegetable farmers, foreign buyers and local governments.

However, digital technologies also face many challenges in promoting the development of agriculture or smart agriculture. First, the digital technology supply system and mechanism oriented to the actual needs of agricultural development have not yet been fully established. The lack of compound digital talents who are proficient in both digital technology and agricultural production and operation further restricts the deep integration of digital technology and agriculture. Second, the top-level design of the development of digital agriculture is not perfect. For example, many

agricultural and rural big data platforms established across the country lack communication and coordination mechanisms between superiors and subordinates and departments, and are often duplicated and costly, which is easy to form "information islands"; Due to the problems existing in the investment cost and application prospects of the smart agriculture pilot project, it is difficult for the pilot project to play a demonstration and promotion role after the pilot. Third, many digital technology application scenarios still lack the support of mature technology and big data. For example, the technology and equipment of many facilities such as agricultural Internet of Things, artificial intelligence greenhouses, and agricultural product traceability are not mature enough, and the application of some digital technologies has become a "vase". Fourth, the adoption of many digital technologies is costly and inefficient, making it difficult for farmers to adopt them. These cost-effectiveness issues are particularly prominent in the application of artificial intelligence technology to agricultural production and the application of blockchain technology to the traceability of the quality and safety of agricultural products. Fifth, the digital divide restricts the inclusive development of digital agriculture and rural areas. In rural areas, for example, only a very small number of farmers with high levels of digital literacy and skills have access to digital technologies such as IoT and AI devices. Sixth, it is difficult for farmers to share higher profits from the development of the digital platform economy. The percentage of farmers who sell their produce directly on online platforms is low.

To promote the application of digital technology in the field of agriculture and promote the development of new agricultural productivity, it is necessary to have corresponding necessary and sufficient conditions. Well-developed infrastructure is a necessary condition for promoting the application of digital technologies in agriculture and rural areas, but it is not a sufficient condition. In order for digital technology to be applied in the agricultural field, the following three sufficient conditions need to be met: first, it must meet the actual needs of the application subject, and only then can it be sustainable to save costs and increase efficiency; Second, it should be supported by more mature technology and data resources; The third is to be easy to adopt or have a high level of digital literacy for farmers and other adopters. For example, the digitization of transactions has low requirements for farmers' technical capabilities, while drone plant protection services have no technical requirements for service buyers (farmers). However, the application of technologies such as the Internet of Things, artificial intelligence, and blockchain requires users to have a high level of digital literacy.

The use of digital technology to develop smart agriculture and promote the high-quality development of China's agriculture requires new ideas, reform and innovation. In terms of development ideas: governments at all levels should formulate development roadmaps for different regions at different stages according to the necessary and sufficient conditions for the development of smart agriculture; According to the purpose of high-quality development (greatly promoting high-quality social and economic development), we should adhere to the principles of rapid, inclusive, beneficial and green development. We should adopt the technical path of "agriculture + digital" according to the unique biological life attributes of agriculture. In terms of increasing the reform and innovation of China's digital agriculture: first, build a multidisciplinary digital technology innovation system, increase technology research and development, and improve the support conditions for technology application; the second is to establish a cross-departmental management system and guarantee system to plan and coordinate the development of smart agriculture; The third is to improve the mechanism to give full play to the role of the government and the market, do a good job in top-level design, clarify the demand orientation, optimize the diversified investment system and improve the incentive mechanism; Fourth, efforts should be made to address the digital divide, unbalanced development, and the difficulty for farmers to benefit.

4. Conclusion

The high-quality development of agriculture must first clarify its connotation and extension in theory, and only in this way can it provide theoretical guidance for practice. High-quality development of agriculture means that agriculture should greatly improve agricultural productivity

and agricultural total factor productivity while adopting new factors of production or new production methods. Scientific and technological innovation is extremely important for the high-quality development of agriculture, but institutional innovation, policy innovation and investment innovation to escort the high-quality development of agriculture are equally important.

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