Giving Wings of Technology to Comprehensive Agricultural Development to Actively Boost Agricultural Supply-Side Structural Reform (Postprint)

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Abstract

The article centers on advancing agricultural supply-side structural reform through agricultural comprehensive development. It first briefly introduces the basic functions and accomplishments of agricultural comprehensive development, and analyzes its important roles in agricultural supply-side structural reform from the aspects of infrastructure construction, support for characteristic industries, cultivation of new-type entities, and promotion of ecological governance. Secondly, it focuses on elaborating the significance, conceptual connotations, and main approaches of promoting rural complexes through agricultural comprehensive development. Finally, from the perspective of leveraging the role of science and technology in agricultural comprehensive development, it proposes the close integration of "storing grain in land" and "storing grain in technology," along with strengthening ties and cooperation with the Chinese Academy of Sciences, thereby equipping agricultural comprehensive development with technological wings and facilitating agricultural supply-side structural reform.

Full Text

Special Issue: Science and Technology Promoting Agricultural Supply-side Structural Reform

The 2017 Central No. 1 Document stated that after years of unremitting efforts, China' s agricultural and rural development has continuously reached new levels and entered a new historical stage. The principal contradiction in agriculture has shifted from insufficient aggregate supply to structural contradictions, prominently characterized by the coexistence of periodic oversupply and supply shortages, with the main aspect of the contradiction lying on the

supply side. The document particularly emphasized the need to "strengthen innovation-driven development through science and technology to lead the accelerated development of modern agriculture."

A forum on "Science and Technology Promoting Agricultural Supply-side Structural Reform" was held in Beijing, organized by the Chinese Academy of Sciences and hosted by the *Bulletin of Chinese Academy of Sciences*. The forum invited central departments including the Central Rural Work Leading Group, Ministry of Finance, National Development and Reform Commission, Ministry of Agriculture, Ministry of Water Resources, and State Administration of Grain, as well as research institutions such as the Chinese Academy of Sciences, Chinese Academy of Engineering, Tsinghua University, and Peking University, along with local leaders and experts from Anhui, Jiangsu, Shanxi, Hebei, and other provinces to discuss how science and technology can promote agricultural development and supply-side reform. Based on this, the *Bulletin of Chinese Academy of Sciences* invited some speakers to contribute papers to form this special issue.

Adding Technological Wings to Agricultural Comprehensive Development to Actively Boost Agricultural Supply-side Structural Reform

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Abstract

This study focuses on promoting the agricultural supply-side structural reform through agricultural comprehensive development. Firstly, the paper briefly introduces the basic functions and achievements of agricultural comprehensive development, and analyzes its important role in the agricultural supply-side structural reform from the aspects of infrastructure construction, supporting characteristic industries, fostering new types of agricultural operators, and promoting ecological governance. Secondly, it elaborates on the significance, conceptual connotations, and main approaches of agricultural comprehensive development in promoting pastoral complexes. Finally, based on the role of science and technology in agricultural comprehensive development, it proposes that "storing grain in the land" and "storing grain in technology" should be closely integrated, and that ties and cooperation with the Chinese Academy of Sciences should be strengthened, thereby adding technological wings to agricultural comprehensive development to actively boost agricultural supply-side structural reform.

Keywords: agricultural comprehensive development, supply-side structural reform, pastoral complex, agricultural science and technology

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Promoting agricultural supply-side structural reform is the main theme of "three rural" work for the current and future period. Science and technology constitute primary productive forces and are also key elements in advancing agricultural supply-side structural reform. This paper focuses on expounding, in simple yet profound terms, the main functions and distinctive advantages of agricultural comprehensive development, the pilot construction of pastoral complexes to cultivate new momentum for agricultural and rural development, and the strengthening of agricultural technology measures to enhance the level and effectiveness of agricultural comprehensive development, thereby providing guidance for agricultural comprehensive development to better promote agricultural supply-side structural reform.

Agricultural Comprehensive Development is an Important Force in Promoting Agricultural Supply-side Structural Reform

In 1988, to reverse the situation of grain production stagnating for many years and the increasingly prominent contradictions between supply and demand of major agricultural products, the State Council decided to establish the National Land Development and Construction Fund (later renamed the National Agricultural Comprehensive Development Fund) to coordinate the implementation of agricultural comprehensive development. The main tasks of agricultural comprehensive development are to strengthen agricultural infrastructure and ecological construction, promote agricultural industrialization and the integrated development of primary, secondary, and tertiary industries in rural areas, improve comprehensive agricultural production capacity, ensure national food security, increase agricultural efficiency and farmer income, and promote sustainable agricultural development and agricultural modernization. Over nearly 30 years of development practice, agricultural comprehensive development has closely followed the central government' s decisions and deployments on "three rural" work, actively leveraged its own advantages, cumulatively transformed 780 million mu of medium- and low-yield fields into high-standard farmland, conducted water-saving renovations on 1,340 key medium-sized irrigation districts, supported a large number of high-quality and efficient agricultural industrialization projects

in planting, breeding, processing, and distribution, actively promoted appropriately scaled agricultural operations, and facilitated the integrated development of the three industries, making important contributions to ensuring national food security and increasing agricultural efficiency and farmer income.

Agricultural comprehensive development will play an important role in promoting agricultural supply-side structural reform:

(1) **Vigorously improving comprehensive agricultural production capacity and implementing the strategy of "storing grain in the land and storing grain in technology" to consolidate the foundation of agricultural supply-side structural reform.** Agricultural comprehensive development takes the large-scale construction of high-standard farmland and the improvement of comprehensive agricultural production capacity as its core tasks, tilting capital investment and project layout toward major grain-producing areas, and focusing on farmland water conservancy construction to carry out comprehensive management of fields, water, roads, forests, and mountains.

(2) **Vigorously supporting advantageous and characteristic industries and optimizing industrial structure and regional layout to pinpoint the essentials of agricultural supply-side structural reform.** Agricultural comprehensive development strongly supports high-quality and efficient agricultural planting and breeding, agricultural product processing, storage and preservation, circulation services, and other projects, promotes the construction of agricultural industrial chains and value chains, concentrates on building regional agricultural advantage and characteristic industrial clusters, and facilitates the integrated development of primary, secondary, and tertiary industries in rural areas.

(3) **Vigorously cultivating new types of agricultural business entities and promoting appropriately scaled agricultural operations to enhance the effectiveness of agricultural supply-side structural reform.** Agricultural comprehensive development strongly supports and fosters new types of agricultural business entities such as farmer cooperatives, agriculture-related enterprises, family farms, and large-scale planting and breeding households. By taking high-standard farmland construction as the carrier, agricultural industrialization management as the vehicle, and agricultural socialized services as the support, it actively promotes appropriately scaled agricultural operations to increase agricultural efficiency and farmer income.

(4) **Vigorously promoting comprehensive agricultural ecological management and strengthening agricultural technology support to stabilize the foundation of agricultural supply-side structural reform.** Centering on promoting sustainable agricultural development, agricultural comprehensive development implements differentiated development policies based on functional zoning. It vigorously carries out

ecological management, soil and water conservation, grassland ecology projects, and large-scale construction of farmland shelterbelts, improvement of grasslands and pastures, and small watershed management, effectively promoting the improvement of the agricultural ecological environment.

Vigorously Promoting Pastoral Complex Pilots to Actively Cultivate New Kinetic Energy for Agricultural and Rural Development

For the current and future period, agricultural comprehensive development takes promoting agricultural supply-side structural reform as the overarching theme, focusing on improving comprehensive agricultural production capacity, advancing agricultural industrialization, transforming agricultural development patterns, developing appropriately scaled agricultural operations, and helping win the battle against poverty, to give full play to its functional role. At the same time, it must actively adapt to the new situation and requirements of agricultural and rural development, base itself on its functional positioning, implement innovation-driven strategies, actively expand new focal points for work, and conscientiously implement the requirement proposed in the 2017 Central No. 1 Document to "support qualified villages in building pastoral complexes that integrate circular agriculture, creative agriculture, and farming experience, with farmer cooperatives as the main carrier and with farmers' full participation and benefit, and carry out pilot demonstrations through channels such as agricultural comprehensive development" [1]. Taking the construction of pastoral complex pilots as an important breakthrough in the new era of agricultural comprehensive development, it actively cultivates new momentum for agricultural and rural development to boost agricultural supply-side structural reform.

In May 2017, the Ministry of Finance issued the "Notice on Launching Pilot Projects for Pastoral Complex Construction," proposing to support qualified villages in strengthening infrastructure, industrial support, public services, and environmental landscape construction, focusing on increasing agricultural efficiency, farmer income, and rural greening. The goal is to achieve "three synchronizations" of rural production, life, and ecology, "three-industry integration" of primary, secondary, and tertiary industries, and "three-in-one integration" of agriculture, culture, and tourism, while actively exploring new models, new business forms, and new paths for comprehensive rural economic and social development. This will gradually establish pastoral complexes that integrate circular agriculture, creative agriculture, and farming experience, with farmer cooperatives as the main carrier and with farmers' full participation and benefit [2].

Significance of Building Pastoral Complexes The pastoral complex is designed to meet the requirements of agricultural supply-side structural reform, ecological environment sustainability, and the development of new industries and business forms. Based on beautiful villages and industrial development,

it expands the multifunctionality of agriculture to achieve the organic unity of pastoral production, pastoral life, and pastoral ecology, as well as the deep integration of the three industries, thereby designing a stable production and lifestyle for China' s agriculture, rural areas, and farmers that can be promoted and replicated. The construction of pastoral complexes conforms to the development trends and historic changes in agriculture and rural areas, reflects the objective requirements of urban-rural integration and agricultural modernization, builds a new platform for advancing agricultural supply-side structural reform, provides new leverage for the coordinated development of agricultural modernization and urban-rural integration, constructs a new model for the coordinated advancement of rural production, life, and ecology, and offers new impetus for inheriting rural civilization and achieving historic rural transformation. From the fundamental perspectives of production, life, and ecology, it can fundamentally play a major role in exploratory innovation and demonstration leadership.

(1) **It explores new mechanisms for agricultural and rural development.** As China' s economic development enters a new normal, the traditional supporting forces for agricultural and rural economic development are weakening. Agricultural industrial upgrading, sustained farmer income growth, and rural landscape improvement all face greater development resistance and downward pressure. The development model of traditional agricultural parks has become rigid, and the development of new business forms and new models is constrained. Therefore, there is an urgent need to seek new levers for advancing agricultural and rural development.

(2) **It satisfies new demands of urban and rural residents.** The substantial development of urbanization and industrialization has led to deepening rural hollowing and aging, degradation of rural social functions, absence of basic public services in rural areas, and a widening urban-rural gap, making rural areas a prominent shortcoming in urban-rural integration and the development of the "new four modernizations." At the same time, the demand from urban and rural residents for rural eco-tourism, experiencing rural culture, and participating in farming civilization is growing day by day.

(3) **It reflects new requirements for sustainable agricultural development.** Rural areas are the protection zones and conservation areas of "clear waters and green mountains," bearing important ecological functions. On the basis of ecological protection, it is necessary to fully tap the economic and social value of rural ecological landscapes, utilize the unique charm of agricultural civilization and pastoral scenery, and build a green ecological homeland aspired by urban and rural residents, so that "clear waters and green mountains" and "golden mountains and silver mountains" complement each other and promote sustainable agricultural development. Therefore, the pastoral complex proposed by the central government is

not a single, partial pilot exploration in fields such as production, life, and ecology, but a comprehensive transformation of agricultural and rural production and lifestyle, representing a major policy innovation that will lead the future development and evolution of agriculture and rural areas.

Conceptual Connotations of Pastoral Complexes

(1) **Insisting on farmer benefit as the core.** Building pastoral complexes should take farmland protection as the prerequisite, improve comprehensive agricultural production capacity, and enhance agricultural comprehensive efficiency and competitiveness. With the complex as the carrier, it should drive farmers to benefit extensively from the "integration of three industries" and the "coordination of three life aspects."

(2) **Insisting on integrated development as the mechanism.** The pastoral complex embodies the integration of various resource elements, with the core being the integration of the three industries. A complete pastoral complex should be an industrial integration body and urban-rural composite containing multiple business forms such as agriculture, forestry, animal husbandry, fishery, processing, manufacturing, catering, warehousing, tourism, and wellness.

(3) **Insisting on ecological priority as the foundation.** It is necessary to maintain rural pastoral ecological landscapes, protect clear waters and green mountains, retain rural nostalgia, and achieve ecological sustainability. Circular agricultural models should be established to build a complete ecological cycle chain at the production and life levels.

(4) **Insisting on innovation-driven development as the impetus.** There is no unified construction model or planning design for pastoral complexes. It is essential to adhere to local conditions, highlight distinctive features, and focus on protecting and promoting original characteristics rather than transplantation, replication, and homogenization.

(5) **Insisting on sustainable development as the orientation.** Building pastoral complexes is not about creating artificial potted landscapes, but developing agricultural complexes with multiple functions and strong vitality. It should center on agricultural supply-side structural reform, be market-demand oriented, and achieve sustainable development of pastoral complexes.

Main Approaches for Agricultural Comprehensive Development to Promote Pastoral Complex Construction

(1) **Grasping the direction and adhering to the fundamental purpose of "being agricultural and serving farmers."** It is necessary to improve comprehensive agricultural production capacity to ensure national food security; ensure farmer participation and benefit, allowing farmers

to participate in the construction process of pastoral complexes through cooperatives and other channels; and maintain rural pastoral landscapes with ecological friendliness. The core of the pastoral complex is "serving agriculture," its characteristic is "pastoral," and the key lies in "comprehensiveness." Taking farmers' full participation and benefit as the fundamental principle, it is essential to effectively protect farmers' basic interests in production, life, and long-term development.

(2) **Innovating mechanisms and giving full play to market leadership and fiscal support.** It is necessary to fully leverage market mechanisms to attract more financial and social capital investment in pastoral complex construction, properly handle the distribution of interests among government, enterprises, and farmers, so that regions achieve development, enterprises obtain benefits, and farmers gain advantages. Fiscal support should be increased, and fiscal investment methods improved by comprehensively considering various approaches such as subsidies, interest discounts, guarantee funds, and risk compensation funds to enhance the efficiency of fiscal fund utilization. In improving technological support, attracting talent, developing new industries and business forms, and improving operational service systems, market mechanisms should also be the main approach, supplemented by relevant policy support, to place pastoral complex construction on a vibrant and sound development track.

(3) **Coordinating and integrating to fully leverage the synergy of agriculture-related policies and funds.** It is necessary to strengthen the coordination and connection of relevant agriculture-related policies and funds, using pastoral complex construction as a platform to closely integrate support policies and investment funds in various fields such as rural production, life, and ecology. This will promote coordinated advancement in agricultural production, farmer life, and rural ecological construction, facilitate the development of circular agriculture, creative agriculture, and farming experiences, and expand the multifunctionality of agriculture. Taking pastoral complex construction as the platform carrier for promoting the integrated development of the three industries, comprehensive industrial development will be achieved through comprehensive capital investment.

(4) **Adapting measures to local conditions and combining overall planning with targeted policies.** It is necessary to focus on building six supporting systems—the production system, industrial system, management system, ecological system, service system, and operation system—according to the construction goals, functional positioning, and model characteristics of pastoral complexes, with adapted measures, overall planning, and targeted policies. Efforts should focus on addressing weaknesses in pastoral complex development, fully reflecting the construction requirements of "three-life synchronization," "three-industry integration," and "three-in-one integration," and creating high-level pastoral complex pilots

with local characteristics and demonstration leadership.

The Chinese Academy of Sciences Joins the National Agricultural Comprehensive Development Joint Conference, Creating a New Situation for Bilateral Exchange and Cooperation

At the end of 2014, with the approval of the State Council, the Chinese Academy of Sciences (CAS) officially became one of the 11 member units of the National Agricultural Comprehensive Development Joint Conference, marking a new stage in cooperation between CAS and agricultural comprehensive development institutions. Recently, CAS, the Ministry of Agriculture, and the Ministry of Finance jointly implemented the Hulunbuir Grassland and Animal Husbandry Technology Demonstration Project in Inner Mongolia Autonomous Region, which has been approved by the State Council and launched. Targeting the technological and industrial weaknesses in China' s grassland and animal husbandry development, this project implements a new model of modern grassland and animal husbandry development in Hulunbuir, centered on grassland and animal husbandry technology demonstration and driven by innovation element investment, achieving ecological function restoration, production capacity improvement, and herders' livelihood enhancement, and exploring a new path for sustainable grassland and animal husbandry development suited to China' s national conditions.

Meanwhile, agricultural comprehensive development focuses on leveraging CAS' s technological advantages in remote sensing and geographic information systems, farmland quality assessment, and big data analysis. Both parties jointly launched a third-party evaluation project for high-standard farmland construction under agricultural comprehensive development. Currently, self-evaluations and demonstration assessments of high-standard farmland in various regions have been completed, and the third-party evaluation of national agricultural comprehensive development high-standard farmland construction will be completed in the second half of 2017. This project pioneers third-party evaluation of high-standard farmland construction and will provide scientific basis, data support, and decision-making reference for agricultural comprehensive development and even national high-standard farmland construction.

Striving to Improve the Level of Technology Measures in Agricultural Comprehensive Development to Promote Agricultural Supply-side Structural Reform

Promoting Agricultural Supply-side Structural Reform Requires the Close Integration and Coordinated Efforts of "Storing Grain in the Land" and "Storing Grain in Technology" The foundation of promoting agricultural supply-side structural reform lies in comprehensively improving agricultural infrastructure conditions, enhancing comprehensive agricultural production capacity, and ensuring national food security; the key is to implement the strategies of "storing grain in the land"and "storing grain in technology."

Agricultural comprehensive development, with its main function of large-scale high-standard farmland construction, is an important force in implementing the "storing grain in the land" strategy. The implementation of the "storing grain in technology" strategy mainly relies on agricultural technology research and development and technology promotion. These two aspects are like "two wings of one body" and must be closely integrated and coordinated.

In recent years, agricultural comprehensive development institutions at all levels have further strengthened cooperation with relevant CAS research institutes, jointly carrying out scientific and technological research projects focusing on key links and bottleneck issues in local agricultural production and industrial development, and achieving a series of cooperative results.

Agricultural comprehensive development must place greater emphasis on strengthening agricultural technology support, comprehensively enhance exchanges and cooperation with CAS and other research institutes and universities, further innovate mechanisms, improve policies, concentrate efforts, promote the promotion and utilization of modern agricultural scientific and technological achievements, comprehensively improve the technological content and contribution rate in project areas, and add technological wings to agricultural comprehensive development, enabling it to play a demonstrative and leading role in promoting agricultural supply-side structural reform.

Increasing Technology Measures in Agricultural Comprehensive Development to Boost Agricultural Supply-side Structural Reform

(1) **Establish an integration mechanism for land management technology measure funds.** Agricultural comprehensive development should further increase investment in technology measures and improve the efficiency of technology fund utilization and project effectiveness. It should explore and establish an integrated investment mechanism for agricultural technology funds, using agricultural comprehensive development land management project areas as a platform to consolidate relevant agricultural technology project funds for concentrated investment, thereby giving full play to the scale effects of agricultural technology measures. While continuously increasing fiscal investment, it should actively attract and leverage financial and social capital investment in the agricultural technology field to provide financial guarantees for the research and promotion of agricultural technology achievements.

(2) **Establish and improve the construction mechanism for technology demonstration projects.** First, at the national level, build cooperative demonstration projects with CAS. Focus on promoting the Hulunbuir Grassland and Animal Husbandry Technology Demonstration Project, with technology as the guide, industry as the vehicle, and enterprises as the platform, to establish and improve an integrated "industry-university-research" advancement mechanism. Actively plan and imple-

ment new cooperative demonstration projects around key and bottleneck links in agricultural production and technology fields. Second, at the local level, plan and implement a batch of technology demonstration and cooperation projects. Closely focusing on local realities and market demands, build a platform for institute-locality cooperation and promote the implementation of a number of institute-locality cooperative demonstration projects with advanced and applicable technologies and strong demonstration and driving effects. Third, at the departmental level, construct a batch of agricultural comprehensive development departmental projects with high technological content. Give full play to the technological advantages of departments such as agriculture, forestry, water resources, and supply and marketing cooperatives, focusing on areas such as improved variety breeding, famous and special economic forests, and medium-sized irrigation districts, to build a batch of departmental projects with strong technological connotations, playing a demonstrative and leading role in technology application and promotion.

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Note: Figure translations are in progress. See original paper for figures.