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Scientific and Technological Innovation Leads High-quality Development of Agriculture in the Yellow River Delta

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Scientific and Technological Innovation Leads High-quality Development of Agriculture in the Yellow River Delta

Abstract

The Yellow River is the main birthplace of Chinese civilization and the mother river of the Chinese nation. On September 18, 2019, President Xi Jinping presided over a symposium on ecological protection and high-quality development of the Yellow River Basin in Zhengzhou and delivered an important speech, elaborating a major strategic deployment to strengthen ecological protection and promote high-quality development. The lower-reaches of the Yellow River Basin have sound conditions for agricultural development, but the high-quality agricultural development in the Yellow River Delta still faces many challenges. Chinese Academy of Sciences (CAS) has a solid scientific research foundation in the Yellow River Delta. It has proactively deployed scientific research bases and started numbers of scientific research projects which has achieved significant scientific research results. Based on long-term research, and around the strategic goals of ecological protection and high-quality development of the Yellow River Delta, a method for further transforming development thinking was put forward, through effective combination of ecological principles and high-tech, and adaptive development of saline-alkali land, efficient and refined development of saline-alkali land, and modern industrial development, to explore a new pattern of efficient, high-quality, and high-value development of saline-alkali land agriculture in the Yellow River Delta. By exploring new mechanisms for agricultural scientific and technological innovation, activating scientific and technological innovation capabilities and service capabilities, a batch of key technologies will be breakthrough for high-quality agricultural development in the Yellow River Delta, therefore proposing a "CAS's Solution" and establishing a "CAS's Model".

Keywords

the Yellow River Delta; saline agriculture; high-quality development of agriculture

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The Yellow River is the main birthplace of Chinese civilization and the mother river of the Chinese nation. The peace in the Yellow River is the premise of the peace in China. The CPC Central Committee and the State Council have always attached great importance to the governance and protection of the Yellow River Basin. Especially since the 18th National Congress of the Communist Party of China, the economic and social development and the living conditions of people in the Yellow River Basin have changed greatly. On September 18, 2019, Chinese President Xi Jinping, also general secretary of the CPC Central Committee and chairman of the Central Military Commission, presided over a symposium on ecological protection and high-quality development of the Yellow River Basin in Zhengzhou and delivered an important speech. Starting from overall situation of the national development, Xi points out that protecting the Yellow River is a great plan related to the great rejuvenation of the Chinese nation, elaborating a major strategic deployment to strengthen ecological protection and promote high-quality development, which strengthens the confidence and determination for the governance and protection of the Yellow River.

The implementation of ecological protection and

high-quality development strategy in the Yellow River Basin is a specific practice of Xi’s socialist thought with Chinese characteristics in the new era. On the basis of crossing the administrative division and promoting the coordinated development of the region, we should make the Yellow River beneficial to the people by adapting to local conditions and adopting targeted policies. The Yellow River Delta has a flat terrain and obvious location advantage, where the integration and development of primary, secondary, and tertiary industries is rapid. This area has not only the demand and impetus for ecological protection and high-quality development but also a good development basis.

According to the national strategic deployment for the ecological protection and high-quality development of the Yellow River Basin, we should fully consider the differences between the upper, middle, and lower reaches, perform ecological protection based on local conditions, coordinate the water–sediment relationship, and promote the economical and intensive utilization of water resources. At the same time, all the areas along the Yellow River should create new ways of high-quality development with regional characteristics based on the local conditions. The Yellow River Delta is

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located at the intersection of land, ocean, and river, with superior geographical location and rich natural resources. It has the most complete wetland ecosystem in the warm temperate zone in China, as well as a large area of saline-alkali land that can be used as reserve farmland. To realize the agricultural re-structuring and improve the agricultural development in the Yellow River Delta, we should explore the path for high-quality agricultural development on saline-alkali land and ensure the health of the river ecosystem.

1 Challenges for the high-quality development of the Yellow River Delta

The Yellow River Delta boasts a vast area, superior location, and rich natural resources. It is the last large river delta to be developed and also a treasure land to be developed in China. It has obvious late-developing advantages and great development potential. The efficient ecological economic zone of the Yellow River Delta is located in the central position around the Bohai Sea, covering 19 counties (cities, districts), with a land area of 40 million mu (1 mu = 666.7 m²). It connects Beijing-Tianjin-Hebei Region and Shandong Peninsula, is separated by sea with the Coastal Economic Belt of Liaoning Province, radiates westward to the central and western regions of China, and extends southward to the Yangtze River Delta and eastward to Northeast Asia. Therefore, it has favorable conditions for deepening international and domestic regional cooperation and accelerating open development. Besides, the synchronization between rainfall and heat, moderate temperature, and four distinct seasons in this area are suitable for the growth of crops, grasses, and trees.

The land reserve resources in the Yellow River Delta are flat and suitable for mechanized operation, which are unique in China. At present, there are nearly 8 million mu of unused land (0.81 mu of unused land per capita) in this area, nearly 45% higher than the average level of eastern coastal areas in China. The coastline of the Yellow River Delta is nearly 900 km, which is an important seawater/freshwater fishery resource base in China. The cross distribution of land and ocean, fresh water and salt water, as well as natural and artificial ecosystem is particularly conducive to the large-scale development of ecological planting/aquaculture industry, stock/seed breeding, industry chain of ecological agriculture, and ecotourism.

According to the natural advantages, the Yellow River Delta has good conditions for agricultural development. However, the development opportunities and challenges coexist, and the high-quality development of agriculture in this region still faces three major challenges.

1.1 Unbalanced distribution of natural resources

The main natural resources of agricultural development in the Yellow River Delta include climate resources, land resources, and water resources, among which the most

unbalanced two are land resources and water resources. The delta has rich arable land, while the quality is not high. The unused land includes 2.7 million mu saline-alkali land, 1.48 million mu wasteland land, and 2.12 million mu beach land. In particular, saline-alkali land seriously affects the development of planting industry due to its large area and high soil salt content. The Yellow River water plays a vital role in the agricultural development of this area, while its total supply cannot meet the demands of agricultural production, wetland protection, and industrial and domestic water in this area. Even if the agricultural water consumption in the Yellow River Delta accounts for more than 70% of the total water consumption, it still cannot fully meet the demand of water for saline-alkali land development and agricultural production. Therefore, the contradiction between low quality land (such as saline-alkali land) and water resource supply limits the effective utilization of climate, light, and heat resources and restricts the high-quality development of agriculture.

1.2 Contradiction between agricultural development and environmental protection

Protecting wetland and offshore ecological environment is an important prerequisite for the efficient development of local agriculture. The efficient ecological economic zone of the Yellow River Delta harbors offshore and coastal wetlands, river wetlands, lake wetlands, marsh wetlands, and constructed wetlands, with a total area of 8.326 5 million mu^[3]. The wetland ecosystem in this area has pivotal ecological functions. In addition, the coastline of the area is nearly 900 km, and the shallow sea area is nearly 15 million mu. Therefore, it is a major problem in agricultural development in this area to coordinate water resource utilization and reduce the risk of environmental damage by agricultural source pollutants to wetlands and offshore waters. The damage of pollutants from agricultural production to the wetlands and offshore waters has become a major risk facing agricultural development in this area. In order to protect the ecology and environment of the area while realizing the high yield, safety, and high efficiency of agriculture, we have no choice but to select the road of green agriculture development.

1.3 Insufficient scientific support

The high-quality development of agriculture in the Yellow River Delta depends on the support of science and technology, investment, and policy. Scientific innovation and the application of advanced technology are the key points. The development of the Yellow River Delta now faces some challenges such as weak research foundation, insufficient colleges, universities, and research institutions, and a shortage of innovative talents and high-level research teams. Meanwhile, the economic ability to support scientific and technological innovation is insufficient, and the development of scientific innovation is unbalanced between regions and fields in this area.

In addition, the scientific and technological service industry in the Yellow River Delta is characterized by low

total amount, small scale, unreasonable structure, weak core competitiveness, and a lack of leading carrier. For example, the scientific and technological service industry in Binzhou and Dongying is featured by uneven regional development, scattered industrial layout, small scale of science and technology parks, as well as a lack of regional characteristics, agglomeration benefits, and scale advantages ^[4].

2 Scientific and technological support for high-quality agricultural development in the Yellow River Delta in a forward-looking manner

The Chinese Academy of Sciences (CAS) has carried out long-term and systematic research on the Yellow River problems involving ecological protection, water resources, downstream flow cutoff and sediment, as well as agricultural development and utilization. In the near region downstream of the Yellow River, the CAS has constructed field stations to carry out long-term observation and experimental demonstration for solving the problems in the resource, environment, and sustainable agricultural development.

2.1 Long-term and systematic research on the Yellow River Delta

Since the 1990s, the relevant institutes of the CAS have successively studied the evolution process of the Yellow River Delta, the water–soil–air interaction in the coastal zone and its ecological effects, the comprehensive management of the coastal zone, the ecological response of the river–sea–land interaction, and the comprehensive simulation of ecology and environment based on the natural evolution, ecological process, and spatiotemporal dynamics of human activities in the Yellow River Delta. These studies have provided a decision-making basis for regional sustainable development. The Yantai Institute of Coastal Zone Research, CAS has established a coastal wetland station in the Yellow River Delta to study the theoretical innovation and key technologies to ensure the environment safety and sustainable utilization of biological resources in the coastal zone with a focus on the ecological, environmental, and marine fields.

2.2 Transformation and industrialization of modern agricultural technologies in the Yellow River Delta

The Institute of Geographic Sciences and Natural Resources Research, CAS established the Engineering Laboratory for Yellow River Delta Modern Agriculture in 2018. Focusing on the integrated research and promotion of key technologies and personnel training, this laboratory makes effort to build a leading and internationally advanced comprehensive research base for modern agricultural technology innovation and experimental demonstration, thereby leading the development of saline agriculture and modern agriculture.

Focusing on saline-alkali agriculture, the CAS, the Yellow River Delta Agricultural High-tech Industry Demonstration Zone (AHIDZ), and Dongying City, Shandong Province have deployed a number of research bases related to agriculture, and successively established the Yellow River Delta Research Center of the Institute of Geographic Sciences and Natural Resources Research of the CAS and the Dongying Molecular Design and Breeding Research Center of the Institute of Genetics and Developmental Biology of the CAS in recent years. They have worked together to improve the agricultural science and technology innovation capacity of the Yellow River Delta via in-depth cooperation and serve the development of disciplines, local social and economic development, and the implementation of national strategies.

2.3 Science and technology accumulation and talent advantage in developing agriculture on saline-alkali land

At present, the CAS has more than 100 institutes, some of which have rich technical reserves, solid research basis, and high-level research teams in the fields of halophyte resource development, molecular design breeding for new plant materials, soil amelioration, information technology and intelligent agriculture, plant factory and protected agriculture, new fertilizer, plant regulators, marine ecological ranches and healthy aquaculture, and deep processing of aquatic products. Taking advantages of research accumulation and talents can provide scientific and technological support for the high-quality development of agriculture in the Yellow River Delta.

2.4 Organization and implementation of a series of major projects

For a long time, the CAS has organized and implemented a series of project groups including research and development of agricultural technologies and system integration demonstration in the Yellow River Delta. In the past five years, the CAS has deployed about 20 research projects such as the Science and Technology Service Network Program (STS Program) and the Strategic Priority Research Program, with an investment research fund of nearly CNY 150 million. The Science and Technology Department of Shandong Province, local governments, and enterprises also have corresponding supporting funds of more than CNY 250 million. At the same time, the CAS has organized the implementation of a number of projects supported by the National Key Research and Development Program, International Cooperation Program, and National Natural Science Foundation of China. The implementation of these projects solved key scientific and technological problems, innovated agricultural development, and exerted demonstrating and driving effect for comprehensive management of saline-alkali land, which can provide effective scientific and technological support for the governance and green development of saline-alkali land in the Yellow River

Delta. In particular, significant progress has been achieved with the support from Bohai Granary Science and Technology Demonstration Project and Special Fund for Blue Granary Science and Technology Innovation. In 2014 and 2015, Vice Premier Wang Yang highly affirmed the achievements made when investigating the two demonstration bases ^[5].

2.5 Intensifying research and development (R&D) and tech-transfer

In order to support the construction and development of AHIDZs in the Yellow River Delta, the CAS actively organizes preeminent teams to participate in R&D and tech-transfer. At present, there are four high-tech CAS teams in the AHIDZs, including the innovation teams of intelligent agricultural machinery from the Institute of Computing Technology, the saline-alkali land plant resource from the Institute of Botany, the agricultural insect from the Institute of Zoology, and the agricultural big data and intelligent agricultural from the Institute of Geographic Sciences and Natural Resources Research. In the next two years, the CAS will continue to organize research teams to participate in the R&D and tech-transfer in the AHIDZs.

3 New ways for high-quality development of agriculture in the Yellow River Delta

The Yellow River Delta has a large land area and a large number of unutilized lands, with provide good conditions for agricultural development. However, the vast saline-alkali land and a few farmlands with low soil salt content and low fertility make the agricultural development in this area inefficient and extensive. This not only consumes much water resources but also brings environmental risks. According to the principle of land-sea coordination and focusing on the new goal of high-quality agricultural development in the Yellow River Delta, we should alter the traditional mode of agricultural development toward a green and high-benefit mode.

3.1 It is necessary to integrate agricultural development into the overall plan for high-quality development

The development of saline-alkali land, the utilization of water resources, and the protection of land-sea ecological environment should be integrated into the overall planning of high-quality development in the Yellow River Delta. From coast to land, intertidal ecological reserves, estuarine wetland reserves, saline-alkali grass-based animal husbandry areas, and grain, cotton, and vegetable cultivation areas should be reasonably divided. Through scientific zoning and overall planning, the spatial pattern of ecosystem can be constructed, which will promote the rational development and utilization of saline-alkali land, improve the utilization efficiency of

water resources, and control the discharge of surface source pollutants into the sea to protect the offshore environment.

3.2 Developing ecologically adaptive agriculture by breaking the traditional management of saline-alkali land

The traditional development and utilization of saline-alkali land is dominated by remediation, which has the problems of large investment, long cycle, and poor stability. Therefore, it is necessary to change the development mode to achieve the high-quality development of saline-alkali land in the Yellow River Delta. Based on the long-term research and achievements of the CAS in the development and utilization of saline-alkali land and the local characteristics of resources and environment, salt-tolerant crops should be selected for adaptive planting on saline-alkali land with different salt content for the establishment of different types of saline-alkali land agroecosystems. The potential of water, soil, gas, and biological resources in the Yellow River Delta should be maximized through the mode optimization and technical integration of saline-alkali land agriculture based on method of system engineering and analysis of regional resource environment.

3.3 Developing high-efficiency, high-quality, and high-value modern agriculture on saline-alkali land by changing the extensive development mode

The traditional extensive agricultural development of saline-alkali land has the problems of low quality and inefficiency, high investment, and difficult remediation. The Yellow River Delta has not only good climate conditions but also fine irrigation conditions. Therefore, the high-yield, high-efficiency, high-quality, and high-value agricultural modes on saline-alkali land can be established by salt elimination, salt barrier, soil fertilization, and plant conditioning. Besides, the effect of soil salt on plant secondary metabolism can be used to improve the product quality of halophytes. The agricultural modes on saline-alkali land include protected planting, melon and fruit planting, Chinese medicinal herb planting, and aromatic plant planting. The accurate management and control of facilities, equipment, and green inputs can not only reduce the investment of water, fertilizer, and medicine but also improve the utilization efficiency and reduce the discharge of pollutants.

3.4 Developing intelligent agriculture on saline-alkali land based on big data

The advantages of the construction experience and method system of the field observation network of the CAS should be taken to realize the integrated observation of air-sky-ground, and the cooperation with relevant departments and local governments should be strengthened for the construction of the observation network of the regional resources and environment in the Yellow River Delta. In addition, regional and long-term

observation should be carried out and the data should be accumulated to establish a big data platform serving agriculture. The change laws in the resources and environment, the driving mechanism of natural resource changes, and the evolutionary development trend should be revealed for building a new future agricultural mode driven by big data, digital design, and optimization of all elements.

3.5 Using the ecological principles to achieve high yield, high efficiency, and safety

On the basis of restructuring of planting and breeding in saline-alkali land through the optimal allocation of water, soil, gas, and biological resources, the ecological function of ecosystem should be fully excavated and utilized. Biotechnology and ecological engineering technology should be used to develop ecological agriculture on saline-alkali land. The principles and methods of adapting biological resources to soil salt content, allocation of water resources, and matching of climate resources can be used to design the cropping system. The healthy breeding system can be designed according to the cycle theory of forage and manure returning to field.

At the same time, the theory of biological symbiosis should be fully used in the whole system. That is, the roles of microorganisms in feed conversion, aquaculture environment regulation, waste conversion, and soil habitat regulation should be fully played. The role of natural enemies in pest control and that of insects in plant pollination and waste conversion should be played. The mutual promotion and antagonism between different plants and the synergistic mechanism between plants and insects should be used to establish intercropping, rotation, and nested cropping modes, so as to achieve growth promotion, fertilization, and control of weeds, diseases, and pests. For the development of high-quality agriculture, it is necessary to combine ecological theory with modern intelligent agricultural machinery and equipment, information technology to establish a modern ecological agriculture system with high yield, high efficiency, and safety.

4 Activating scientific and technological innovation capabilities and service capabilities through mechanism innovation

Guided by Xi's thought on socialism with Chinese characteristics for a new era and the spirit of the 19th National Congress of the CPC, the high-quality development of agriculture in the Yellow River Delta should be implemented following the five major development concepts of innovation, coordination, greenness, openness, and sharing. With agricultural supply-side structural reform as the main line and the consideration of national needs and international frontiers in the leading and key common technologies for agriculture development on saline-alkali land, the domestic advantageous scientific and technological forces should be

integrated. Through cooperation of CAS with local governments and enterprises, a group of agricultural technological innovation platforms with concentrated innovative resources, open organization and operation, and diversified structure should be built. The industrial development should be led by technological breakthroughs, and a scientific and technological innovation system should be built for high-quality agricultural development in the Yellow River Delta. The problems in saline-alkali land remediation and development, optimal allocation of agricultural resources, efficient and clean agricultural production, construction of healthy agricultural ecosystems, and quality and safety of agricultural products should be tackled to pave the way for the agricultural modernization in China.

At present, there are still some problems in the agricultural development of the Yellow River Delta, such as unsatisfactory natural resource conditions, technical difficulties, and weak industrial development. These problems lead to the low benefit and weak ability of industrialization to stimulate technological innovation in this area. More than that, the research innovation in this area is still guided by the national and local government projects, as well as scientist consciousness orientation, and the technological innovation objectives are not matched with industrial demand objectives. The traditional science-driven development model of deploying R&D projects—achieving achievements—application and promotion of achievements, rather than determining research projects with industrial needs and industrial models, still plays a key role in this area, and the efficiency of research investment is limited. Therefore, it is urgent to open up the channel between innovation chain and industrial chain to drive the agricultural development by technology innovation. In addition, the integrated innovation vitality of research team, government, enterprises, and finance should be stimulated through capital investment, market mechanism, and interest drive for building an open research system.

Aiming at the existing problems, the CAS is establishing the pilots of research system innovation in AHIDZs, and first tries to explore the cooperation mechanism between the CAS and the Shandong Provincial Government, enterprises, and financial institutions, as well as the new mechanism and new model of talent introduction and innovation and entrepreneurship of researchers.

4.1 Expanding the cooperation between the CAS and Shandong Province

For a long time, relying on STS projects in the field of agriculture, the CAS has established a typical cooperation model with the Shandong Provincial Government, which has achieved good results. On this basis, it is necessary to consider the needs of high-quality agricultural development in the Yellow River Delta, explore new cooperation mechanisms and new models under the new situation, and focus on need orientation, multi-party investment, strong team cooperation, and benefit sharing. The technical problems should be put forward

according to the common needs of government, enterprises, and research. The resources and investment should be raised together by the needy parties. Besides, strong cooperation of teams should be organized according to the task to jointly tackle the problems in the integrated innovation of research, government, enterprises, and finance.

4.2 Establishing a new mechanism for independent innovation and entrepreneurship of scientific and technical personnel

In order to encourage the innovation vitality of researchers and improve the efficiency of achievement transformation, a market-oriented benefit-driven scientific and technological innovation mechanism is needed. Emphasis should be placed on solving the problem of uncoordination between research management system and entrepreneurship mechanism of scientific and technical personnel. Research institutes mainly take the innovation capacity of researchers and the level of achievements as the assessment index. The limitations in the cooperation of scientific and technical personnel with local authorities and enterprises and their self-run enterprises should be comprehensively liberalized under the premise of conforming to national laws. The CAS will formulate relevant policies with AHIDZs to establish management institutions, support and guide scientific and technical personnel for legal entrepreneurship, help enterprises develop healthily, and obtain personal and team benefits through technological innovation and transformation.

4.3 Establishing ways of talent introduction

Talents are the main body of innovation, and the high-quality development of agriculture in the Yellow River Delta requires the introduction and cultivation of high-level innovative talents. According to the distribution characteristics of scientific and technical personnel and the needs of innovation and entrepreneurship, the CAS will jointly study and formulate talent introduction policies with AHIDZs, focusing on the double-transboundary employment of talents, stable research fund support, support in entrepreneurship and innovation, establishment of local R&D teams, mutual recognition of professional title evaluation, and support for provincial research projects. Through a variety of attraction methods, not only phased project talents can be introduced, but also long-term fixed teams can be fostered.

4.4 Constructing a complete and efficient R&D service system

A complete and efficient R&D service system is needed to

build the AHIDZ into an efficient and high-level research base, talent highland, and a place suitable for innovation and entrepreneurship. The system should provide professional and high-quality supporting services for the research team, create a high-quality research environment that makes the research team devote to R&D and rapidly transform and apply the results. The R&D service system should include high-standard open test platform and technical service personnel, professional test demonstration service team, public open pilot platform and technical service personnel, department for the management and maintenance of field observation instrument and equipment, construction and maintenance engineering service team of test site, tech-transfer service platform and professional team. At the same time, service information platform and service management method should be established.

As a component of ecological protection and high-quality development strategy in the Yellow River Delta, high-quality agricultural development in this area is not only a major opportunity but also a major challenge for local sustainable development and agricultural science and technology innovation of the CAS. Based on the long-term research of the CAS in the Yellow River Delta and the construction of research platforms, an integrated team for agricultural scientific and technological innovation should be built to enhance the overall innovation capacity of research teams. By exploring new mechanisms for agricultural scientific and technological innovation and activating scientific and technological innovation capabilities and service capabilities, we will develop a batch of key technologies for high-quality agricultural development in the Yellow River Delta, therefore proposing a “CAS’s Solution” and establishing a “CAS’s Model.”

References

- 1 National Development and Reform Commission. 国家发展改革委关于印发黄河三角洲高效生态经济区发展规划的通知. http://www.gov.cn/jwqk/2009-12/23/content_1494695.htm (in Chinese).
- 2 Xi J P. 在黄河流域生态保护和高质量发展座谈会上的讲话. http://www.qstheory.cn/dukan/qs/2019-10/15/c_1125102357.htm (in Chinese).
- 3 Wang Q, Zhang H J, Zhang T P, et al. Study on geological environment evaluation and protection countermeasures of wetland resources in the Yellow River Delta. *Shandong Land and Resources*, 2018, 34 (5): 81–86 (in Chinese).
- 4 Deng W Q, Li Y. 黄河三角洲科技服务业发展模式创新探讨. *Inner Mongolia Science Technology & Economy*, 2018, (16): 14–15 (in Chinese).
- 5 Xinhua News. 汪洋山东考察:紧紧依靠科技进步促进农业稳定发展. http://www.xinhuanet.com/politics/2014-05/23/c_1110838369.htm (in Chinese).



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