

Strategic Path and Countermeasures for Developing Internet Plus Modern Agriculture

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Abstract: Internet Plus modern agriculture utilizes Internet concepts, technologies, and methods in the field of agriculture. This new approach ensures the integration of Internet with the modern agricultural industry against the backdrop of the new generation of information technology revolution. After analyzing the demand for modern agricultural development, this study hypothesizes the need to develop Internet Plus modern agriculture in China. The study defines Internet Plus modern agriculture and analyzes its characteristics from several perspectives, including digitalized perception of information, intelligent agricultural machinery, precision agriculture, smart post-production links, and personalized agricultural technologies. In addition, the study analyzes the challenges from three levels—technology, industry, and application—and proposes innovative ideas and strategic objectives for the development of modern agriculture over the next 15 years. Furthermore, we believe that Internet Plus modern agriculture has a three-faceted developmental focus: triggering breakthroughs in the application theories, methods, and key technologies; forming an industrial cluster for the successful implementation of Internet Plus modern agriculture; and demonstrating the application of Internet Plus in various fields, such as agricultural production, supply chain, and productive services. Therefore, China should accelerate Internet connectivity and information sharing in rural areas, construct a technical standards system for Internet Plus modern agriculture, as well as develop disciplines and nurture field experts. These steps would contribute toward transforming modern agricultural industry in China.

Keywords: Internet Plus modern agriculture; modern agricultural industry system; agricultural supply chain; agricultural productive services

1 Introduction

Since the founding of the People's Republic of China, tremendous progress has been observed in agriculture. For five consecutive years, the grain output of China has been maintained at over 1.3 trillion kilograms. China has fed nearly 20% of the world's population with only 9% of the world's arable land. Absolute poverty in rural areas has been eliminated, and agricultural modernization has made a qualitative leap forward. However, the development of modern agriculture in China started late and is faced with existing challenges, such as low levels of agricultural yield per unit area, decline in labor productivity, and low utilization efficiency of agricultural resources. In addition, the competitiveness of agricultural product market needs to be improved. The aging of the rural labor force, "hollowing out" of rural areas, and phenomenon

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of part-time and sideline agriculture imposes serious challenges. Under the current pattern of small-scale farming, which is a longstanding approach, the traditional modes of agricultural production and industrial development can no longer meet the demands of modern agricultural development. Amid the rapid scientific and technological development, emerging technologies—such as artificial intelligence (AI), Internet of Things (IoT), fifth generation mobile networks (5G), big data, cloud computing, and blockchain—are in a constant state of flux. Therefore, it is essential to reshape Internet Plus modern agriculture with innovative systems, foster the establishment of Internet Plus in modern agriculture, adapt to the current economic developments, and finally, improve the quality and efficiency of modern agricultural production.

Internet Plus modern agriculture has been implemented abroad for some time. In as early as 2005, the National Science Foundation of the United States (NSF) invested above 300 million USD to jointly build a global environment for network innovation with over 100 institutions. Its aim was to provide virtual laboratory conditions for research, education networks, and distributed systems, as well as to promote innovations in the global Internet. In 2011, Japan launched a large-scale experimental platform, JGN-X, based on JGN (Japan Gigabit Network), and deployed an infrastructure exploration network called RISE, based on open flow technology. In 2014, the European Union officially launched a seven-year Horizon 2020 plan. As one of the three strategic areas of the plan, the industrial leadership policy aims to seize the opportunity provided by information and communication technology (ICT) to facilitate the innovation of network science research and enhance the global competitiveness of EU enterprises. In 2015, China followed suit and issued the *Guidance on Actively Promoting the Internet Plus Action*, clarifying that the innovative results of the Internet should be integrated into various economic and social fields. Subsequently, and the new economic form of Internet Plus was established by 2050. In addition, domestic scholars have conducted a series of studies on the development of Internet Plus modern agriculture. Answering to the need for transformation of the agricultural industry chain, Tang Run et al [1] built an Internet Plus agricultural collaboration platform comprising seven functions, such as the transfer of land rights, agricultural material trading, and agricultural machinery coordination. Based on the Internet-driven agricultural productive services, Guo Haihong [2] proposed an innovative model. Meanwhile, based on cross-border integration thinking, Wang Lei [3] proposed the Internet Plus transformation strategy for fresh agricultural product suppliers, focusing on function expansion. However, the existing research mostly focusses on micro perspectives, by proposing innovative platforms based on industrial system, producer services, and so on. Therefore, it becomes crucial to acquire an overarching knowledge of Internet Plus modern agriculture.

2 The demand for modern agricultural development

2.1 Demand for eco-friendly and energy-efficient agricultural production

Although the level of agricultural production and the degree of its marketization in China have been constantly improving in recent years, the overall competitiveness of the agricultural product market in China and abroad remains relatively backward. China aims to move from increasing production to improving quality to trigger its agricultural modernization and improve its global agricultural competitiveness. In line with this, it is essential to use Internet Plus information technology for digital design, precise control, intelligent decision-making, and the scientific management of agricultural production factors.

2.2 Demand for integrated development of agricultural production

An aging rural labor force, the “hollowing out” of rural areas, and part-time and sideline agriculture pose serious challenges; however, small-scale farming in China will continue exist. Nonetheless, the traditional agricultural production models can no longer adapt with the personalization, precision, and intelligence of modern agriculture that can be provided by Internet Plus. Similarly, the traditional agricultural marketing and management models need the support of innovative management ideas and methods to deal with the challenges of the new era.

2.3 Demand for sustainable and quality-driven agriculture

The aggravation of agricultural non-point source pollution, decline in the quality of cultivated lands, and reduction of agricultural resources have negatively affected the improvement of environment and sustainable development of agriculture in China. In addition, owing to the strong seasonality of agricultural products, perishability, excessive

circulation links, low efficiency, and underdeveloped rural transportation facilities such as cold chain logistics, it has been a challenging task to apply the Internet to fresh agricultural products. In this context, controlling the compound pollution of agricultural production, improving the production conditions and ecological environment of producing areas, and achieving agricultural ecological security are immediate requirements. Simultaneously, it is important to ensure the sustainable development and utilization of agricultural and environmental resources for achieving resource security. Furthermore, equal attention must be paid to high efficiency and quality and national health and safety, and thus national food security, must be ensured.

2.4 Demand for developing agricultural information service and reducing digital divide

Further development in science and technology has resulted in a steady increase in China's mobile and fixed broadband network access and utilization rate. However, several factors – the uneven development level of Internet popularization, infrastructure construction, technological innovation and creation, security risk prevention, and digital skills proficiency – in different regions of China have restricted information construction and digital transformation. Amid accelerated digital empowerment in various fields, it is essential to further improve the level and quality of Internet access in rural and remote areas. This will enhance intelligent agricultural and rural production levels, improve data management and online services, and bridge the digital divide.

3 Meaning and characteristics of Internet Plus modern agriculture

3.1 New definition of Internet Plus modern agriculture

Internet Plus modern agriculture is a new form of agriculture derived from the integration of Internet technology, ideas, and patterns with modern agriculture. Internet Plus modern agriculture is a dynamic and innovative process, which adapts itself with the need of the hour. With increasing support by the state, its implication has undergone profound changes. Referring to policy documents such as *Outline of Digital Rural Development Strategy* issued in 2019 and the pilot demonstration construction practice of agricultural and rural informatization conducted by the state in recent years, this article defines Internet Plus modern agriculture as follows: establishing a new form of Agriculture 4.0 that features industrial integration, increased income for farmers, rural precision governance, improvement in agricultural quality, and convenient services using information technology, such as mobile Internet, IoT, big data, cloud computing, and edge computing; it focuses on digitalization, precision, networking, and personalization, and it places modern agricultural producers, operators, and other stakeholders at the center; it aims to reinforce the application of Internet Plus innovations in the field of modern agriculture. The combination of Internet Plus and modern agriculture is not only confined to the agricultural industry chain, but also includes integration of industrial, production, and operating systems of agriculture. It is characterized by digitalization, and is a brand-new means of agricultural production.

3.2 New characteristics of Internet Plus modern agriculture

In agriculture, the application of Internet Plus is demonstrated through digitalized information perception, intelligent agricultural machinery and equipment, precision agriculture, online post-production management, and personalized agricultural machinery services. In line with this, the corresponding development goal is to realize agricultural information perception, quantitative decision-making, intelligent control, and precise input, thereby constituting a new model of agricultural production [4].

Digitalized information perception: Internet Plus modern agriculture focusses on the accurate acquisition and stable transmission of agricultural information, as well as the upgrade of processing capacity. Using wireless sensor networks, the Internet, IoT, and other modern transmission channels, based on electrochemical, optical, electrical, and remote sensing technology, agricultural information can be stably entered to an intelligent control terminal on multiple scales. By processing multi-source, heterogeneous agricultural objects, relationships, and behavior information, it can provide accurate information to facilitate modern agricultural production and digital support for intelligent decision-making [4].

Intelligent agricultural machinery and equipment: In Internet Plus modern agriculture, industrialization is used as a source of reference to develop agriculture, realizing the comprehensive integration of agricultural machinery, agronomy, and information. Agricultural sensors and intelligent control systems are promoted to form an intelligent network system through AI+IoT technology. This is conducive for the automatic transfer of agricultural machinery and equipment in the

field, real-time monitoring of crop production processes, and comprehensive promotion of unmanned farms.

Precision agriculture production: The accuracy and quantification of production input is emphasized in the application of Internet Plus modern agriculture. Based on the agricultural quantitative decision-making model, agricultural managers can quantitatively adjust their management decisions according to the specific conditions of each step in agricultural production and optimize the resource allocation, thereby realizing precision agriculture production and management decisions. This reduces investment, saves resources, improves the environment, lowers costs, and promotes efficiency [5].

Online post-production management: Combined with intelligent hardware, blockchain, big data, electronic commerce, and other intelligent technology and methods, Internet Plus modern agriculture can control the management and perception of system; monitor risk; trace quality; and perform online sales and other functions in the transportation, storage, packaging, distribution, sales, and other steps of agricultural post-harvest logistics. Online post-production management will consistently upgrade the transparency of agricultural product logistics and the traceability of agricultural product quality and safety, promoting high quality and reasonable prices of agricultural products.

Personalized agricultural technology services: Internet Plus modern agriculture can realize personalized agricultural technology services in terms of cultivation, disease and insect control, variety selection, soil fertilizer management, and so on. Internet information and farming big data platforms are utilized by applying intelligent analysis algorithms, such as association rules, information abstract extraction, and sentiment analysis, to the information network related to farmer household groups and individuals. Diversified agricultural technology information can be introduced to farmers in a targeted and timely manner according to their types and circumstances. The production skills of farmers can be improved by remote training and real-time online Q&A to achieve personalized agricultural technology services in production.

4 Challenges of Internet Plus modern agriculture development

4.1 Gap in research and low control of core technologies

At present, most of the key technologies of intelligent agriculture in China are at the tracking research stage. The level of overall development is far from the international benchmark, and research cannot be transformed into dominant technologies. The shortcomings of Internet Plus modern agriculture technology in China are highlighted as follows [6]. First, the special sensors for agriculture fall behind, the localization gap is huge, and the high-end demand is heavily dependent on imports (the import of sensors accounts for 80%, and that for sensor chips is up to 90%) [7]. Second, the accuracy of animal and plant models and intelligent decision-making is low. In many cases, it is time-sequence control rather than on-demand decision-making control. Third, intelligent precision operation equipment is lacking and the operation quality is poor. Furthermore, modern agricultural production needs to be deeply integrated with emerging information technologies, such as the Internet, big data, IoT, cloud computing, 5G, and AI. Lack of multidimensional information collection and low processing capabilities of people, machines, objects, and the environment directly affects the development of Internet Plus modern agriculture.

4.2 High capital and labor investment combined with a low return on industrial development investment

Similar to other information technology industries, the Internet Plus modern agriculture has a higher cost of investment at the early stage, not only for the quality of the early software developers but also for the level of technical maintenance personnel. Rural production and operation entities are generally older, and they have a low education level with a weak ability to accept innovative technologies and formats. In addition, they are willing to pay for emerging technologies, such as the Internet. Consequently, high-tech agricultural projects with large-scale applications are difficult to achieve. After the government withdrew financial support, projects execution have become low. Additionally, agriculture continues to be a weak industry with a long production cycle, high risk of natural disasters, and low return on investment; therefore, many agricultural projects need sufficient support from the government and public. Internet giants such as HUAWEI Technology Limited have started to design agricultural projects using Internet technology to provide a systematic solution for agricultural production. The JD and Alibaba groups have entered the fields of intelligent breeding and logistics and financial loans and promoted the development of Internet Plus modern agriculture; however, in the short term, it may be a challenging task to realize large-scale radiation and extension of information technologies, such as Internet, IoT, and big data in the agricultural field.

4.3 Internet Plus modern agriculture application platform faces issues, such as lack of long-term operation mechanism

Although the information service platform has made certain achievements in the development of Internet Plus modern agriculture, common problems persist, such as unclear positioning and inadequate and long operation mechanisms. First, in general, there are several types service platforms in various agricultural fields leading to homogenization. The positioning of each platform and the leading function are unclear, impacting the effective use of agricultural information resources and causing resources wastage. Moreover, specifically on the internal platform, operators lack the resources for long-term maintenance. As most of them have not explored the profit channels to support their development, they cannot achieve the win-win model of platform operation and enterprise development. For example, the Beijing Zhongyinong Information Technology Co., Ltd. is the main operator of the Beijing agricultural information platform, which manages information about villages and households in Beijing; based on this, an information service platform has been built. However, the organization is still exploring the operation mode in the actual application process, as there is a contradiction between the interest appeal of the enterprises and the public welfare attribute of an agricultural information service.

5 Strategic targets and paths of developing Internet Plus modern agriculture

5.1 Development ideas

The action plan in fields related to agriculture, rural areas, and those living in such areas should be thoroughly implemented and the concept of innovative development firmly established. To achieve the major strategic needs of agricultural modernization and rural revitalization, efforts should be made to improve the conditions of agricultural and rural network infrastructure and consolidate the foundation of agricultural development. The spillover effects of the Internet Plus innovation should be fully developed and demonstration projects of Internet Plus modern agriculture deployed. The supporting role of big data in promoting the management process and control of agricultural product supply chain should be fully used to build a new system of quality and safety management and assume control of the entire industrial chain of agricultural products. The informatization platform should be used in a supporting role to promote the precision and universality of agricultural productive services and generate new farmers in the information age. Agricultural labor productivity, land output rate, and green development level should be comprehensively improved through the construction of the Internet Plus modern agricultural technology innovation, application, and industrial development systems, to commence the development of modern agriculture.

5.2 Strategic targets

The next 15 years is an important period for the social economy of China to improve its quality and efficiency and to transform and upgrade itself. It is essential to rely on scientific and technological innovation to drive economic development [8]. The development of modern agriculture requires the establishment of a green development technology that is led by information and bio-technology and features intelligent production and sustainable development; practice of “high output efficiency, product safety, resource conservation, and friendly environment” to improve agricultural quality; and ensuring national food and ecological safety. As an important part of modern agriculture, under the information technology revolution, the Internet Plus modern agriculture supported by “AI + Big Data + 5G + IoT” will usher in a new direction for modern agricultural development in China [9]. The strategic road map of Internet Plus modern agriculture is shown in Fig. 1.

5.2.1 Overall objectives

Combining information technology with the demand for developing modern agriculture strategies in China will result in the advancement of the theory, method, and key technology of Internet Plus. Consequently, the industry of modern agriculture, hardware and software, and intelligent agricultural machinery manufacturing will be cultivated to comprehensively improve the “new infrastructure” of the agricultural and rural network. In addition, it will increase the use of major intelligent agricultural technology products, improve the agricultural industrial system, ensure transparency in the quality and safety control of the industrial chain of agricultural products, and achieve online, personalized, and digital agricultural production services [10]. By 2035, the development of agricultural production will result in intelligent

production, networked management, and accurate and inclusive services. This will enhance the efficiency and benefits of agricultural production, thereby leading to the development of modern agriculture [11–13].

	By 2025	By 2035
Overall objectives	Decisive progress on Internet plus modern agriculture would be made. Intelligent production, networking operation, and precise and universal services would be realized. The three major transformations in agriculture in which machines replace human labor, computers replace human brains, and self supply replaces import would be strongly supported. The efficiency, effectiveness, and benefits of agricultural production, and the development of modern agriculture would be greatly improved.	
Phased objectives	<ul style="list-style-type: none"> Internet Plus will have made critical progress in modern agriculture. Digital production and intelligent transformation of agricultural machinery and operation would have been completed; A number of modern agricultural innovation and industrial highlands with international influence would have been created; The output capacity of farmland, labor productivity, and the level of green development would have been significantly improved. 	<ul style="list-style-type: none"> Internet Plus would have made decisive progress in modern agriculture. Internet Plus modern agriculture application will enter the maturing stage; Internet Plus modern agriculture in China will be in the world's first tier of comprehensive strength; Agricultural intellectualization would have been realized.
Agricultural information infrastructure	<ul style="list-style-type: none"> With the popularization of 4G in rural areas and the innovative application of 5G, the "digital gap" between urban and rural areas would have been significantly narrowed; A big data map of agricultural resources and environment will be built. 	<ul style="list-style-type: none"> A new generation of agricultural Internet infrastructure represented by mobile Internet, cloud computing, big data, IoT, 5G, and AI would have been completed, and a supporting operation and maintenance mechanism would also have been formed.
Internet Plus modern agriculture industrial system	<ul style="list-style-type: none"> A new batch of industries and forms of Internet Plus modern agriculture would have been cultivated; Internet Plus would have been deeply applied in the promotion of agricultural equipment industry. 	<ul style="list-style-type: none"> The precise control and efficient operation of the whole agricultural industry chain would have been realized; Internet Plus will critically promote the intelligent upgrading of the agricultural industrial system.
Internet Plus agricultural product quality and safety	<ul style="list-style-type: none"> Agricultural traceability based on Internet Plus would have been widely applied in the supervision of agricultural product quality cases; A unified national traceability platform with advanced technology and adequate services would have been built. 	<ul style="list-style-type: none"> The traceability database system, the government traceability platform, and the mainstream e-commerce system would have been completed; A sustainable commercial operation of agricultural products traceability ecological map would have been set up.
Internet Plus agricultural producer services industry	<ul style="list-style-type: none"> A number of agricultural big data intelligent service industry forms would have been cultivated and formed ; Services for the whole process of agricultural production would have been made online and digitized. 	<ul style="list-style-type: none"> The efficiency of Internet in agricultural productive services would have been greatly improved; A group of Internet Plus agricultural producer services would have been created to support the integration of agricultural innovation, industrial, value, and service chains.

Fig. 1. Internet Plus modern agricultural strategic route.

5.2.2 Phased objectives

By 2025, the Internet Plus modern agriculture will have made important progress, completing the digitalization of efficient agricultural facilities, large-scale production of pigs, poultry, dairy cattle, aquatic products, and the intelligent transformation of agricultural machinery and equipment. The trinity of the sky, space, and earth monitoring systems for agricultural production will be fully completed. The automatic driving of agricultural machinery based on the BeiDou Navigation Satellite System (BDS) will be widely applied, and the national agricultural product quality safety traceability platform will be completed [14]. To cultivate Internet Plus modern agriculture, the industry represented by agricultural hardware and software, intelligent agricultural machinery, and big data intelligent services, will be reformed to construct a replicable and popularized Internet Plus agricultural production service form to drive innovations to new heights with international influence. Internet Plus would have made positive progress in solving outstanding problems that restrict the development of agriculture in China, thereby significantly improving land and labor productivity, and green development [15].

By 2035, Internet Plus will have further developed agricultural operations, management, and services. There will be a decisive progress in Internet Plus modern agriculture driving the system to perfection. The industrial, production, and operating systems will have been built with the core technology of "AI + Big Data + IoT/Cyber-Physical Systems (CPS) + 5G." Agricultural big data intelligent services, intelligent equipment manufacturing, software and hardware, and other industries will have matured. Self-produced agricultural sensors and agricultural machinery intelligent equipment products in China will meet the mainstream technical standards, achieving the localization of agricultural sensors and chips and large-scale agricultural machinery intelligent equipment. The Internet Plus agricultural production service system covering the entire industrial chain would have been established and agricultural intelligence achieved, bringing China's Internet Plus modern agriculture to a high world ranking [16].

5.3 Priority tasks

To ensure advanced theory, method, and key technologies of the Internet Plus modern agriculture application, it is essential to conduct in-depth research on a data-driven agricultural knowledge model and theory and methods of virtualized, unmanned, and integrated information service models. The integration of common technologies, such as new-

generation AI technology, and new ICT and Internet technology, with modern agriculture should be constantly strengthened to transform and upgrade modern agricultural product design, process control, and application services to digital, networked, cloud-based, and intelligent development. In addition, the Internet Plus grain production technology, including intelligent breeding technology, field environmental perception, and autonomous operation and obstacle avoidance technology, should be emphasized. There should be advances in the Internet Plus fruit/tea/vegetable production technology; Internet Plus protected horticultural technology such as plant factory, and facilities inputs intelligent control technologies; and Internet Plus breeding technology, such as health inspection robots, intelligent waste-recycling, intelligent information-processing and optimization technology for aquatic animal growth, and space/air/ground multi-source information acquisition and fusion technology. Research should be conducted on Internet Plus agricultural machinery equipment technologies, such as sensor high-performance chips with independent intellectual property rights, a high-end unmanned aerial vehicle (UAV) plant protection system with a load of more than 200kg, unmanned tractors, precise fertilization and application of medicine and irrigation technology, and residual film recovery intelligent equipment. Furthermore, skills should be acquired on the Internet Plus agricultural products circulation technology, including quality sensors, intelligent alarms, safety production risk control systems, agricultural blockchain technology, and agricultural products intelligent logistics technology. The Internet Plus agricultural information service technology, such as adaptive agricultural cloud service, the new generation of agricultural visualization human-computer interaction, and agricultural integration media technologies, need to be actively developed to promote the Internet Plus modern agriculture industry.

The quality and efficiency of the modern agricultural industry should be promoted. Combined with the innovative information technology, the agricultural leading and supporting industry systems should be improved, and the modern agricultural industry should be upgraded to attain digitization, networking, cloud and intelligentization in product, process control, and application service. The principles of deep integration of Internet Plus technology and modern agricultural industrial system should continue to be explored, and software tools for intelligent agriculture, agriculture products with intellectual property rights, sensors and instruments, intelligent robots, and big data intelligent service platforms need to be reconstructed. It is also necessary to establish an Internet Plus agricultural industry demonstration zone with industrial characteristics and nurture industrial clusters [17]. The integration of information technology and agricultural production, operation, management, and services should be vigorously developed along with new forms of the modern agricultural industry, such as e-commerce of agricultural products, Internet Plus agriculture and rural leisure tourism, agricultural experts, and direct broadcasting of agriculture. Furthermore, new models, paths, and methods developing the Internet Plus modern agricultural industry in the post-epidemic era need to be explored. Upgrading the industrial structure, optimizing its organization, and transforming the industrial innovation modes should improve agricultural quality and efficiency.

The integrated demonstration of Internet Plus in agricultural production, supply chain, and production services should be performed. Depending on the breeding bases above designated size, the application of Internet Plus digital farms, intelligent farming and agricultural machinery, and other technology equipment, and the intelligent development of agricultural production should be promoted. Relying on above-scale agricultural enterprises above designated size, improving the application of Internet Plus supply chain intelligent management, fresh cold chain logistics, and quality maintenance technology and equipment should be ensured to promote the transparency and networking of the agricultural supply chain. The government and research institutes should promote Internet Plus real-time online agricultural technology services, such as cultivation management, disease and insect pests, and breeding and harvesting. These tasks aim to build a remote online training platform for agricultural productive services to promote technological innovation in agricultural productive services. In addition, to attain innovative Internet Plus modern agriculture, the tasks aim to conduct demonstrations in various fields of agriculture, including 5G technology application, intelligent agriculture demonstration parks, agricultural machinery upgrading and intelligent manufacturing, and single-species entire-industry-chain quality control.

6 Countermeasures and suggestions

6.1 Accelerate the exchange of agricultural and rural Internet information

First, modern agriculture and country should be formed based on 5G, big data, IoT, and other new technologies,

focusing on upgrading the quality and level of Internet access in rural and remote areas. A new-generation high-speed, mobile, safe, and ubiquitous agricultural and rural infrastructure system needs to be gradually constructed. The basic, affordable, and strategic role of infrastructure should be fully utilized in the development of Internet Plus modern agriculture. Moreover, an open and shared service platform should be built for agricultural science and technology resources, to further strengthen the development and utilization of agricultural and rural data and enhance agricultural data collection, cleaning, mining, integration, and analysis. To address issues in production, management, processing, and analysis of data requirements, services containing sharing, management, processing, and analysis of agricultural big data should be made available for scientific research institutions, such as colleges and universities, personnel to demonstrate and promote the services, and managers at all levels. In addition, it is important to set a collection of key laboratories for Internet Plus modern agriculture, improve the innovation conditions of key agricultural laboratories in related fields, upgrade the infrastructure level of the scientific observation station, build a demonstration project of the Internet Plus seed industry, and other modern agricultural areas. The integration of the Internet and agricultural industry, such as agricultural machinery operation, modern breeding, grain feeding, crop cultivation, livestock breeding, and agricultural product supply chain development, should be promoted through the Internet Plus innovation model.

6.2 Continuously promote the Internet Plus modern agriculture standards

First, the standards system of technological applications, such as agricultural IoT, big data, e-commerce of agricultural products, and agricultural technology information services, should be established and improved. It is essential to strengthen the construction of information platforms, popularization, and application of data standards of local regions at all levels; additionally, the application of data standards should be promoted. A unified data interface is needed to provide support for exchanging and sharing information about Internet Plus modern agriculture. Furthermore, a standards system of agricultural machinery and equipment should also be established and improved to develop an intelligent management system for agricultural machinery operation focusing on the needs of intelligent production, collaborative organization, personalized customization, and extension services. This aims to explore the collaborative development mode of industry clusters of agricultural equipment manufacturing and promote the Internet Plus agricultural machinery operation. Moreover, it is crucial to formulate and improve process traceability standards of agricultural products, cold chain logistics, and quality safety based on Internet, IoT, and other information technologies. A traceable management operation system and information platform should be built to achieve intelligent supervision and management of agricultural product circulation [18–21].

6.3 Strengthen the Internet Plus modern agriculture discipline and personnel training

First, the discipline layout of the Internet Plus modern agriculture should be improved. It is suggested that the training of personnel in Internet Plus modern agriculture, which includes agricultural AI and big data, should be introduced in the postgraduate education and training system. In pilot institutions and universities, the enrolment quota of Internet Plus modern agriculture's related disciplines should be increased, and a cross-combination of agriculture and mathematics, computer science, physics, biology, economics, sociology, law, and other disciplines should also receive attention. Second, the training of innovative talent and teams needs to emphasize on leading personnel with the potential for development. In addition, the training of professional and technical personnel in basic and applied research, operations, and maintenance should be undertaken. Furthermore, vertical composite talents should be nurtured through theories, methods, technologies, products, and applications. Similarly, the cultivation of horizontal composite talents and the mastering of AI Plus economy, society, management, standards, and law is significant. Top talents should be sourced via the major research and development tasks of Internet Plus modern agriculture and base platform construction. Several high-level innovation teams should be formed in key areas of Internet Plus modern agriculture to encourage and guide domestic talents toward enhancing cooperation and interaction with relevant global research institutions. Finally, talent incentive mechanisms should be improved and the agricultural science and technology talent support system established and upgraded. In addition, a mechanism needs to be developed to adapt to the characteristics of Internet Plus modern agriculture. Personnel assessment, evaluation systems, and incentive methods should be established and finalized, and professional talents in agricultural science and technology fields retained. Local agricultural talents should be supported and their sense of belonging reinforced through subsidies, for example housing subsidies.

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