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Mechanism Analysis and Regional Collaborative Path Research on the Integration of Digital and Agricultural Technologies in the Yangtze River Delta Driven by New Productive Forces

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Abstract

In the strategic context of the "New Agricultural Productivity" first proposed in the 2025 Central Document No. 1, this study focuses on the Yangtze River Delta region and delves into the intrinsic mechanisms and regional collaborative development pathways of the deep integration of digital technology and agriculture (Digital-Agriculture Integration) driven by new productivity. The study finds that the current Digital-Agriculture Integration in the Yangtze River Delta faces two core bottlenecks: the fragmentation of cultivated land, which restricts large-scale application, and the absence of a regional coordination mechanism, manifesting as policy fragmentation, data silos, inconsistent standards, hindered factor mobility, and uneven development. To address the challenges of regional coordination, the study proposes systematic policy recommendations.

Keywords

New productive forces, Digital-agricultural integration, Yangtze River Delta region.

1. Introduction

Currently, new-quality productive forces, with technological innovation as the core driving force, are profoundly reshaping the global industrial landscape, and the agricultural sector is no exception. Developing new-quality productive forces in agriculture is an inevitable requirement and key path for achieving agricultural and rural modernization. Its core lies in empowering through cutting-edge technologies, optimizing the agricultural industrial structure, enhancing competitiveness, building a modern agricultural industrial system, and promoting the construction of livable and prosperous rural areas.

In September 2023, during his inspection in Heilongjiang, General Secretary Xi Jinping proposed, "Integrate scientific and technological innovation resources, lead the development of strategic emerging industries and future industries, and accelerate the formation of new productive forces." At the same time, General Secretary Xi Jinping emphasized that we must firmly grasp the primary task of high-quality development and develop new productive forces according to local conditions. The Central Rural Work Conference in 2024 proposed to develop new productive forces in agriculture according to local conditions. A strong country must first strengthen its agriculture, and only when agriculture is strong can the country be strong. Against the backdrop of the global technological revolution and accelerated industrial transformation, the digital transformation of agriculture has become the key to rural revitalization and agricultural modernization. The report of the 20th National Congress of the Communist Party of China proposed "accelerating the construction of a strong agricultural country," emphasizing the promotion of high-quality agricultural development through scientific and technological innovation.

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The "No. 1 Document" of the Central Committee in 2025 explicitly proposed the significant strategic direction of "new quality productive forces in agriculture" for the first time, marking a new stage in China's agricultural development where technological innovation leads quality, efficiency, and power transformations. This policy orientation provides fundamental guidance for overcoming agricultural development bottlenecks and empowering comprehensive rural revitalization under the new circumstances. It also highlights the urgency and strategic significance of deeply integrating digital technology with the entire agricultural chain. As one of the most economically active and innovative regions in China, the Yangtze River Delta region possesses significant advantages in developing digital agriculture and should play a pioneering and exemplary role in responding to the national call and exploring the development path of new quality productive forces in agriculture.

Currently, the integration of digital agriculture in the Yangtze River Delta faces two major bottlenecks. Firstly, the fragmentation of farmland restricts large-scale application [1]. The characteristics of fragmented farmland resources and dispersed management entities in the region are significant, making it difficult to achieve large-scale, intensive, and standardized production. This severely restricts the promotion and application of large-scale intelligent agricultural machinery and equipment, as well as the large-scale deployment benefits of digital technologies (such as the Internet of Things and precision agriculture), hindering the overall effectiveness of digital agricultural infrastructure. Secondly, there is a lack of regional coordination mechanisms [2]. Despite differences in agricultural resource endowments, development stages, and industrial layouts among the three provinces and one city in the Yangtze River Delta, an effective coordinated development mechanism for digital agriculture has not yet been established among regions. This is manifested in poor policy coordination, severe data barriers, inconsistent technical standards, and hindered cross-regional flow of factors (technology, talent, capital, data). This "going it alone" situation not only results in repeated resource investment and waste but also makes it difficult for successful models explored and formed in local areas (such as the practice of building agricultural IoT platforms and applying soilless cultivation technology in some counties in Anhui Province) to be effectively replicated and promoted within the region, thus failing to form a synergistic amplification effect. In addition, issues such as varying depths of digital application in rural industries across regions and uneven talent support have also exacerbated development imbalances.

This study focuses on the mechanism analysis and collaborative path research of digital agriculture integration driven by new productive forces in the Yangtze River Delta region. Its core value is reflected in the following three aspects: (1) Theoretical value: deepening cognition and constructing models. The study focuses on the Yangtze River Delta region, deeply analyzing the core mechanisms (such as technology penetration, factor reorganization, function expansion, and efficiency leap) of digital technology (AI, IoT, big data) driving the formation of new productive forces in agriculture, constructing a regional theoretical framework for "digital-agriculture integration", enriching the connotation of new productive forces in agriculture, and providing universal theoretical support for agricultural modernization in developed regions. (2) Practical value: breaking bottlenecks and driving upgrades. The study aims to address the core pain points of agriculture in the Yangtze River Delta: land fragmentation, inefficient factor allocation, and industrial discontinuity. By designing cross-regional factor collaboration mechanisms (land circulation platforms, talent sharing) and exploring industrial upgrading paths (intelligent breeding, precision planting, smart supply chain), it provides actionable solutions for the Yangtze River Delta to break through traditional agricultural constraints and achieve a technology-intensive, high value-added modern agricultural transformation. (3) Policy value: innovating collaboration and support strategies. The core of the study lies in designing policy collaboration paths (unified data platforms, industry alliances, cross-domain

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governance mechanisms) to break administrative barriers and standard differences among the three provinces and one city in the Yangtze River Delta. This can not only activate the regional innovation ecosystem and provide an institutional template for national regional integration, but also directly serve the strategic goals of building a powerful agricultural nation, ensuring food security, and achieving common prosperity [3].

2. Literature Review

Scholars have conducted a series of studies centered around the integration of new productive forces and digital agriculture.

New-quality productive forces have emerged as a hot research area both domestically and internationally in recent years, particularly in China, where its significance has been continuously enhanced by policy promotion and technological advancements. Zheng Jian (2024) studied the relationship between new-quality productive forces and agricultural modernization based on the theory of new-quality productive forces, analyzed the logical mechanism, sorted out issues, and proposed development paths [4]. Zeng Jianxun (2024) believed that it is crucial to grasp the connotation of new-quality productive forces, target enterprise needs, and focus on industry technological characteristics [5]. In 2025, the No. 1 document of the Central Committee of the Communist Party of China first proposed "new-quality productive forces in agriculture", emphasizing the use of technological innovation to lead the agglomeration of advanced production factors and promote the transformation towards agricultural modernization. Jia Haigang et al. (2025) found that new-quality productive forces empower the construction of digital villages, necessitating the establishment of a driving mechanism encompassing digital talent, new infrastructure, production upgrading, and collaborative entities [6]. Zhang Yuanxin et al. (2025) believed that new-quality productive forces are advanced productive forces born from the innovative allocation of production factors driven by technological innovation and the modernization transformation of industrial systems [7]. High-quality agricultural development is the primary task of agricultural modernization, and the development of new-quality productive forces is the only way to achieve it.

Digital agriculture integration is an important path towards agricultural modernization, and its application scenarios and development models are actively explored both domestically and internationally. Lu Zhaoyang et al. (2022) argue that the digital economy empowers high-quality agricultural development, requiring technological innovation, infrastructure improvement, industrial integration, and environmental optimization [8]. Peng Zichen (2023) finds that under the background of intelligent transformation and digital transition, Guiyang relies on the "China Digital Valley" to achieve coordinated development between digital industries and agriculture, but faces governance challenges and factor constraints. The research team proposes strategies such as platform improvement, collaborative innovation, and optimization of external embeddings to assist in the modernization of agriculture and rural areas [9]. Li Yuan et al. (2024) argue that "digital agriculture integration" promotes agricultural and rural modernization, reshapes the industrial ecology, and helps enrich the country through agriculture. It requires strengthening policy guarantees and promoting changes in production relations [10]. Sun Cong et al. (2024) argue that digital agriculture integration enhances agricultural resilience, improving adaptability and resistance in the short term, and promoting prevention, resistance, and adaptability in the long term. The effects are more significant in major grain-producing areas and regions with developed digital economies, and there is a spatial spillover effect [11]. Wen Ruobing et al. (2025) find that the digital economy empowers new productive forces in agriculture, promoting agricultural modernization and high-quality development [12].

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The role of new productive forces in promoting the integration of digital and agricultural technologies has become an important research direction both domestically and internationally. Gao Yuan et al. (2024) argue that agricultural new productive forces represent innovative transformations of agricultural production factors, processes, and industrial chain organizations, enabling greater value creation [13]. Their formation relies on technological progress, organizational change, and policy support, and requires adaptation to the material and social characteristics of rural areas. Luo Biliang et al. (2024) find that agricultural new productive forces are driven primarily by technological innovation, focusing on high-quality development and the goal of becoming a powerful agricultural nation. They emphasize six major paths, including shifting from traditional factors to the "Five Good Practices" synergy and upgrading to digital and intelligent agriculture [14]. Starting from Marxist political economy, Kong Xiangzhi et al. (2024) define agricultural new productive forces as having high-quality laborers as the primary factor and high-tech means of production as the material basis. They emphasize its dynamic, sustainable, and applicable characteristics and propose three cultivation paths: nationwide system support for technological innovation, industrial chain synergy, and market-based allocation of factors [15]. Shang Mingyu (2025) believes that new productive forces are an important driving force for rural revitalization, empowering it in terms of technological innovation, talent cultivation, cultural inheritance, and green development [16]. Wei Luo et al. (2025), based on the "technology-organization-environment" framework and dynamic QCA method, find that agricultural new productive forces effectively promote sustainable agricultural development and modernization [17].

In summary, regarding the issue of the integration of new-quality productive forces and digital agriculture, there have been numerous relevant studies by scholars both domestically and internationally. However, most of these studies treat agricultural new-quality productive forces as a universal concept, lacking regional differentiation analysis; they emphasize technological supply while neglecting institutional innovation, especially avoiding the challenges of cross-administrative coordination; and their discussions on the extension of the industrial chain remain at the macro level, without dissecting the digital bottlenecks in characteristic industries such as rice and aquatic products in the Yangtze River Delta.

This study addresses the limitations present in existing literature on the integration of new-quality agricultural productivity and digital agriculture, achieving three breakthrough contributions: Firstly, it breaks through the universal framework, focusing on the heterogeneity of resource endowments and technological foundations across the three provinces and one city in the Yangtze River Delta region, and constructs a differentiated development model. Through quantitative measurement and typical case studies, it reveals the core impact of regional endowment differences on technology adaptation and institutional innovation, filling the gap in empirical research on regional collaboration. It systematically breaks down institutional barriers across administrative regions, innovatively proposes a ternary circular collaborative mechanism of "technology-resource-institution", designs the "Yangtze River Delta Agricultural Cloud Platform", inter-provincial standard committees, and ecological compensation funds, providing an operable path for eliminating policy fragmentation and data silos. It deeply dissects the digital bottlenecks of characteristic industries, focuses on the pain points of fragmented farmland, rice, aquatic products, and other industrial chains in the Yangtze River Delta region, and designs targeted county-level solutions. These contributions, through the organic integration of "precise identification of regional differences - institutional collaborative innovation - deep cultivation of characteristic industries", transform the theory of new-quality agricultural productivity into a systematic practical framework for agricultural integration in the Yangtze River Delta region, providing a replicable paradigm for collaborative development of agricultural regions nationwide.

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3. Basic Theory and Research Hypothesis

3.1. Basic theory

3.1.1. Connotation and characteristics of new productive forces

New-quality productive forces, centered on big data, artificial intelligence, and green low-carbon technologies, represent a novel form of productive forces that achieves a leap in traditional productivity through scientific and technological innovation. Its essence lies in the comprehensive innovation of laborers, labor objects, and labor tools. In the agricultural sector, new-quality productive forces manifest as three core characteristics: (1) Technological innovation: Driving agricultural total factor productivity through disruptive technological breakthroughs (such as biotechnology breeding and intelligent equipment) is the core driving force behind agricultural modernization [18]. (2) Data elements: Integrating non-material forms such as data and information into agricultural labor objects, optimizing resource allocation, and reshaping the industrial chain, forming a ternary structure of "digital agricultural laborers—digital agricultural labor tools—digital agricultural labor objects" [19]. (3) Greenification: Emphasizing low-carbon sustainability, reducing agricultural environmental costs through green technologies, and achieving coordinated ecological and economic development.

3.1.2. The connotation and dimensions of digital agriculture integration

Digital agriculture integration refers to the process of digital technology penetrating into the entire agricultural industry chain, encompassing three layers of connotation: (1) Technology penetration: Technologies such as the Internet of Things and blockchain are deeply integrated into agricultural production processes, enabling digital management such as precise fertilization and intelligent irrigation, and promoting innovation in the "Internet + agricultural industry chain" [20]. (2) Industry chain integration: Breaking down industrial boundaries, connecting pre-production, production, and post-production links through data elements, and forming a modern industrial system that integrates agriculture, culture, and tourism. (3) Subject collaboration: Multiple subjects such as the government, enterprises, and farmers collaborate in a data sharing platform to optimize decision-making and resource allocation.

3.2. Mechanism of Action and Research Hypothesis

3.2.1. The direct impact of new productive forces on digital agriculture integration

New productive forces directly empower agricultural modernization through digital technology. The mechanism of action is as follows: the application of digital infrastructure (such as intelligent agricultural machinery and agricultural big data platforms) enhances agricultural production efficiency and drives the transformation of traditional agriculture towards precision and intelligence. For example, blockchain technology can optimize the traceability system of agricultural products and reduce circulation losses. New productive forces directly shorten the agricultural innovation cycle through technological leapfrogging, serving as the core driving force for the integration of digital and agricultural technologies.

3.2.2. Indirect path driven by technological innovation

As the core of new productive forces, technological innovation indirectly promotes the integration of digital and agricultural technologies through technological upgrading. The mechanism of action is as follows: key technological innovations (such as gene editing and AI algorithms) accelerate the iteration of agricultural technologies, giving rise to new business forms such as smart farms and vertical agriculture. At the same time, technological innovation promotes the integration of traditional agriculture and strategic emerging industries, expanding the value space of the industrial chain. By enhancing the total factor productivity of agriculture (such as the coverage rate of improved varieties and the contribution rate of science

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and technology), technological innovation indirectly strengthens the technical foundation for the integration of digital and agricultural technologies.

3.2.3. Supporting Paths for Digital Human Capital

High-quality talent serves as a bridge between new-quality productive forces and the integration of digital agriculture. The mechanism of action is as follows: new-type workers need to possess digital skills and cross-disciplinary knowledge, enabling them to operate intelligent agricultural systems and promote technology implementation. For instance, "digital farmers" can lead agricultural big data analysis and optimize planting decisions. Digital human capital is crucial for the implementation of new-quality productive forces in agriculture by enhancing the efficiency of technology application and solving the "last mile" transformation challenge in agriculture.

The new productive forces promote the integration of digital and agricultural technologies through a three-dimensional mechanism: direct penetration via technology, indirect driving through innovation, and continuous support from talents. Its theoretical foundation stems from the qualitative transition and system reconstruction of productive force elements. Subsequent research needs to consider regional differences and explore the adaptation of collaborative policies and systems.

4. Analysis of the Current Situation of Digital and Agricultural Integration Development in the Yangtze River Delta Region

4.1. Advantages and characteristics

4.1.1. Shanghai: Strong in technological research and development but limited in arable land → "Technology service export" model

(1) Technological leadership data. Shanghai boasts a digitalization rate of 95.5% in agriculture, ranking first in the country in terms of the informatization rate of agricultural technology extension services.

The number of high-tech enterprises and the proportion of R&D expenditure in the country exceed 30%, with the integrated circuit and artificial intelligence industries leading the nation.

(2) Technology spillover effect. Shanghai has the strongest technology spillover effect on Zhejiang (with the highest proportion), followed by Jiangsu, and Anhui is the weakest. The proportion of technology spillover received by Anhui from Shanghai is only one-third of that received by Jiangsu, confirming the challenges of its "undertaking and transformation" path.

4.1.2. Anhui: Rich in resources but weak in digitalization → Path of "Infrastructure gap filling + Undertaking and transformation"

(1) The main obstacles in Anhui include a weak technological foundation and poor data circulation. It belongs to the "low synergy region" in the digital economy, with the lowest synergy degree with Shanghai, but its technology acceptance capability has been improving year by year from 2018 to 2023. (2) Progress in technology acceptance and transformation: Anhui is rich in agricultural resources (with cultivated land accounting for 40% of the Yangtze River Delta), but its agricultural digitization rate is only 67.5%, 28 percentage points lower than that of Shanghai. Through the joint construction of industrial parks (such as the Yangtze River Delta (Huzhou) Industrial Cooperation Zone), the technology transaction amount reached 186.3 billion yuan in 2022.

4.2. Core weaknesses

4.2.1. Fragmentation of technology application

(1) Duplicated data construction. There is repeated investment in the digital infrastructure sector: three provinces and one city independently build provincial-level big data platforms

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(such as the Anhui provincial platform), leading to resource wastage. There is a pronounced tendency towards localization in data element transactions, with the proportion of cross-provincial circulation being less than 20%.

(2) Fragmented performance in links. The digital integration level of agricultural production, management, and sales links is low: the transaction volume of agricultural e-commerce has increased, but the cross-field data sharing rate is only 35%. Shanghai focuses on digital agricultural research and development, while Jiangsu mainly focuses on the digitization of manufacturing, lacking a unified technical standard.

4.2.2. Weak inter-provincial coordination mechanism

(1) Regional imbalanced data. The research and development (R&D) intensity in Jiangsu, Zhejiang, and Shanghai reached 3.2%, while that in Anhui was only 2.1% (in 2023) [21].

(2) Slowdown in fixed asset investment growth: In 2023, the overall growth rate in the Yangtze River Delta region decelerated to 5.8%, with Anhui Province recording a year-on-year decrease of 2.3 percentage points.

(3) Lack of collaborative mechanism. The proportion of cross-provincial patent cooperation is low: the proportion of joint patent applications between Shanghai and Anhui is less than 5%, far lower than that between Shanghai and Zhejiang (28%).

(4) Inadequate policy alignment: Among the 152 cross-provincial services, only 30% involve agricultural digital collaboration.

5. Regional Differences and Typical Cases

5.1. Regional heterogeneity manifestation

Significant differences exist among the three provinces and one city in the Yangtze River Delta region in terms of resource endowments, technological foundations, and digitalization levels, leading to diversified characteristics in the integration path of digital agriculture:

5.1.1. Shanghai: Strong in technological research and development but limited in arable land → "Technology service export" model

As the science and technology innovation hub of the Yangtze River Delta, Shanghai boasts top-tier research institutions and a high density of talent resources. However, due to urbanization and scarcity of arable land, its agricultural scale remains relatively small. Therefore, its core approach is to export digital agricultural solutions (such as smart equipment and data analysis models) to surrounding areas through technology spillover effects, forming a "research and development - service - radiation" model. This model leverages Shanghai's pivotal position in the new quality productivity network, strengthening technological collaboration with Jiangsu, Zhejiang, and Anhui.

5.1.2. Anhui: Rich in resources but weak in digitalization → Path of "Infrastructure gap filling + Undertaking and transformation"

Anhui is rich in agricultural resources (such as large cultivated land area and high diversity of agricultural products), but its digital infrastructure is weak and the level of technology application lags behind. It is necessary to advance on both tracks of compensatory investment (such as 5G base stations and IoT coverage) and technology absorption and transformation (introducing technology from Shanghai, Jiangsu, and Zhejiang and localizing it). For example, Anhui is classified as part of the "Rising Central and Western Regions Belt", relying on the "Rise of Central China" policy to attract the inflow of technological resources from the east, while optimizing policy support to reduce digitalization costs.

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5.2. Typical case supporting mechanism

5.2.1. Nanjing Agricultural High-tech Zone, Jiangsu: Technology Transfer Demonstration

Mechanism analysis: The district focuses on cutting-edge fields such as bio-agriculture and intelligent equipment, accelerating the transformation of technology from research and development to field application by establishing industry-university-research platforms (such as joint laboratories between universities and enterprises).

Emphasizing that "scientific and technological innovation drives new productive forces and forms a virtuous cycle", the Nanjing Agricultural High-tech Zone serves as a model for achieving digital upgrading across the entire agricultural chain by optimizing production processes and resource allocation (such as IoT monitoring systems).

Regional synergy value: As the hub of Jiangsu-Anhui synergy, the synergy degree between Jiangsu and Anhui continues to rise, and its technological demonstration effect provides Anhui with a replicable transformation model.

5.2.2. Zhejiang "Rural Brain": Data Platform Collaboration

Mechanism analysis: Based on the provincial integrated data platform, it integrates multi-source data such as meteorological, soil, and market data to achieve precise decision-making for agricultural production. The "Rural Brain" precisely responds to consumption upgrades (such as traceability of green agricultural products) through data-driven approaches, promoting agricultural supply-side reforms. The "benign interaction between resilience and efficiency" in Zhejiang's digital economy confirms the supporting role of data platforms in industrial collaboration.

Regional synergy value: The platform breaks administrative barriers and promotes the docking of agricultural product production and marketing in the Yangtze River Delta (such as real-time sharing of market data in Shanghai), highlighting the efficiency of the combined force of "government + market" dual-driven policies and markets in cross-regional resource integration.

5.3. The underlying drivers and collaborative insights of regional disparities

(1) Root causes of disparities. The eastern region (Shanghai, Jiangsu, and Zhejiang) boasts high technical efficiency but faces strong land constraints, while the central and western regions (Anhui) are abundant in resources but incur high innovation costs. It is necessary to avoid the "gradient trap" (for example, if Anhui only undertakes low-end technologies, its growth will be sluggish).

(2) Collaborative Path. Shanghai needs to strengthen technology diffusion, such as exporting standardized modules of "Rural Brain" to Anhui; Anhui needs to prioritize addressing its infrastructure shortcomings and establish a "Shanghai-Anhui Technology Transfer Enclave"; Jiangsu and Zhejiang should leverage the demonstration effect of the Nanjing Agricultural High-tech Industrial Development Zone and the Zhejiang Platform to promote the ternary cycle of technology-resources-market in the Yangtze River Delta.

6. Policy Suggestions

6.1. Establish a collaborative mechanism for the Yangtze River Delta

(1) Establish a leading group for the coordinated development of digital agriculture in the Yangtze River Delta. Led by provincial-level leaders from Shanghai, Jiangsu, Zhejiang, and Anhui, the group will coordinate cross-provincial policy alignment and resource allocation, focusing on addressing administrative barriers. Drawing on Anhui Province's experience in integrating into the Yangtze River Delta, it is necessary to strengthen institutional alignment and

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innovation chain linkage (such as intellectual property sharing platforms and financial leverage support).

(2) Establish a cross-regional ecological compensation and green collaboration mechanism. In response to differences in agricultural environmental carrying capacity (such as the abundant ecological resources in Anhui and the dense arable land in Jiangsu), set up ecological compensation funds and promote the sharing of green technologies (such as water-saving irrigation and intelligent monitoring) [22].

6.2. Establish a cross-provincial digital agriculture integration standard committee

(1) Unify technical standards and data specifications. The committee, whose members include agricultural research institutions (such as the Anhui Academy of Agricultural Sciences), enterprise representatives, and technical experts, should formulate standards for agricultural IoT device interfaces, data collection, and secure sharing in the Yangtze River Delta region to avoid redundant construction.

(2) Promote mutual recognition of certifications and collaborative supervision. Establish a blockchain platform for tracing the quality of agricultural products, achieve mutual recognition of testing results among the three provinces and one city, and reduce the cost of cross-provincial circulation.

6.3. Jointly build and share an agricultural cloud platform (Shanghai-Zhejiang technology + Anhui-Jiangsu resources)

(1) Technical layer: Shanghai and Zhejiang lead the platform development and computing power support. The Shanghai Zhangjiang Science Center and Hangzhou Internet enterprises provide AI algorithms and cloud computing capabilities to build the "Yangtze River Delta Agricultural Brain" and integrate production, logistics, and market data.

(2) Resource layer: Anhui and Jiangsu provide application scenarios and infrastructure. Anhui focuses on integrating data from the entire industrial chain of specialty agricultural products (such as Dangshan pears and Changfeng strawberries); Jiangsu promotes the coverage of IoT devices in farmland and strengthens the digitization of the production end [23].

(3) Operating mechanism: Adopt a dual-track system of "public welfare + market". Provide free access to basic data services, while charging for value-added features (such as customized market analysis) to ensure sustainable operation of the platform.

6.4. Differentiated implementation path

(1) Shanghai: Focusing on AI breeding and digital supply chain finance. AI breeding R&D center: Establish joint laboratories relying on universities (such as Jiao Tong University and Fudan University), share data from Anhui germplasm resource bank, and accelerate the breeding of high-yield and stress-resistant varieties. Supply chain finance innovation: Pilot agricultural product warehouse receipt pledge and blockchain traceability financing to solve the financing difficulties of small and medium-sized agricultural enterprises.

(2) Zhejiang: Deepen the application of the Internet of Things (IoT) and the e-commerce ecosystem. Promote agricultural IoT across the entire region: Drawing on the experience of Jiangsu, subsidize the installation of smart greenhouses and irrigation systems to enhance production precision. Build an e-commerce hub for agricultural products: Collaborate with Anhui to establish a live streaming base, train farmers in e-commerce operation skills (such as the "Village Broadcast Plan"), and connect with resources from platforms like Alibaba and Pinduoduo.

(3) Jiangsu: Strengthen intelligent equipment and green production. Large-scale application of intelligent agricultural machinery: Promote unmanned harvesters and plant protection drone

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rental services, lowering the threshold for small farmers to use. Develop circular digital agriculture: Pilot the "photovoltaic + smart greenhouse" model to promote agricultural carbon neutrality.

(4) Anhui: Promoting low-cost smart agricultural machinery and e-commerce to assist farmers. Penetration of low-cost smart devices: For the plains of northern Anhui, lightweight sensors and simple IoT kits (such as the Huaiyuan County model) are promoted, with the government subsidizing 70% of the equipment cost. Dual-driven by "e-commerce + training": Jointly with Zhejiang e-commerce platforms, we carry out "one village, one anchor" training to solve the problem of agricultural products moving upstream; replicate the experience of Changfeng strawberry digital greenhouse and build county-level e-commerce demonstration parks for characteristic agricultural products.

7. Conclusion

This study, themed "Mechanism Analysis and Regional Collaborative Path Research of Triangular Digital Agriculture Integration Driven by New Productivity", delves into how new productivity promotes the integrated development of digital agriculture in regions such as the Yangtze River Delta through theoretical analysis and empirical investigation. The core findings indicate that new productivity is not solely driven by technology, but rather promotes the deep integration and regional collaborative development of digital agriculture through the synergistic effect of the "technology-factor-institution" triple mechanism [24]. Meanwhile, based on practical experience in the Yangtze River Delta region, this study emphasizes the importance of collaborative breakthroughs, arguing that breaking down regional barriers and policy linkage holds greater strategic significance than mere technological breakthroughs at individual points.

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