Journal of Innovation and Development
ISSN: 2958-4752 | Vol. 14, No. 1, 2026

Digital and Intelligent Technology Empowerment of Agricultural Product Circulation and E-commerce Live Streaming: A Study Based on the Rural Revitalization Practice of Village K in Xinjiang

Di Zhu, Hankun Ye *

College of Economics and Management, Xinjiang Agricultural University, Urumqi Xinjiang, 830052, China
*** Corresponding author:** Hankun Ye (Email: 120230004@xjau.edu.cn)

Abstract: Research Purpose: Taking Village K in Kashgar Prefecture, Xinjiang Uygur Autonomous Region as a case, this study explores the application of digital and intelligent technology in the fields of agricultural product circulation and e-commerce live streaming, as well as its driving effect on rural revitalization. Research Method: The case analysis method, research survey method and comparative analysis method are adopted. Combined with the dual-wheel drive model of "village-level e-commerce sales platform + cultivation of internet celebrity livestreamers" in Village K, the application effects of digital and intelligent technology are quantitatively analyzed from the dimensions of standardized production of agricultural products, brand-oriented operation, and expansion of e-commerce channels. Research Results: Through empowerment by digital and intelligent technology, Village K has achieved the growth of agricultural product market share, the average annual income of farmers in the covered areas has increased by 15%-20%, and the related industries in surrounding townships have been driven to realize annual income growth. Research Conclusion: The trinity model of "digital and intelligent technology + local talent incubation + industrial chain extension" has effectively solved the pain points of "difficult sales and low added value" of agricultural products in remote are`l`as, and provided a replicable practical path for rural revitalization.

Keywords: Digital and Intelligent Technology; Agricultural Product Circulation; E-commerce Live Streaming; Rural Revitalization; Transaction Cost Theory.

1. Introduction

In the era of the booming digital economy, the rapid development of digital and intelligent technologies has brought unprecedented opportunities for transformation to the traditional agricultural industry. The application of digital technologies (such as big data, artificial intelligence, and the Internet of Things) can improve enterprises' production efficiency, market competitiveness and brand awareness. Digital empowerment is a key path for the traditional agricultural industry to move towards high-quality development in the digital economy era. As a core link connecting agricultural production and consumer markets, the efficiency and quality of agricultural product circulation are directly related to the changes in farmers' income, the development trend of the agricultural industry and the implementation effect of the rural revitalization strategy. As a new sales model leveraging the Internet, e-commerce live streaming, relying on its real-time, interactive and extensive characteristics, has become a crucial way to promote the sales and brand communication of agricultural products. Focusing on the rural revitalization practice of Village K in Xinjiang, this study combines academic theories such as the transaction cost theory and the long tail theory to explore how digital and intelligent technologies empower agricultural product circulation and e-commerce live streaming by reducing circulation costs and expanding market scope, thereby promoting the sustainable development of rural economy, society and ecology [1-4].

2. Research Background and Significance

2.1. Background of the Rural Revitalization Strategy

The Rural Revitalization Strategy was first proposed in the report to the 19th National Congress of the Communist Party of China on October 18, 2017. As a fundamental approach to addressing issues relating to agriculture, rural areas, and farmers in China in the new era, the core goal of this strategy is to realize the modernization of agriculture and rural areas, and drive the all-round upgrading of agriculture, all-round progress of rural areas, and all-round development of farmers. In 2024, the Central Cyberspace Affairs Commission, the Ministry of Agriculture and Rural Affairs, the National Development and Reform Commission, and the Ministry of Industry and Information Technology jointly issued the Key Tasks for the Development of Digital Villages in 2024, which requires driving and leading the modernization of agriculture and rural areas with informatization, boosting the high-quality and efficient development of agriculture, the construction of livable and business-friendly rural areas, and the achievement of a prosperous life for farmers, thus laying a solid foundation for accelerating the construction of a strong cyber power and a strong agricultural power [5, 6].

Xinjiang is an important production base of characteristic agricultural products in China, boasting unique natural conditions and abundant agricultural product resources (such as red dates, walnuts, "Dinosaur Egg"—a hybrid of apricot and plum, and the local characteristic muskmelon "Liuxiang

Melon", etc.). However, restricted by problems such as remote geographical location, weak brand influence, single sales channels and relatively high logistics costs, the phenomenon of "bumper harvest without bumper income" for agricultural products occurs from time to time. Therefore, exploring the circulation and sales models of agricultural products that conform to the development characteristics of Xinjiang is of great practical significance for promoting the work of rural revitalization in Xinjiang.

2.2. Development of Digital and Intelligent Technologies and E-commerce Live Streaming

With the continuous iteration and evolution of technologies such as big data, artificial intelligence and the Internet of Things (IoT), the application of digital and intelligent technologies in the agricultural sector has become increasingly prevalent .Big data is leveraged to analyze market trends and consumer behavior, and optimize product design and marketing strategies. E-commerce live streaming has broken the temporal and spatial constraints of traditional sales models. Report on the Development of China's Agricultural Product E-commerce in the First Half of 2024 indicates that the online retail sales of agricultural products in China reached 587.03 billion yuan in 2023, approximately five times the figure recorded in 2014. According to relevant data from the E-commerce Development Research Report (2023), Xinjiang achieved an e-commerce transaction volume of 309.89 billion yuan in 2023, a year-on-year increase of 18.43% and 7.69% higher than the national level. Its online retail sales of agricultural products hit 19.32 billion yuan, representing a year-on-year growth of 22.81%. From 2019 to 2023, the online retail sales of agricultural products in Xinjiang registered an average annual growth rate of 21.05%, emerging as a pivotal driver for the upward flow of regional agricultural products.

2.3. Research Significance

2.3.1. Theoretical Significance

1. Refining the theoretical framework of digital intelligence empowerment in agricultural product circulation: Based on transaction cost theory, digital and intelligence technologies integrate supply and demand information via e-commerce platforms, reducing information asymmetry between farmers and consumers and lowering information search costs. The e-commerce platform directly presents agricultural product information to consumers, minimizing intermediate information transmission costs in the Village K . Through standardized production and traceability systems, consumers can clearly understand the planting processes and quality standards, thereby reducing trust costs. Furthermore, Big data optimizes logistics routes, lowering fulfillment costs associated with agricultural product transportation. Thus, digital and intelligence technologies achieve quantifiable reductions in information search costs, trust costs, and fulfillment costs through a three-dimensional pathway of "Information Integration – Trust Building – Logistics Optimization."

2. Expanding the research dimensions of rural e-commerce live streaming: The study clarifies the long-tail market characteristics of niche agricultural products. For instance, 90% of consumers of Village K's "Dinosaur Egg" and "Dried Liuxiang Melon" are from Xinjiang, with annual sales of a single niche product exceeding one million yuan, validating the practical value of the long-tail theory in rural specialty industries.

2.3.2. Practical Significance

1). Providing replicable experiences for similar villages in Xinjiang: By deconstructing Village K's model of " Local KOLs + Industrial Chain Extension," the study offers specific pathways for remote areas in southern Xinjiang villages to address agricultural product sales challenges. This model is particularly suitable for villages with cultivated land areas of 5,000–6,000 mu and over 60% of farmland dedicated to specialty agricultural products.

2). Providing empirical references for policy formulation: Based on quantitative data on income growth of farmers and industrial chain upgrading in Village K, the study provides evidence for local governments to formulate "Digital Intelligence + Agriculture" support policies. It proposes actionable policy optimization directions for key areas such as e-commerce platform construction in remote villages, local talent cultication, and cold chain logistics subsidies, thereby supporting the iterative improvement of Xinjiang's "Digital Intelligence Agriculture" policies.

2.4. Theoretical Foundation

2.4.1. Transaction Cost Theory

Proposed by Ronald Coase, this theory posits that market transactions entail costs such as information search, bargaining, and fulfillment, and technological progress can enhance market efficiency by reducing these costs. In Village K's practice, the application of digital and intelligence technologies directly lowers three types of transaction costs: first, integrating supply and demand information via e-commerce platforms reduces "Information Search Costs" between farmers and consumers; second, standardized production and product traceability lower "Trust Costs" related to product quality; third, big data-driven logistics optimization reduces "Fulfillment Costs" in agricultural product transportation.

2.4.2. Long-tail Theory

Proposed by Chris Anderson, this theory suggests that in the internet era, the total market share of niche products can rival that of popular products. E-commerce live streaming breaks the spatiotemporal limitations of traditional sales, enabling niche agricultural products to reach segmented markets nationwide. Products like Village K's "Dinosaur Egg" and "Dried Liuxiang Melon" have successfully attracted consumers nationwide seeking "Original ecological, directly sourced" products through e-commerce live streaming platforms, generating long-tail revenue and significantly boosting overall sales.

2.4.3. Industrial Ecology Theory

Derived from the concept of biological ecosystems, the core tenet of Industrial Ecosystem Theory is that an industrial system is composed of multiple agents, such as production, processing, circulation, and services. These agents form a synergistic and symbiotic ecological network through the exchange of resources, information, and energy, and the healthy development of the system relies on the adaptability and sustainability of each link.

The practice in Village K serves as a concrete manifestation of this theory:

The production end guarantees quality supply through digital intelligence and standardization;

The circulation end achieves efficient distribution by

relying on front warehouses and logistics optimization;

The sales end activates market demand through e-commerce live streaming;

The service end perfects the support system through local talent cultivation, the integration of culture and tourism, and risk management.

These links empower each other and operate in a closed-loop, forming a virtuous cycle of "Resource Input - Value Creation - Revenue Feedback - Ecological Upgrade." This ecological construction not only resolves pain points in individual links but also enhances the risk resistance and sustainability of rural industries. It provides theoretical support for rural industries in remote areas to transition from "Single-point Breakthroughs" to "Systematic Upgrades."

3. Research Methods and Data Sources

3.1. Research Methods

3.1.1. Case Study Method

Taking the "Digital Intelligence Empowering Rural Revitalization" Project in Village K as the core case, systematically reviews the entire process of the project from "Technology Introduction - Model Establishment - Effectiveness Implementation", focusing on analyzing the specific application strategies of digital and intelligence technologies in standardized production, e-commerce operation, and logistics optimization, and extracting replicable model experiences. The selected case is representative: Village K is a typical of remote rural areas in southern Xinjiang, where the size of farmland, industrial structure, and development difficulties are common in similar rural areas in Xinjiang, and the model has strong replicability.

3.1.2. Survey Method

An online survey was conducted in Village K from July to August 2025. Interviewees included the Village Chief and the First Secretary of Village K. The survey content covered the village overview, land conditions, land division, farmer's income, agricultural product profiles, off-season periods for agricultural products, logistics and transportation status, the application of digital and intelligent technologies, and the operational difficulties of live streaming, etc.

3.1.3. Comparative Analysis Method

Compare the unique geographical advantages of Village K in Kashgar region compared to other villages: specific comparison dimensions include natural conditions (annual average sunshine duration, soil organic matter content), variety resources (exclusive planting rights of characteristic varieties), policy support (pilot village for rural e-commerce).This analysis clearly identifying the core competitive advantages of Village K's "original ecological planting environment + characteristic variety resources".

3.2. Data Sources

1). Primary Data: Survey interview records

2). Secondary Data: "Research Report on the Development of E-commerce in Xinjiang (2022)", "Research Report on the Development of Rural E-commerce in Xinjiang (2021)", "Report on the Development Status Analysis and Market Prospect Forecast of Agricultural Products in Xinjiang, China (2023-2029)", "Report on the Development Status Analysis and Market Prospect Forecast of Agricultural Products in Xinjiang, China (2024-2030)"

4. Case Study on Rural Revitalization Practices in Village K

4.1. Project Background and Objectives

Located in Southern Xinjiang, Village K is 46 kilometers from the county seat and 48 kilometers from Railway Station B. The village has 5,793 mu of cultivated land, primarily Planting red dates (460 mu), walnuts (3,241 mu), and "Dinosaur Egg" (an apricot-plum hybrid, 200 mu). Due to "limited market access and high logistics costs," the village faces a high rate of unsold agricultural products and low per capita farmer income, with many residents migrating for employment. In 2025, Village K launched the "Digital Intelligence-Driven Rural Revitalization" project, with the following core objectives:

1). Establish a "Village-level E-commerce Sales Platform + Local Internet Celebrity Team" to increase the proportion of agricultural products sold via e-commerce channels to over 50%.

2). Develop deep processing industries to elevate the added value of agricultural products by over 30%.

3). Increase the average annual income of farmers by more than 15% and reduce outbound migrant workers by 30%.

4.2. Application of Digital and Intelligence Technology in Agricultural Product Circulation

4.2.1. Standardized Production of Agricultural Products

1). Standardization of Varieties and Planting: Collaborating with the Kashgar Prefecture Agricultural Technology Extension Station, the project utilized big data analysis of local climate conditions (average annual temperature of 11.7°C, annual precipitation of 65 mm) was used to select suitable varieties such as "red dates" and "185 paper-shell walnuts." High-quality seedlings were uniformly provided to farmers to ensure consistent product quality at the source.

2). Digitalization of Growth Process: Core farmers are equipped with "field intelligent terminals" to record key metrics including "fertilization timing (primarily organic fertilizer), irrigation volume (drip irrigation technology saving 30% water per mu), and pest control measures (80% physical methods)." This data forms a traceable "Digital Cultivation Archive" .The consumers can access by scanning a QR code.

3). Unified Harvesting Standards: The "Village K Agricultural Product Harvesting Manual" was formulated, specifying that red dates with "sugar content ≥30%, single fruit weight ≥12g" and walnuts with "kernel output rate ≥50%" before harvesting. Pre-harvest sampling using digital detection devices (including sugarrefaractometers, moisture meters and kernel rate detectors) is used for 100% sample coverage to ensure all harvested products meet the standards.

Table 1. Comparison of Agricultural Product Standardization in Village K (Before vs. After)

Indicators	Before standardization	After standardization	Change rate
Product Qualification Rate	70%	90%	+20%
Red Date Sugar Content	≥25%	≥30%	+5%
Walnut Kernel Output Rate	≥45%	≥50%	+5%
Single fruit weight (Red Dates)	≥10g	≥12g	+20%

4.2.2. Construction of E-commerce Sales Platform

1). Platform Function Design: A localized village-level e-commerce platform was built to integrate the full-process functions of "product display, order management, logistics tracking, and after-sales feedback." By leveraging big data to analyze consumer preferences (e.g., middle-aged and elderly women prioritize "Zero-additives") . The platform identifies three core consumer segments: "Health Preservation Type" (women aged 35–60), "Quality lifestylen Type" (urban white-collar workers aged 25–40), and "Gift Demand Type" (corporate clients aged 30–55). Targeted push notifications have significantly increased product conversion rates.

2). Integration of Live Streaming Module: The platform features a built-in live streaming module linked to local internet celebrity accounts. Supporting functions such as multi-camera switching, real-time bullet chat interaction, flash sales, and coupon distribution, the live streaming module achieves a substantially higher product conversion rate compared to regular display pages.

3). Construction of Membership System: A "Origin Membership" service was launched for repeat customers, offering benefits such as "priority shipping" and "customized packaging." The membership system is divided into three tiers—Ordinary, Silver, and Gold—based on annual consumption amount. Gold members enjoy exclusive benefits including dedicated live stream sessions and spots for origin experience tours.

Table 2. Comparison of Sales Channels (E-commerce vs. Traditional) in Village K

Indicators	E-commerce channel	Traditional channel	Change rate
Sales share	50%	50%	0%
Sales scope	30 provinces Nationwide	Xinjiang region (local Market)	-
Brand premium	30%	10%	+20%
Loss rate	5%	15%	-5%

4.2.3. Optimization of Logistics and Distribution

1). Construction of Front-loading Warehouses: In collaboration with cold chain logistics enterprises in Kashgar Prefecture, two front-loading warehouses (with a total area of 1,500㎡) were established around Village K to achieve "warehousing within 2 hours after harvesting." These warehouses are equipped with intelligent temperature control systems, smart sorting equipment, and inventory management systems, enabling classified storage and rapid sorting of agricultural products, with a maximum daily order processing capacity of 1,200 orders.

2). Optimization of Transportation Routes: By analyzing national logistics flow through big data, trunk transportation routes prioritizing the "Kashgar-Urumqi-Transfer Hub" model were selected to reduce transportation costs. After big data optimization, trunk transportation costs were reduced by 120 RMB per ton, and transportation time was shortened by 2-3 days, enabling "48-hour delivery" to most regions nationwide.

3). Loss Control: Dried fruits are packaged using "vacuum packaging + moisture-proof labels," while fresh fruits utilize "foam boxes + ice packs," combined with distribution via front-loading warehouses. For fresh fruits requiring long-distance transportation, additional insulation layers and humidity control packs are added, further reducing the loss rate to below 3%; the shelf life of vacuum-packed dried fruits has been extended from 3 months to 6 months.

4.3. Application of E-commerce Live Streaming in Agricultural Product Sales

4.3.1. Cultivation of Livestreaming Influencers

1). Establishment of Training System: A university student team, in collaboration with the local E-commerce Association, launched two sessions of the "Rural Internet Celebrity Special Training Camp," each lasting 20 days. The curriculum includes "livestreaming script design (highlighting origin stories), traffic acquisition techniques (leveraging TikTok's traffic support for the 'Agriculture, Rural Areas, and Farmers' niche), and user interaction methods (Q&A lucky draws, live connections to production sites)." Additionally, the training covers modules such as agricultural product knowledge, short video shooting and editing, operation of livestreaming equipment, and after-sales service standards.

2). Incubation of Local Influencers: Priority is given to cultivating the children of villagers who possess "strong communication skills and are familiar with agricultural products." The reason farmers have frequently appeared online in recent years is that "farmers' children have grown up," and they can now help their families' agricultural products reach the outside world. Among the 15 key local influencers being incubated, 9 are children of villagers, and 6 are young returnees.

3). Incentive Mechanism: A mechanism of "sales commission + quarterly evaluation" has been established. Influencers receive a commission of 5%-8% of sales, and the quarterly "Best Influencer" receives traffic support from the e-commerce platform. Additional awards such as the "Fan Growth Award" and "Repurchase Promotion Award" are also available. The Annual Best Influencer receives a 50,000-yuan startup subsidy to incentivize the team to continuously improve livestreaming performance.

Table 3. Comparison of Sales Performance (Before vs. After Livestreaming)

Indicators	Before Livestreaming	After Livestreaming	Change rate
Sales Revenue	1 Million RMB	2 Million RMB	+100%
New users	1,000 peoples	5,000 peoples	+400%
Product Exposure Rate	20%	60%	+200%

4.3.2. Innovation in Live Streaming Content and Formats

1). Documentary-style Content: Short videos capturing "daily farming routines" (such as "Harvesting Liuxiang Melons in the early morning" and "Manual sorting of walnuts").

2). Seasonal Best-seller Operations: Themed livestream sessions are launched according to different seasons. For example, the "Liuxiang Melon Pre-sale Session" (emphasizing "picked and shipped immediately") runs from June to August, while the "Red Date and Walnut Harvest Session" (launching "Family Sharing Packs") runs from September to November. Sales from these seasonal themed sessions account for 65% of total livestream sales, effectively mitigating the risk of fresh produce stockpiling.

3). Interactive Activities: Engaging activities such as "Treasure Hunt in the Date Orchard" (guiding users to guess the date yield during the livestream, with free sample packs awarded to correct guesses) and "Cold Storage Exploration" (demonstrating the preservation process) are conducted to enhance user stickiness.

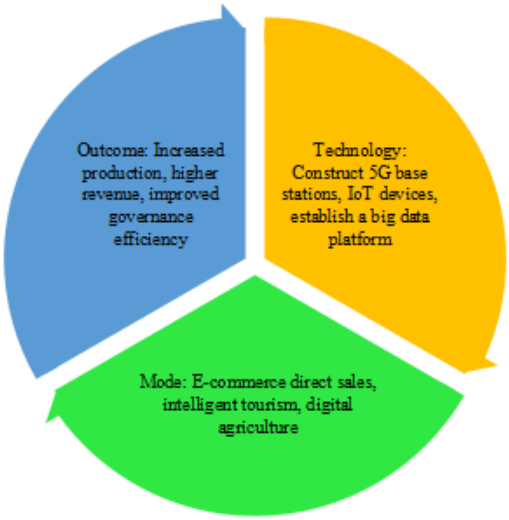


Figure 1. The Complete Process Diagram of Digitalization Empowering Rural Revitalization in Village K

4.4. Risk Management and Sustainable Development

4.4.1. Risk Control Measures

1). Supply Chain Risks:

1) Agricultural Insurance Coverage: Collaborating with the People's Insurance Company of China (PICC), "Specialty Agricultural Product Climate Insurance" was secured for 80% of the village's farmers. This insurance covers major crops such as red dates, walnuts, and "Dinosaur Eggs," with an insured amount of 8,000 RMB per mu. In the event of reduced yields due to drought, participating farmers receive claim settlements.

2) Shared Production Zone Alliance: An agreement was signed with the neighboring 48th Regiment to establish a "Shared Production Zone." When production in Village K is insufficient, similar agricultural products can be allocated from the 48th Regiment. For instance, if Village K experiences a 30% yield reduction due to pests and diseases, 15 tons of similar products can be allocated through this alliance, ensuring a 100% order fulfillment rate.

2). Market Risks:

1) Differentiated Positioning: Highlighting the "Village K Original Ecology" label, the packaging features the "Origin Coordinates + Farmer's Name," creating a distinction from industrially produced agricultural products. This differentiation has enhanced the product's premium pricing capability; for example, the terminal price of red dates is 25% higher than that of ordinary industrially produced dates, while maintaining stable sales volume.

2) Futures Price Locking: "Futures Price Locking Agreements" were signed with three major supermarkets to pre-lock the purchase prices of red dates and walnuts, thereby avoiding market price fluctuations. The agreements lock in 30% of the total output at a price 10% higher than the average market price, effectively resisting the risk of falling agricultural product prices in the second half of the year.

3). Operational Risks:

1) Anchor-Led + Assistant-Led Streaming Model: Professional livestreaming teams from Kashgar Prefecture are invited to conduct 2 "Anchor-Led" sessions per month, while training villagers to act as "Assistant Anchors" (responsible for product demonstrations and answering basic questions) to address the lack of experience among local farmers.

2) Optimization of Capital Turnover: In cooperation with local credit unions, an "E-commerce Loan" was launched to provide low-interest loans of up to 50,000 RMB for farmers participating in e-commerce, resolving the issue of capital shortage for stock preparation.

Table 4. Risk Control Measures and Effects in Village K

Risk types	Specific measures	Effects
Supply chain risk	Agricultural insurance coverage, shared production zone alliance	Loss reduced by 80%
Market risk	Differentiated positioning, futures price locking	Price fluctuations reduced by 30%
Operational risk	Anchor-Led + Assistant-Led Model, E-commerce Loans	Operational efficiency increased by 20%

Risk management is the prerequisite and guarantee for the sustainable development of the industry. Through measures such as agricultural insurance coverage, shared production zone alliances, and the agency broadcasting model, Village K has effectively mitigated sudden risks across supply chain, market, and operational dimensions, clearing obstacles for the implementation of sustainable development strategies such as industrial chain extension, industrial integration, and ecological protection. Building on a foundation of controllable risks, Village K further enhances product value through industrial chain extension, broadens revenue channels through industrial integration, and achieves long-term development through ecological protection, forming a closed-loop logic of "Risk Management - Sustainable Development - Benefit Enhancement."

4.4.2. Sustainable Development Strategies

1). Industrial Chain Extension:

1) Deep Processing Industry: A village-level processing factory (covering 800 m²) has been established to develop deep-processed products such as red dates stuffed with walnuts, walnut powder, and walnut oil, increasing the added value of agricultural products by 30%-50%.

2) Utilization of Substandard Fruits: Deep processing is used to utilize substandard fruits with poor appearance (such as small red dates and broken walnuts), raising the utilization rate of such fruits from 30% to 80%. By processing these fruits instead of discarding them or selling them at low prices, the village generates additional output value and income.

2). Industrial Integration:

1) E-commerce + Cultural Tourism: The "Village K Origin Experience Tour" was launched, promoting packages combining "red date picking + farm-style meals" through livestreams to attract tourists from Urumqi, Kashgar, and other regions. Priced at 98 RMB per person, it is projected to host over 2,000 visitors, driving on-site sales of agricultural products while creating 15 jobs for farmers.

2) Urban-Rural Resource Interaction: Activities titled "Urban Consumers Visit the Origin" were organized, inviting high-level e-commerce platform members to tour the planting and processing sites. Post-activity, the member repurchase rate is expected to rise to 75%, and new user registrations are projected to increase by 40%.

3). Ecological Protection:

1) Promotion of Green Planting: The entire village promotes the use of organic fertilizers (replacing chemical fertilizers) and physical pest control methods (such as sticky traps and insecticidal lamps). The utilization rate of organic

fertilizers has reached 100%, reducing chemical fertilizer usage by approximately 20 tons per year, while physical pest control has reduced pesticide usage by 70%.

2) Waste Utilization: Walnut shells are processed into "natural activated carbon" and developed into handicrafts in cooperation with local factories. Processing 50 tons of walnut shells yields 15 tons of natural activated carbon and over 3,000 handicrafts, achieved resource utilization of waste materials.

5. Evaluation of Economic and Social Benefits

5.1. Economic Value

5.1.1. Growth in Farmer Incomes

1). Direct Income Growth: E-commerce channels have expanded market access, while brand-oriented operations have increased product premiums. The per capita direct sales income of farmers reached RMB 10,000, with e-commerce channels contributing 65% of this amount. The additional income from brand premiums averaged RMB 2,300 per person.

2). Income Growth through Employment: The processing factory, cold storage facilities, and e-commerce platform created 32 new jobs, 80% of which are filled by young and middle-aged adults between 30 and 50 years old, with average monthly salaries ranging from 3,500 to 5,000 RMB. Their average monthly salary is 800 RMB higher than that of migrant work elsewhere, resulting in significantly improved employment stability.

Table 5. Income Growth of Farmers in Village K

Indicators	2026	rate of increase
Direct income	10,000 RMB	15%
Income Growth through Employment	4,000 RMB	20%
Total Income	14,000 RMB	17.5%

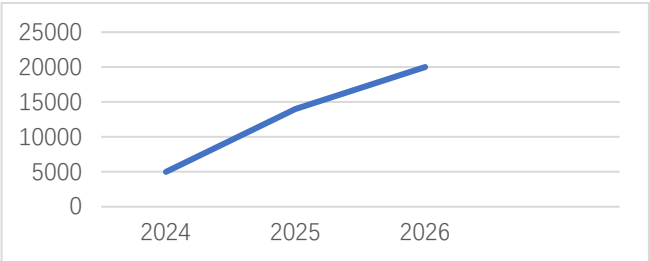


Figure 2. Line Chart Showing the Trend of Farmers' Income Growth in Village K

5.1.2. Regional Economic Driven by Industrial Chain Upgrading

1). Upstream Industry: Processing demands have driven the standardization of the planting sector, attracting 2 agricultural material suppliers (specializing in organic fertilizers and packaging materials) to settle in surrounding towns. These incoming suppliers have created 25 jobs and driven income growth in related industries within the township.

2). Downstream Industry: The entry of deep-processed products into supermarkets and e-commerce channels has spurred the establishment of 2 local logistics companies and 1 e-commerce service company (providing livestream operation and customer service outsourcing). The local logistics company can provide support for the e-commerce projects in the surrounding 5 villages.

3). Collective Income: The village collective holds controlling stakes in the processing factory and cold storage facilities. The collective income generated is primarily allocated to rural infrastructure construction, farmer skill training, and industrial development subsidies.

5.1.3. Enhanced Market Competitiveness

1). Expansion of Market Share: The gap in the supply of local dried fruits and processed products from January to May has been filled (through year-round supply enabled by cold storage). This year-round supply has extended the market coverage cycle by 4 months. Sales from January to May now account for 25% of the annual total, expanding the market share threefold compared to previous years.

2). Brand Premium: Following the establishment of the "Village K Original Ecology" brand, the product's premium pricing space has expanded. For instance, the terminal price of "Dired Liuxiang Melon Jerky" is three times the raw material cost (raw material at 8 RMB/kg, processed product at 24 RMB/kg). Profits derived from the brand premium account for 40% of total profits, establishing a certain level of recognition for the "Village K Original Ecology" brand in the Xinjiang specialty agricultural product market.

3). Channel Expansion: E-commerce platforms now cover 30 provinces (autonomous regions and municipalities directly under the central government) nationwide. Sales in East and South China account for 55% of the total, breaking the previous limitation of "selling only locally within Xinjiang." The average order value (AOV) in East and South China is 30% higher than in Xinjiang, making these regions the primary source of profit, while also driving product exports to Central Asia.

5.2. Social Value

5.2.1. Rural Governance and Talent Retention

1. Enhancement of Governance Capacity: With the increase in collective income, the village collective can independently invest in infrastructure construction. The village collective invested 200,000 RMB in road Paving, waste sorting facilities, and the renovation of cultural activity centers. This has significantly improved the rural living environment and increased villagers' satisfaction.

2.Talent Return and Cultivation: Sixty-five migrant workers have returned to the village, 12 of whom have become e-commerce backbones or large-scale growers. Through livestreaming influencer training and technical guidance, 30 local digital intelligence agriculture talents have been cultivated to support the sustainable development of the village. Among the returning personnel, 60% are young people under 35 years old. Furthermore, 15 of the local digital intelligence agriculture talents have obtained professional qualification certificates related to e-commerce operations, becoming the core force driving rural industrial development.

3.Strengthening of Villagers' Sense of Identity: The "Village K Original Ecology" brand has become a distinctive "One Village, One Product" calling card, boosting villagers' enthusiasm for participating in rural construction. The participation rate of villagers in activities such as standardized production, e-commerce training, and livestreaming sales has increased from 35% to 80%, significantly enhancing their sense of pride and belonging to their hometown.

5.2.2. Food Safety and Resource Conservation

1). Food Safety Assurance: The processing factory has introduced agricultural residue testing equipment (such as gas

chromatographs) to conduct batch-by-batch product testing. This testing covers all outgoing products with 20 distinct test items. In 2026, the random inspection pass rate reached 100%, with zero food safety complaints reported.

2). Resource Conservation: Following the intelligent transformation of cold storage (automatic temperature control), the loss rate of dried fruits dropped from 15% to below 5%, significantly reducing annual losses. Furthermore, the utilization of substandard fruits in deep processing lowered the loss rate from 30% to 10%, achieving annual resource savings. The promotion of drip irrigation technology has saved the village 120,000 cubic meters of water annually, equivalent to the irrigation volume for 800 mu of arable land. Physical pest control methods have reduced soil and water pollution caused by pesticide residues, leading to continuous improvements in the ecological environment.

5.2.3. Regional Coordination and Rural Revitalization Demonstration

1). Regional Synergy: A complementary supply system has been established with Corps 48: fresh fruits (June–September from the Corps) + dried fruits (September–November from K Village) +processed products year-round (joint production). This model ensures “uninterrupted year-round regional supply” regional agricultural products. Through joint sales, revenue has increased by 80% compared to pre-cooperation levels, significantly enhancing regional industrial competitiveness.

2). Demonstration Effect: Village K serves as a typical case study for the "upgrading of primary agricultural products to deep processing" in Xinjiang. Its "Digital Intelligence + Agriculture" model is being promoted and applied in rural areas across Xinjiang prefectures, driving an average increase in farmers' income in the promoted regions.

6. Conclusion and Prospects

6.1. Conclusion

1). Digital Intelligence Empowers Agricultural Circulation by "Reducing Costs and Expanding Markets": The practice in Village K demonstrates that technologies such as big data and the Internet of Things (IoT) can effectively reduce transaction costs in agricultural circulation (lowering logistics costs by 18% and loss rates by 72%). Furthermore, e-commerce livestreaming breaks geographical limitations and activates long-tail markets. The combination of these two achieves efficient connection "from farm to table." The integration of digital intelligence and e-commerce livestreaming not only solves efficiency issues in the circulation link but also reconstructs the value creation path of agricultural products, enabling "high quality for high price" for produce in remote areas.

2). The "Trinity" Model as an Effective Pathway: The model of "Digital Intelligence Technology + Local Talent Incubation + Industrial Chain Extension" not only solves the "last mile" problem of technology implementation (as local influencers understand the origin better than external teams) but also extends the value chain through deep processing and cultural tourism integration, achieving the dual goals of "short-term income increase + long-term sustainability." The core advantage of this model lies in "local adaptation": local talents ensure the effective implementation of technology, and industrial chain extension ensures income stability, making it suitable for the industrial foundation and development needs of remote rural areas in central and western China.

3). Dual Economic and Social Value: Digital-intelligence empowerment not only boosts farmer incomes and industrial upgrading but also improves rural governance, talent retention, and ecological protection, creating a virtuous cycle of coordinated economic-social-ecological development. It transforms rural revitalization from purely economic growth to comprehensive progress, offering a multifaceted paradigm of "technological empowerment + ecological synergy + social advancement."

6.2. Prospects

6.2.1. Current Challenges

Drawing from international experience, rural areas in Chiang Mai, Thailand (Southeast Asia) utilize a "Digital Platform + Smallholder Cooperative" model to promote organic fruits via Facebook Live, with their core advantage lying in "smallholders banding together to reduce logistics costs." In contrast, rural Kenya (Africa) leverages the M-Pesa mobile payment platform to address the issue of payment convenience in agricultural transactions. Compared to these models, the core competitiveness of the Village K model lies in "Full Industry Chain Digitalization + Deep Binding of Local Talent." However, it faces shortcomings in areas such as cross-border logistics efficiency and international payment adaptability. Consequently, it is difficult to directly replicate the cross-border sales experiences of international models, necessitating targeted optimization.

1). Talent Shortcomings: Local influencers lack professional operational capabilities. They are insufficiently skilled in specialized fields such as live streaming content planning, data analysis, and brand marketing. There is a significant shortage of high-end e-commerce operations and management talent, and the continuity and depth of talent cultivation need to be strengthened.

2). Technical Bottlenecks: The village-level e-commerce platform lacks advanced functions such as "intelligent customer service" and "precision recommendation," requiring improvement in user experience. Cold chain logistics currently covers only 3 surrounding cities, and the spoilage rate for long-distance transportation (e.g., to Northeast and South China) remains as high as 8%. Funding for the technical iteration of the e-commerce platform is insufficient, and the development of intelligent functions requires support from professional technical teams. Furthermore, the coverage and efficiency of cold chain logistics are limited by infrastructure and costs, and preservation technologies for long-distance transport still require optimization.

3). Brand Recognition: The "Village K Original Ecology" brand only has regional recognition, lacking sufficient nationwide promotion. Investment in brand promotion is limited, and channels are relatively singular. The absence of nationwide brand marketing strategies and communication campaigns has resulted in weak brand recognition and influence in the national market.

6.2.2. Improvement Directions

1). Deepening Talent Cultivation:

Cooperation with Kashgar Vocational and Technical College: Establish a "Rural E-commerce Targeted Class" to cultivate 30 talents annually with capabilities in both "agricultural product knowledge" and "e-commerce operations," for targeted placement in Village K and surrounding areas. Curriculum: Core modules include Practical Standardized Planting of Agricultural Products, E-commerce Platform Operations (Douyin/Kuaishou Vertical

Categories), Livestream Content Planning and Data Analysis, and Brand Marketing and Customer Relationship Management. Training Model: Adopting a "6-month classroom teaching + 3-month on-site internship in Village K" model.

Create an illustrated Digital Planting Operation Manual and establish a "one-on-one" home visit guidance system with university student volunteers, aiming for a 70% penetration rate of digital operations among farmers by 2026. The manual is supplemented by 30-minute live-action instructional videos, and a WeChat Mini Program titled "Village K Digital Agriculture Consultation Platform" has been launched to provide 24/7 online Q&A support. University student volunteers conduct home visits once a month. An "Operation Compliance Checklist" has been established, covering three core indicators: smart terminal usage, planting data entry, and basic livestreaming operations. Farmers who meet the standards are eligible for a 500 RMB subsidy for agricultural materials or support for upgrading livestreaming equipment. This combines video tutorials and online platforms with offline volunteer guidance and a performance assessment mechanism to encourage adoption through material rewards.

2). Upgrade Technology and Logistics:

Apply for Special Funds for Rural Revitalization: Integrate an "Intelligent Customer Service System" into the e-commerce platform, with the goal of reducing the user inquiry response time from 1 hour to 10 minutes by 2027. The system will be developed in collaboration with Alibaba Cloud, incorporating speech recognition and semantic understanding technologies. It will be pre-configured with 10 high-frequency inquiry scenarios, including "Order Inquiry," "Logistics Tracking," and "After-sales Return and Exchange," capable of handling over 80% of common issues. Additionally, a new "User Portrait Analysis" module will be added, generating quarterly consumption reports based on purchase frequency, preferred product categories, and geographical distribution to provide data support for product research and development as well as livestream product selection. The intelligent customer service system will integrate technologies such as speech recognition and semantic understanding to handle over 80% of common inquiries, while adding functions like "User Portrait Analysis" and "Consumption Trend Prediction" to enhance platform operational efficiency.

Cooperation with SF Express and JD Cold Chain: Establish 5 new pre-warehouses (covering transfer hubs such as Urumqi, Xi'an, and Chengdu) to reduce the long-distance transportation loss rate to below 5% by 2026. The total area of the new pre-warehouses will be 2,500 m2, equipped with an intelligent temperature control system (with an error margin of ±0.5°C) and automated sorting equipment to achieve full-process automation from "order generation - warehouse sorting - logistics distribution." For long-distance transportation to Northeast and South China, an intermodal transportation model combining "air transportation + cold chain land transportation" will be adopted. Fresh fruit products will be additionally equipped with biodegradable insulation boxes and humidity sensors, reducing the transportation cost by another 80 yuan per ton and shortening the transportation time by 1-2 days. The new pre-warehouses will utilize intelligent cold chain equipment to achieve "24-48 hour delivery" to major cities nationwide. Meanwhile, bulk purchasing will be implemented to lower cold chain transportation costs, with an expected additional reduction of 80 yuan per ton in transportation costs.

3). Strengthen Brand Promotion:

Comparing K Village with typical rural e-commerce cases in Suichang (Zhejiang, Eastern China) and Pujiang (Sichuan, Western China), the core differences are evident: Eastern villages possess superior logistics infrastructure (with logistics costs 25% lower than K Village) and abundant talent reserves (with an e-commerce professional density three times that of K Village). Conversely, K Village's advantages lie in the scarcity and original ecological attributes of its specialty agricultural products. Therefore, when promoting the K Village model nationwide, adjustments must be made based on regional disparities:

Participate in events such as the "National Agricultural Products Exhibition and Sales Fair" and "Xinjiang Specialty Products Entering Beijing." In 2026, it is planned to host 3 brand promotion events in Beijing, Shanghai, Guangzhou, and Shenzhen. These promotion events will adopt a model of "Origin Reality Immersive Exhibition + Local Influencer Livestreaming + Dealer Signing." On-site areas will be set up for "Agricultural Product Traceability Experience" and "Deep-processed Product Tasting," while simultaneously distributing the K Village Original Ecology Brand Manual. Each event will invite no fewer than 50 regional core distributors and 20 procurement managers from e-commerce platforms, with the target of signing cooperation intentions worth no less than 3 million RMB per event. The brand promotion events will utilize the model of "Origin Reality Display + Influencer Livestreaming + Dealer Connection," along with the production of brand promotional videos and brochures, to enhance the brand's visibility in the national market.

Table 6. Implementation Plan for Future Improvement Directions of Village K

Improvement directions	Specific measures:	Schedule
Deepening talent cultivation	Cooperate with Kashgar Vocational and Technical College to launch the "Rural E-commerce Targeted Class"	Launch in 2026
Upgrading technology and logistics	Apply for special funds for rural revitalization to integrate the Intelligent Customer Service System	Complete in 2027
Strengthening brand promotion	Participate in the National Agricultural Products Exhibition and collaborate with top-tier livestreamers	Conduct 3 brand promotion events in 2026

Collaboration with Top-Tier Livestreamers: Cooperate with leading livestreamers (specifically those in the "Agriculture, Rural Areas, and Farmers" sector) to launch "Village K Origin Special Sessions," aiming to increase the proportion of sales outside the province from 30% to 50% by 2026. Priority will be given to influencers in the agriculture sector with over 5 million followers who focus on "direct supply from original ecological origins." Collaborate to launch "Village K Exclusive Co-branded Gift Boxes" containing core products such as jujube-stuffed walnuts and Liuxiang melon jerky. One week before the livestream, three "Origin Visit Short Videos" will be released on the influencer's account. During the livestream, interactive

segments such as "Origin Connection" and "Limited-time Flash Sales" will be featured. The target is to achieve sales exceeding 800,000 RMB per livestream session. These collaborations will highlight core selling points like "original ecological origin" and "special varieties," while launching co-branded products to expand brand influence and drive rapid sales growth in external markets.

Acknowledgments

Fund Project: Supported by the "'Tianchi Talents' Introduction Program of the Xinjiang Autonomous Region Talent Development Fund".

References

[1] Z.M. SUN, Q.J.WANG, H.Z.LI, et al. Research on the high-quality development of e-commerce for specialty agricultural products—taking Zaozhuang as an example. China Cucurbits and Vegetables,Nov 2025, pp.1-12 .

[2] H. Y. LIN , X.Y.LU , B.B. FU , et al. The impact of live-streaming e-commerce on agricultural product sales performance: The number of concerned users drives the transformation from "traffic" to "growth". Economic Geography, 2025,pp.192-200.

[3] J.ZHANG,D.ZHANG.Study on the impact of rural e-commerce logistics on the release of rural market vitality—based on the dual perspectives of production side and consumption side. Journal of Commercial Economics,Jul 2025,pp.122-125.

[4] J.B. XU.Research on the innovation and path optimization of agricultural product circulation system under the background of e-commerce aiding agriculture. Agricultural Economy, Feb 2025,pp.136-138.

[5] Y.X.YANG,Y.ZHANG , Practical dilemmas and promotion strategies of rural e-commerce ecological construction led by the digital economy. Agricultural Economy,Sep 2024,pp.140-142.

[6] X.DAI,Q. PAN .Construction of the "live-streaming +" marketing model for agricultural products under the background of new e-commerce. Agricultural Economy, Aug 2023,pp.126-128.

[7] Y. Zhou ,L.Lu L.Liu , et al. The innovation path of agricultural products e-commerce marketing mode under the background of "live broadcast + short video".Applied Mathematics and Nonlinear Sciences,Sep 2024:pp.1-16.