

A Marketing-Mix Perspective on Live-Streaming E-commerce Empowering Rural Industrial Integration: An Exploratory Study Based on Multiple Mountainous Villages in Southern Anhui

Chenglin Li¹, Yu Zheng²

¹*School of Economics and Management, Anqing Normal University, Anqing, Anhui, China*

²*Associate Professor, School of Economics and Management, Anqing Normal University, Anqing, Anhui, China*

Abstract: Against the backdrop of the digital economy, live-streaming e-commerce offers critical opportunities for rural industrial integration and rural revitalization. Nevertheless, existing literature lacks localized empirical evidence for hilly-mountain rural regions and insufficiently explores the role of university-student agricultural assistance teams in industrial integration. Drawing upon field investigations of five villages in southern Anhui and first-hand sales data (October 2024-February 2025) from Anqing Normal University's student agricultural assistance team, this paper adopts exploratory case study and descriptive statistics to unpack how live-streaming e-commerce empowers rural industrial integration. The results identify a collaborative four-dimensional driving mechanism composed of technology, market, policy and talent. Meanwhile, sales data reveal prominent seasonal volatility and large customer unit-price gaps, exposing weaknesses in product portfolio design and supply-chain resilience of mountain rural e-commerce. Targeted practical strategies are further proposed, including optimizing seasonal product portfolios, implementing differentiated live-stream marketing, and building talent inheritance mechanisms for student assistance teams, to support sustainable university-local collaborative rural revitalization.

Keywords: Live-Streaming E-Commerce; Rural Industrial Integration; Digital Countryside; Driving Mechanism; University-Local Collaboration

1. Introduction

Digital economy has profoundly reshaped the circulation system of agricultural products, and live-streaming e-commerce, as an integrated

model of digital economy and real economy, has become a vital channel to drive rural industrial upgrading and integrated development. Official industry data show that China's rural e-commerce transaction volume exceeded 2.17 trillion yuan in 2023, among which live-streaming e-commerce accounted for 23.6%, growing by nearly 15 percentage points compared with 2019[1]. Anhui Province, a major agricultural province, achieved rural e-commerce transaction volume of 118 billion yuan in 2023, while southern Anhui region contributed over 35% of the provincial rural online retail volume from 2020 to 2024, with an average annual growth rate of rural e-commerce sales reaching 16.8%[2]. Mountainous and hilly terrain, scattered smallholder operation and abundant characteristic agricultural resources jointly shape the unique industrial foundation of southern Anhui, making it a typical research site for exploring live-streaming-enabled rural industrial integration.

Existing research has confirmed that live-streaming e-commerce can shorten agricultural product circulation links, activate rural production factors and boost farmers' income. However, three obvious research gaps remain in current literature: First, most studies adopt national panel data or plain agricultural region cases, lacking embedded empirical analysis targeting mountainous hilly areas represented by southern Anhui; Second, existing literature mostly describes the income-increasing effect of live streaming superficially, without in-depth deconstruction of the micro interactive mechanism among platforms, governments, farmers and college student practitioners; Third, few studies systematically discuss the unique role and sustainable operation mode of university student assistance teams in rural industrial integration.

Against this background, this paper proposes two

core research questions (RQs):

RQ1: What four-dimensional collaborative driving mechanism does live-streaming e-commerce rely on to advance rural industrial integration in mountainous southern Anhui?

RQ2: What targeted marketing and industrial optimization strategies can solve seasonal imbalance, insufficient brand premium and weak supply chain problems in mountain rural live-streaming e-commerce?

This study adopts exploratory case analysis and descriptive statistics based on first-hand operation data of student live-streaming stores and field interview records from southern Anhui villages. Its value lies in constructing a localized four-dimensional driving framework applicable to hilly rural areas, supplementing empirical evidence for the interaction logic of digital empowerment and rural industrial convergence. Practically, the summarized “university-student + village cooperative + live-streaming platform” replicable mode provides operable marketing and industrial development suggestions for mountain regions with similar resource endowments, and enriches the practical path of university-local collaborative rural revitalization.

2. Literature Review and Theoretical Foundation

2.1 Definition of Core Concepts

2.1.1 Live-streaming e-commerce

Live-streaming e-commerce is a new e-commerce form relying on digital platforms with real-time audio-video interaction as the core feature, essentially a deep integration of content, social interaction, and transaction logics. Two differentiated practice forms exist in rural scenarios:

Influencer live streaming: Led by third-party internet celebrities, focusing on traffic monetization and impulsive consumption stimulation, with hidden risks including false promotion and ambiguous product accountability.

Store-origin live streaming: Independently operated by farmers or village cooperatives, centering on origin display, supply chain transparency and brand narrative. This form matches rural industrial development better, serving as the core carrier to achieve standardized, branded and value-added transformation of agricultural products.

Nevertheless, most existing discussions of rural live-streaming modes are generalized from

macro panel data and plain region cases, with few embedded analyses targeting mountain smallholders who face fragmented production and poor logistics conditions.

2.1.2 Rural industrial integration

Rural industrial integration is a systematic evolution process centered on factor reconfiguration, function expansion and value symbiosis, rather than simple superposition of primary, secondary and tertiary industries. Driven by digital live-streaming technology, it breaks original industrial boundaries and generates new economic subjects such as the symbiotic network of “farmers-live streamers-consumers-service providers”. In southern Anhui’s tea industry, live streaming has achieved chain integration covering planting, intensive processing, cultural IP development and immersive agritourism experience, realizing qualitative change from industrial superposition to value symbiosis.

However, current conceptual interpretations of rural industrial integration are mostly derived from large-scale plain agricultural areas, paying insufficient attention to how scattered mountain smallholders participate in industrial value reconstruction.

2.1.3 Digital empowerment

Distinct from simple digital equipment deployment, digital empowerment refers to structural capacity improvement and release of human agency triggered by embedded digital technology, presenting three logical layers: technical synergy via big data and AI to coordinate “product-live streaming-consumer” links; subject empowerment to transform smallholders into digital producers and content creators; institutional transformation forcing upgrading of quality control, logistics and collaborative policy systems. The actual effect of digital empowerment depends on the matching degree between rural social foundation and digital infrastructure.

Nevertheless, existing studies on digital empowerment largely draw upon macro panel evidence from plain regions, lacking micro-level embedded analysis of the real constraints faced by mountain smallholders in receiving digital dividends.

2.2 Theoretical Basis

2.2.1 Industrial convergence theory

Derived from Porter’s value chain model and Schumpeter’s innovation theory, industrial convergence theory explains how technological

progress breaks industrial boundaries and spawns new business forms. In rural contexts, it interprets three core evolution paths of agriculture driven by live streaming: functional extension (agriculture expanding to cultural tourism and experience economy), organizational reconstruction (cooperatives transforming into village MCN institutions), value reconstruction (shifting from physical product sales to experience and trust sales). This theory lays the foundation for analyzing integration driving forces and restrictive factors in this paper.

However, prior applications of industrial convergence theory in rural research are mainly grounded in plain region cases, rarely discussing the barriers for mountain smallholders to realize organizational reconstruction and value upgrading.

2.2.2 Platform economy theory

Platform economy theory regards live-streaming platforms as two-sided multi-market intermediaries that reduce transaction costs, match supply and demand and build consumer trust. In rural scenarios, platforms undertake dual functions of technical interface and rural resource reallocation center. This study builds a ternary interaction model of “platform-farmers-consumers” to analyze how platform algorithms, traffic allocation and credit evaluation reshape smallholders’ bargaining power and industrial integration depth.

Nevertheless, relevant platform-economy-oriented rural research mostly uses macro panel data and overlooks how fragmented production characteristics of mountain smallholders alter platform supply-demand matching effects.

2.2.3 Digital divide theory

Digital divide theory divides unequal digital benefit distribution into three layers: access divide (unbalanced rural network and equipment coverage), capability divide (farmers’ insufficient digital literacy and content creation ability), outcome divide (uneven distribution of live streaming traffic dividends). This paper transcends static gap description, focusing on how university student teams bridge the capability divide and adjust internal income distribution structure of villages.

However, existing digital-divide-related rural studies seldom conduct embedded field analysis for mountain smallholders, and rarely investigate external actors such as college student teams that mitigate multilayer digital gaps in hilly villages[3]

2.2.4 Theory of consumption values

The theory of consumption values (TCV) was brought up by Sheth et al to explicate a basic question in the marketing area of how customers choose among different products or services[4], posits that consumer choice is jointly driven by functional, social, emotional, epistemic and conditional values. In livestream commerce contexts, self-gratification value has been further introduced as an additional antecedent of purchase intention. Empirical findings indicate that functional, social, emotional, conditional and self-gratification values significantly predict consumers’ buying willingness, whereas epistemic value exerts no prominent effect. Viewers’ purchase intention for a certain product will always be triggered by a special discount offered, regardless of whether the discounts or coupons are given by a popular streamer or not[4]. This theory provides a micro-foundation for interpreting the market dimension of the four-dimensional driving framework, especially how livestream content shapes consumer perceived value of mountain agricultural products.

2.2.5 Stimulus-organism-response model

The Stimulus-Organism-Response (S-O-R) model explains consumer behaviour as a sequential process in which external stimuli shape internal organismic states and further generate behavioural responses. In livestream e-commerce, their personalized communication and dynamic performance enhance both perceived entertainment and social presence, rendering the live-streaming experience more engaging and immersive[4] as external stimuli; consumers’ perceived entertainment, social presence as well as cognitive and emotional trust serve as organismic mediators; and purchase intention constitutes the final response[4]. Grounded-theory studies further reveal that consumer viewing purposes (purchase-oriented versus entertainment-oriented) moderate the above mechanism. The S-O-R model complements the talent dimension of the four-dimensional framework by clarifying how student agricultural-assistance teams as micro-streamers stimulate consumer trust and buying behaviour.

2.3 Literature Review and Research Gap

This section reviews existing empirical research related to livestreaming e-commerce and rural industrial integration, grounded on the theoretical lenses elaborated in Section 2.2, including

industrial convergence theory, platform economy theory, digital divide theory, consumption-value theory and the S-O-R framework. Relevant studies are sorted into three dimensions: agricultural product circulation, digital rural empowerment, and youth participant practice.

2.3.1 Live-streaming e-commerce and agricultural product circulation

Early studies defined live streaming as a supplementary sales channel for traditional agriculture, focusing on its de-intermediation effect to lower circulation costs. Recent research shifted to value chain perspective, pointing out that live streaming forces unified quality standards, packaging upgrading and full-link after-sales system construction for agricultural products. Consensus has been reached that live streaming has evolved from a sales tool to a catalyst of industrial organizational change, yet existing literature lacks systematic empirical research on its linkage effect of agritourism and cultural industry integration.

Drawing on the Stimulus-Organism-Response and consumption-value theoretical frameworks, existing international studies further unpack consumer behavioural logic behind agricultural live-stream shopping. Sensory, affective and functional characteristics of streamers, interactive atmosphere as well as scene immersion jointly shape consumers' cognitive and emotional trust, which further mediate purchase intention[5,6] Empirical evidence demonstrates that functional, social, emotional, conditional and self-gratification values serve as significant predictors of buying willingness, while epistemic value exerts no prominent effect. Streamer popularity can strengthen most value-purchase relationships, yet it has little influence on conditional value driven by discounts[4]. From signal theory, multi-dimensional information transmitted via live-stream helps alleviate information asymmetry in agricultural product transactions, and streamer professionalism serves as an important boundary condition; high streamer expertise can effectively convert consumers' positive cognitive perceptions generated by information stimuli into real purchasing behaviours[7].

2.3.2 Digital empowerment and rural revitalization

Two conflicting academic perspectives have long dominated relevant discussions on digital rural development: technological determinism emphasizes the direct income-boosting effect

brought by digital infrastructure, while social constructivism holds that actual empowerment outcomes are highly contingent upon local social networks, institutional context and agency of local stakeholders. Existing literature frequently falls into this binary opposition, with insufficient meso-level integrated frameworks to interpret the mutual shaping process between digital technology and rural social settings. Quantitative cross-city evidence indicates that digitalization can effectively boost rural industry benefits with obvious regional heterogeneity. The empowering effect is more remarkable for regions rich in natural landscape resources than culture-oriented rural areas, which implies that differentiated digital marketing strategies should be formulated according to local resource endowments[8]. Rural e-commerce can cut intermediate circulation links, foster local agricultural brands and create local jobs, but In many rural areas, limited internet coverage and slow network speeds severely restrict the potential of e-commerce. Additionally, an imperfect logistics system also constrains e-commerce development, especially in remote areas where efficient logistics services are hard to achieve, increasing operational costs for e-commerce. Secondly, there is a general lack of e-commerce talent in rural areas. Although e-commerce offers new employment and entrepreneurial opportunities for rural residents, many lack the necessary e-commerce knowledge and skills due to limited educational resources[3]. County-level practical investigations also point out common bottlenecks including farmers' agricultural products suffer from crude packaging design and insufficient brand building, resulting in low additional economic value of local characteristic agricultural products. In addition, local sales channels are relatively single, and the operation risk will rise when relying excessively on a certain online sales channel. and cooperative organisations are regarded as an effective approach through the unified production standard, unified packaging and unified brand operation mode, the homogenized agricultural products can be differentiated to enhance the market competitiveness of local specialties[9].

2.3.3 College youth participation in rural live-streaming e-commerce

Young college students are recognized as key actors of rural digital transformation, with unique advantages including digital operation skills and local identity recognition. Scholars have summarized light-weight operation modes such

as “village live studio + cooperative” and “university team stationed incubation”. However, existing research mostly relies on individual case description, without systematic analysis of how college student teams embed industrial integration and interact with traditional farmers. From the perspective of influencer marketing, micro-influencers represented by university student assistance teams rely on authentic, grounded content output rather than huge commercial traffic. Their local embedded identity helps reduce audiences’ perceived persuasion bias and build consumer trust toward agricultural commodities[10]. Streamers’ multi-faceted support including emotional, informational and service-related support can boost multi-dimensional user engagement, which constitutes a vital driving force for constructing regional agricultural brand equity in rural live-stream scenarios[11].

2.4 Summary of Literature Gaps

Three critical deficiencies exist in current research:

Superficial mechanism analysis: Most literature only describes the income growth phenomenon brought by live streaming, without detailed deconstruction of micro driving paths such as data feedback adjusting agricultural production and platform rules reshaping industrial division of labor;

Ignored regional heterogeneity: Studies mostly adopt national macro data or plain agricultural zone cases, lacking localized empirical research targeting mountainous hilly southern Anhui with scattered smallholders and abundant cultural resources;

Missing multi-subject interaction analysis: Insufficient discussion on coordination and conflicts among platforms, governments, enterprises, farmers and college student teams, especially the endogenous driving role of student teams in industrial integration.

Based on the above gaps, this paper takes southern Anhui mountain villages as research samples, constructs a four-dimensional driving framework of live-streaming empowerment, and focuses on the micro role of university student teams to make up for theoretical and practical deficiencies of existing research.

3. Methodology

3.1 Sample Selection

This study selects typical agricultural villages in southern Anhui, Anqing City, including Zhenjiang Village (crisp persimmon, strawberry, morel mushroom), Tapan Township (camellia oil industrial park), Juwang Village (free-range chicken breeding), Wanghe Town (trichosanthes kirilowii seeds) and Hexi Village (local soil eggs). These samples cover diverse agricultural operation subjects: individual growers, breeding cooperatives and rural e-commerce entrepreneurs, with differentiated industrial scales and digital development levels, ensuring representativeness of mountain rural live-streaming practice.

All first-hand sales data originate from the agricultural assistance team of Anqing Normal University, covering the operation period from October 2024 to February 2025 (5 months in total). Core transaction data are extracted from the “AQ Yicheng Youpin” Douyin store, accumulating 63 valid orders (15 orders in Nov 2024, 18 in Dec 2024, 20 in Jan 2025, 10 in Feb 2025). Supplementary sales data of crisp persimmons (over 300 kg sold via WeChat Mall) are also collected, yet specific order numbers of WeChat Mall are not fully recorded. Field interview samples include village cadres, cooperative directors, elderly farmers, live-streaming team members and local government commerce department staff.

3.2 Research Methods

Mixed research methods combining qualitative exploratory case analysis and quantitative descriptive statistics are adopted, without econometric regression or significance test due to limited sample size:

1. Field investigation & participatory observation: Researchers participated in live streaming operation, village visits and supply chain optimization throughout the research cycle to record real operation obstacles and optimization effects;
2. In-depth semi-structured interview: Standard interview outlines were designed for different interviewee groups, all interviews were audio-recorded and transcribed into text data for thematic coding analysis;
3. Comparative case analysis: Horizontal comparison of operation modes, product structures and industrial integration levels of Zhenjiang Village, Tapan Township and Juwang Village to summarize differentiated development paths;
4. Descriptive statistical analysis: Sort out

monthly transaction volume, sales revenue and customer unit price of Douyin store to identify seasonal sales characteristics and structural defects of product portfolios.

3.3 Data Sources

3.3.1 Primary data

1. Platform operation data: Backend transaction records of Douyin store and WeChat Mall from Oct 2024 – Feb 2025, including monthly order quantity, total sales revenue, customer unit price and category sales proportion;

2. Qualitative field data: Transcripts of in-depth interviews, live streaming operation logs, supply chain transformation records and communication minutes between student teams and village cooperatives.

3.3.2 Secondary data

Official macro statistical data released by Ministry of Agriculture and Rural Affairs, Ministry of Commerce, Anhui Provincial Department of Commerce and CNNIC from 2020 to 2024; industrial research reports from iResearch and other third-party consulting institutions; peer-reviewed academic literature on live-streaming e-commerce and rural industrial integration. All macro industry indicators are clearly marked with citation sources to avoid confusing external literature data with this study's empirical findings.

3.4 Theoretical Framework

Two analytical frameworks are constructed based on industrial convergence theory and platform economy theory.

First, the four-dimensional driving circulation system, as shown in Figure 1, consists of four interrelated dimensions—technological empowerment, market dynamics, policy support, and talent injection—that collectively drive rural industrial integration through iterative feedback loops (see Figure 1). Technological empowerment generates two mediating paths: supply chain integration and brand value-adding, which together determine rural industrial integration depth (dependent variable). Industrial operation feedback reversely optimizes the whole technological empowerment model, creating a closed-loop system.

Second, the multi-subject collaborative industrial integration system is presented in Figure 2. Policy environment provides institutional supply, acting on three parallel paths: market expansion, livestreaming platform digital-technology

empowerment and brand building (see Figure 2). The three paths jointly drive rural industrial system covering production, processing and circulation, and trigger three endogenous operation mechanisms: industrial chain integration, talent cultivation and real-time feedback adjustment, realizing continuous iterative optimization of rural industries.

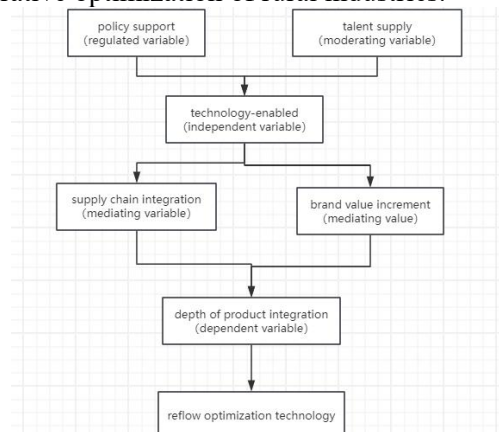


Figure 1. Analysis Framework of Four-Dimensional Driving System

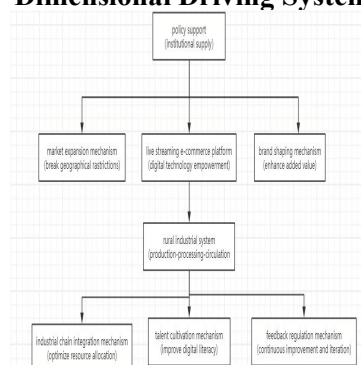


Figure 2. “Four-Dimensional Driving” Theoretical Model; Live Streaming E-commerce Empowering Rural Industrial Integration

4. Descriptive Analysis of Sales Data & Field Cases

4.1 Development Status of Live-streaming E-commerce in Southern Anhui

From 2020 to 2024, rural e-commerce sales in Anhui Province grew from 45.82 billion yuan to 84.76 billion yuan with an average annual growth rate of 16.8%, among which southern Anhui region accounted for over 35% of provincial total volume. Significant regional heterogeneity exists in mountain villages: demonstration villages with university-local collaboration formed standardized live-streaming operation modes, while remote scattered villages remain stuck in

single offline sales channels.

First-hand operation data of the student team show prominent seasonal imbalance of online sales: Crisp persimmons of Zhenjiang Village sold over 300 kg within one month during harvest season, while off-season orders dropped sharply. Douyin store transaction data present huge fluctuation of customer unit prices: January 2025 reached 110.44 yuan per order, yet February 2025 fell to only 26.64 yuan per order, a nearly four-fold gap caused by seasonal change of high-value agricultural products and adjusted consumer purchasing preference.

4.2 Typical Village Practice Case Analysis

4.2.1 Zhenjiang village: “product + digital platform + service” integrated mode

As a municipal agricultural e-commerce demonstration village, Zhenjiang Village cooperated with Anqing Normal University student teams to build dual sales channels of WeChat Mall and Douyin store starting from October 2024. Facing low market recognition and relatively high pricing of local crisp persimmons, the team adopted targeted origin live streaming and short video preheating marketing, achieving sales of over 300kg within one month. Relying on digital channel advantages, the village expands product layout to high-value crops including strawberries and morel mushrooms, transforming single fresh fruit sales into diversified integrated

agricultural industry operation.

4.2.2 Tafan township: “university-local collaboration + e-commerce industrial park + talent cultivation” mode

Since September 2023, Tafan Township has established long-term collaborative relations with the College of Life Sciences, Anqing Normal University. Professional teachers and student live-streaming teams provide on-site guidance for the township e-commerce industrial park, supporting standardized online sales of camellia oil and other characteristic local products. The cooperation mode achieves dual gains of market expansion and local digital talent incubation, forming replicable university-local linkage experience applicable to mountain townships.

4.2.3 Other village supplementary modes

Juwang Village, Wanghe Town and Hexi Village formed differentiated supporting systems in product packaging, regional brand shaping and logistics channel construction around breeding and planting industries such as free-range chicken, trichosanthes kirilowii seeds and local soil eggs, enriching the diversified path of live-streaming empowering mountain rural industrial digital transformation.

4.3 Descriptive Statistical Analysis of Sales Data

Table 1. “AQ Yicheng Premium”Core Store Operation Indicators(2024.11-2025.02)

Number of transaction	Sales (yuan)	Average- Order Value(yuan)	Main- proportion
15	1698.3	110.02	Farm eggs45%, trichosanthes kirilowii seed30%, else25%
18	1945.8	105.26	High- selenium rice38%, trichosanthes kirilowii seed28%, local specialty19%, else15%
20	2253.9	110.44	High- selenium rice42%, Farm eggs26%, trichosanthes kirilowii seed18%, else14%
10	266.44	26.64	eggs20%, else15%

Data Sources: based on“AQYicheng Premium”Collate Backend Data of Douyin Shop

Macro secondary data show that national agricultural live-streaming retail volume maintained steady growth from 2019 to 2023.As reported in Table 1, this study’s first-hand data further verify two prominent characteristics of mountain rural live-streaming sales:

1. Obvious seasonal volatility of transaction scale: Monthly orders fluctuate between 10 and 20, with high-value seasonal agricultural products driving peak sales in January, while off-season sales shrink drastically in February;

2. Large structural gap of customer unit prices: Peak season customers tend to purchase gift-oriented high-value agricultural products,

supporting high unit prices, while off-season sales rely on low-unit-price daily necessities, resulting in sharp decline of single-order revenue. All monthly operation periods maintained positive revenue, proving the basic profitability of student-team-led rural live-streaming mode. However, seasonal imbalance of product portfolios leads to unstable monthly operating income, becoming the core bottleneck restricting sustainable industrial integration.

4.4 Practical Obstacles & Reflection

All obstacles recorded below are real operation problems encountered by the student team,

analyzed to enhance the objectivity and pertinence of research conclusions:

1. Cold-start traffic dilemma: The first crisp persimmon live streaming only attracted less than 50 online viewers with merely 3 closed deals, caused by inappropriate live broadcast time (2-3 p.m., target consumers at work), insufficient pre-promotion and crude live streaming venue layout. After adjusting broadcast time to 8-9 p.m. and launching 3-day WeChat preheating before live streaming, the second live stream attracted over 300 viewers and completed 32 orders;

2. Non-standardized product & supply chain risks: Initial free-range chicken packaging without cold chain protection brought a 20% logistics damage rate. The team optimized packaging with foam boxes, ice bags and oxygen-filled bags, cutting damage rate below 5%, and built a full-process quality control system including pre-delivery photo filing and 24-hour after-sales response after arrival. Batch difference of tea products in Tapan Township also triggered consumer doubts, which was solved by cooperatives' unified grading and sorting standards;

3. Trust barriers with elderly farmers: Senior villagers held negative attitudes towards online sales, doubting student teams would withdraw after short-term practice. The team eliminated mistrust via joint household visits with village cadres, beneficiary farmers' on-site sharing and trial sales before formal signing. A three-level pricing mechanism of "farmer supply price + platform commission + team operation fee" was formulated to guarantee farmers' minimum income.

5. Theoretical Interpretation & Case Verification of Four-Dimensional Driving Mechanisms

5.1 Technological Driving Mechanism: Digital Platform Construction & Intelligent Supply Chain Integration

Drawing on the analytical frameworks illustrated in Figure 1 and Figure 2, this section interprets and empirically verifies the four-dimensional collaborative driving mechanism.

Digital infrastructure and platform operation technology form the basic driving force of rural industrial integration. CNNIC data show China's rural internet penetration reached 66.3% by June 2024, laying a hardware foundation for rural live-streaming development. Digital platforms break time-space restrictions of traditional agricultural

sales via real-time audio-video interaction, while big data algorithms achieve precise matching of characteristic agricultural products and target consumers.

Field Evidence from Southern Anhui Cases

The Anqing Normal University student team built multi-channel digital sales terminals including Douyin store and WeChat Mall for Zhenjiang Village. Full digital management was achieved throughout the whole supply chain process of crisp persimmons from picking to delivery. Supported by platform algorithm traffic recommendation, over 300 kg of low-recognition crisp persimmons were sold within one month, verifying the sales promotion effect of technological empowerment. For supply chain technical optimization, three-layer cold chain packaging reduced fresh product damage rate of Juwang Village free-range chicken from 20% to below 5%, which is the direct supply chain improvement result observed in this study rather than external literature data.

Note: The indicator that live streaming reduces agricultural circulation cost by 30%-45% comes from other university-local collaboration cases cited in existing literature, not empirical data of this research.

5.2 Market Driving Mechanism: Consumption Upgrading & Agricultural Brand Value Creation

Consumption upgrading drives market demand for high-quality, traceable origin agricultural products, forming endogenous market power of live-streaming industrial integration. National agricultural online retail data show consumers are increasingly willing to pay premium prices for agricultural products with transparent production processes. Live streaming achieves real-time origin display and interactive communication, building consumer brand trust and realizing product value appreciation.

Field Evidence from Southern Anhui Cases

Zhenjiang Village crisp persimmons were sold at a 25% premium compared with offline traditional channels via live streaming origin introduction, proving consumers' willingness to pay premium for traceable high-quality agricultural products under consumption upgrading. Huge customer unit price gap between January and February 2025 of the Douyin store fully reflects the decisive role of brand positioning and seasonal product portfolio on consumer purchasing behavior. Tapan Township camellia oil, Hexi

Village soil eggs and other regional agricultural products completed standardized packaging and origin brand shaping via live streaming platforms, realizing transformation from bulk raw material sales to branded high-value product operation.

*Note: The data of citrus damage rate dropping from 35% to 8% in Xiangshan, Zhejiang and homestay occupancy rate rising 60% in Hanyuan, Sichuan are quoted from external literature, not field observation results of this study.

5.3 Policy Driving Mechanism: Institutional Support & Optimized Resource Allocation

Local government industrial support policies and university talent training policies constitute institutional guarantee for live-streaming e-commerce development. Anhui Province issued serial supporting documents for rural e-commerce demonstration projects, investing special funds in rural network and logistics infrastructure construction. Government-university collaborative policy lowers market entry threshold for farmers and standardizes agricultural product quality certification systems.

Field Evidence from Southern Anhui Cases

Anqing Municipal Bureau of Commerce and Bureau of Culture and Tourism provided policy and venue support for the student agricultural assistance team's live-streaming practice. Tapan Township e-commerce industrial park, funded by government industrial support funds, provides free live broadcast venues and logistics storage services for village agricultural producers. Anqing Normal University incorporated live-streaming e-commerce courses into talent training plans under local education policy guidance, realizing organic integration of policy resources, university technology and village industrial demand.

5.4 Talent Driving Mechanism: College Student Innovation & Digital Skill Incubation

University student teams act as core innovative actors bridging digital technology and mountain rural industries, bringing professional live broadcast operation, content creation and brand marketing capabilities lacking among local farmers. Student practice simultaneously achieves rural industrial talent input and university practical education integration.

Field Evidence from Southern Anhui Cases

The Anqing Normal University team designed interactive origin live broadcast scripts and short video marketing plans for multiple southern

Anhui villages, completing stable sales of crisp persimmons, trichosanthes kirilowii seeds and soil eggs. Long-term cooperative relations were signed with Tapan Township, Juwang Village and other subjects to build a city-wide live-streaming agricultural service network. Meanwhile, the team summarized practical operation experience to feed back university curriculum reform, forming a sustainable two-way talent cultivation cycle of "university training – rural practice – curriculum optimization". The unique value of student teams in content innovation and trust construction with consumers becomes the core differentiated feature of this research compared with general rural live-streaming studies.

6. Optimization Strategies & Policy Implications

6.1 In-depth Optimization Strategy of Rural Industrial Integration

Aiming at seasonal sales imbalance, insufficient supply-chain resilience and low brand premium observed in southern Anhui mountain villages, this paper revisits industrial and marketing optimization under the 4P marketing framework, incorporating product portfolio theory, value-based pricing, omnichannel retail and micro-influencer content-marketing theories to interpret practical mechanisms behind each strategy.

Product Strategy: Product Portfolio Theory and Seasonal Demand Management Drawing on product portfolio theory and seasonal demand management, mountain rural e-commerce should construct a layered seasonal product portfolio rather than merely assembling agricultural goods. According to product portfolio theory, a balanced product matrix includes traffic-driving items, profit-generating items and supplementary derivative items to diversify revenue sources and offset cyclical market risks. Under seasonal demand management logic, high-unit-price seasonal gift-oriented agricultural products (crisp persimmons, camellia oil) act as traffic-driving products, which attract consumer attention and activate place-based brand equity during harvest peaks. Meanwhile, high-frequency, low-unit-price daily staples (soil eggs, selenium-rich rice) serve as stable profit-generating baseline products that maintain basic sales volume in off-seasons when seasonal specialties are unavailable. This portfolio configuration weakens over-reliance on short

harvest windows and smooths drastic seasonal revenue fluctuations. Additionally, operators should develop cultural-creative derivative packages embedded with local intangible-cultural-heritage elements to lift overall product premium rate. Expanding the cultivation cycle of high-margin crops such as strawberries and morel mushrooms further extends the availability window of high-value portfolio components.

Price Strategy: Value-based Pricing and Third-degree Price Discrimination Beyond simple tiered pricing schedules, rural live-streaming scenarios can adopt value-based pricing, where prices are determined by consumers' perceived value instead of pure production cost. As demonstrated in Section 5.2, origin live-streaming builds consumer trust via transparent production narratives and place-based brand equity, which creates perceived value surplus and supports product premium above offline market prices. Meanwhile, third-degree price discrimination can be implemented by dividing consumers into segmented groups: bulk wholesale prices for cooperative corporate purchasers, premium gift-set retail prices for live-stream public-domain consumers pursuing origin experience, and economical small-sized daily packs targeting repeat-purchase private-domain customers. Differentiated price menus capture heterogeneous consumer perceived value across groups, stabilize monthly operating revenue and maximize overall project returns.

Place (Channel) Strategy: Omnichannel Strategy Integrating Public-domain and Private-domain Traffic From the perspective of omnichannel retail strategy[12], mountain agricultural operators should break isolated channel operation and realize synergy between Douyin public-domain live-streaming and WeChat private-domain mall. The public-domain Douyin platform undertakes customer acquisition tasks: algorithm exposure brings new unfamiliar consumers and disseminates origin-brand storytelling content. The WeChat private-domain mall functions as the retention and repurchase hub, storing converted customers, delivering follow-up product updates and providing convenient repeat-purchase entries. Omnichannel logic emphasizes seamless data and user flow across channels: consumer preference information collected from Douyin live rooms can guide private-domain push content, while

high-satisfaction private-domain buyers may generate word-of-mouth and feed new traffic back to public-domain live broadcasts. Complementarily, cooperatives should popularize standardized cold-chain packaging systems to reduce logistics damage rates for fresh mountain agricultural products and guarantee service quality across all sales touchpoints within the omnichannel system.

Promotion Strategy: Content Marketing and Micro-influencer Marketing for Student-led Live-stream Teams Student agricultural-assistance teams function as micro-influencers in rural live-stream ecosystems[13]. Distinct from commercial celebrity influencers pursuing high traffic volume, these student micro-influencers rely on content marketing: they produce authentic origin short-video materials, record farmers' daily production processes and deliver place-based brand narratives rather than highly commercialized performance content. Under micro-influencer marketing theory, their relatively small follower scale, local-embedded identity and non-profit-oriented assistance positioning help lower audience perceived persuasion bias and facilitate consumer trust building. Operationally, teams should formulate pre-heating short-video content plans, fix prime-time broadcasting slots (8-9 p.m.), and launch immersive origin-live-stream experience activities. Authentic content output strengthens affective consumer bonds, improves user stickiness and raises repurchase intention.

Core industrial integration target: Build an integrated digital industrial chain covering "planting-breeding – intensive processing – standardized packaging – live-streaming marketing – regional brand operation", eliminating the segmentation between traditional agricultural production and digital sales links in mountain villages.

6.2 Managerial Implications

Drawing on the field evidence and sales data from southern Anhui mountain villages, this section delivers targeted managerial implications for three key micro-level stakeholders: cooperative marketing managers, university student-led agricultural assistance program operators, and live-streaming platform operators.

6.2.1 Implications for village cooperative marketing managers

For rural cooperatives operating under limited

budgets, costly commercial branding is often infeasible. Instead, low-cost brand storytelling can be adopted to build consumer trust without heavy capital investment. First, cooperatives can leverage free origin-based content materials: record short daily clips of planting, harvesting, and manual processing conducted by local elderly farmers, and integrate local folk customs, mountain ecological features and product growth cycles into short-video scripts. Authentic on-site footage captured by mobile phones substitutes high-cost professional shooting. Second, implement scenario-driven narrative design: anchor brand stories around real local farmers rather than virtual IPs. Cooperatives may invite producing farmers to make periodic guest appearances in live-stream rooms to share planting experience, which strengthens the traceability perception of mountain-sourced agricultural goods. Third, embed cultural elements of mountain villages into product packaging and live-stream speech scripts. Simple printed labels with hand-written-style farmer signatures and origin anecdotes help deliver brand connotation with minimal additional costs. This low-cost brand storytelling strategy helps mountain smallholders achieve brand value increment even under tight financial constraints.

6.2.2 Implications for university agricultural-assistance program operators

One core practical bottleneck observed in this study is personnel turnover among student teams, which threatens the continuity of rural live-streaming projects. To resolve inter-generational inheritance challenges, program operators should develop a standardized live-streaming operation SOP (Standard Operating Procedure) manual. The SOP manual should cover modular components: pre-live preparation (pre-heating short-video planning, time-slot selection, product grouping and checking), on-live execution (origin-oriented speech templates, emergency handling for logistics and product quality complaints), and post-live workflows (order statistics, consumer comment sorting, supply-chain feedback to cooperatives). Beyond operational checklists, the manual should also include accumulated local case materials: proven brand-storytelling scripts for regional agricultural products, historical sales fluctuation data, and typical risk-response cases from past live-stream practices. New student members can receive role-based training based on this documented SOP before taking over

live-stream work. Knowledge no longer relies solely on informal oral experience passed between senior and junior students. The codified manual mitigates project discontinuity caused by student graduation and personnel rotation, realizing sustainable inter-generational inheritance of university-local collaborative live-streaming projects.

6.2.3 Implications for live-streaming platform operators

Small-scale agricultural live-streaming rooms run by mountain cooperatives and student assistance teams face inherent disadvantages in traffic competition against commercial influencers. Platforms can optimize algorithm mechanisms to support micro-agricultural live-streaming rooms. First, introduce weighted traffic bias for origin-verified micro-agricultural accounts: assign extra algorithm exposure weight for accounts that complete real-production-site verification for mountain characteristic agricultural products, lowering the threshold to obtain initial cold-start traffic without high commercial promotion expenditure. Second, build dedicated content tags for mountain smallholder live-streams. The algorithm can match these tags with consumer groups with clear preference for ecological, origin-sourced farm produce, improving supply-demand matching efficiency rather than purely prioritizing high-revenue high-volume rooms. Third, launch lightweight auxiliary toolkits tailored for micro agricultural practitioners: built-in templates for agricultural product introduction, risk-warning prompts for fresh-product logistics, and low-cost after-sales process guidance embedded within platform backend. These measures reduce operational barriers and help micro agricultural live-streaming rooms acquire stable, targeted user flow.

7. Research Limitations & Future Research Directions

7.1 Sample Limitations

1. Regional representativeness restriction: Research samples are limited to mountainous hilly villages in southern Anhui, with scattered smallholder operation and weak logistics foundation. The four-dimensional driving framework and optimization strategies summarized in this paper may not be fully applicable to plain large-scale agricultural zones or coastal developed rural areas, requiring cross-

regional comparative verification in follow-up research;

2. Short observation cycle: First-hand data only cover 5 months from October 2024 to February 2025, belonging to short-cycle observation. Long-term cumulative effects of live streaming on regional brand value growth, stable income growth of farmers and vertical extension of industrial chains cannot be fully captured, requiring multi-year continuous tracking research;

3. Small sample size of transaction data: Only 63 valid orders are collected from the Douyin store, without complete order statistics of WeChat Mall crisp persimmons. The limited sample cannot support quantitative econometric analysis or statistical significance testing, restricting the generalization of research conclusions.

7.2 Methodological Limitations

This paper adopts exploratory case analysis and descriptive statistics only, without large-sample econometric models such as DID or PSM to quantitatively test the net effect and interaction of four driving mechanisms. Restricted by field survey conditions, interview sample quantity and multi-platform transaction data collection are insufficient, making it hard to control confounding variables and accurately identify causal relationships between live-streaming operation and industrial integration performance.

7.3 Future Research Outlook

1. Cross-regional comparative research: Select plain grain-producing areas and coastal suburban rural areas as control groups, compare differentiated live-streaming industrial integration paths under different resource endowments, and summarize region-adaptive replicable operation modes;

2. Quantitative causal effect identification: Collect large-scale panel data of farmer households and adopt causal inference measurement methods to quantify the net impact of live-streaming participation on farmers' income, local employment and industrial added value, providing more precise empirical basis for policy formulation;

3. Emerging digital technology frontier research: Explore the empowerment mechanism of AI digital human live streaming on reducing rural live broadcast operation costs and extending live streaming duration; study development obstacles and paths of cross-border live streaming for characteristic mountain agricultural products,

expand the theoretical boundary of digital live streaming empowering rural industrial integration.

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