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Beauty Empowers Agriculture: A Study on the Industrial Integration and Farmers-Assisting Mechanism of Rainbow Pepper Lipstick

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Abstract: Taking the Rainbow Pepper Lipstick project as a case study, this research explores how the cross-border integration of "Beauty+Agriculture" empowers rural revitalization. Against the backdrop of policy support, consumption upgrading, and agricultural transformation, the project has constructed a full-chain integration model of "agricultural resources – beauty products – market consumption". Through the "enterprise + cooperative + farmer" collaborative model, rainbow peppers are processed into high-value-added lipsticks, realizing an approximate 320-fold increase in the value of agricultural products and effectively driving income growth, employment expansion, and industrial upgrading. This study enriches the practical application of industrial integration theory in the interdisciplinary field of agriculture and beauty, and provides replicable paths for the high-value transformation of agricultural products. It also points out that the project faces challenges such as market competition, supply chain fluctuations, and high technological costs, which need to be addressed through differentiated competition, standardized management, and industry-university-research cooperation. In the future, this model can be extended to more agricultural products, and the endogenous driving force of rural industries can be continuously enhanced through market diversification and benefit-sharing mechanisms.

1. Introduction

In an era where the digital economy and the rural revitalization strategy are in sync and resonate, agricultural transformation and the upgrading of beauty consumption have formed a historic convergence. The Central Government's No. 1 Document has consistently emphasized the "shift of agriculture from a production-increase orientation to a quality-oriented one" and encouraged the conversion of agricultural products into high-value-added commodities through fiscal subsidies, tax reductions and exemptions, and support for scientific and technological R&D. Meanwhile, the global cosmetics market is experiencing the upsurge of the "natural, green, and safe" trend. iResearch's "2025 China Cosmetics Trend White Paper" indicates that 72% of consumers regard "plant-based ingredients" as the primary consideration when purchasing color cosmetics. As the largest single item in color cosmetics, the demand for natural pigment substitution in lipsticks has witnessed explosive

growth. However, traditional agriculture has long been mired in the low-value-added predicament of "primary products – low-price sales – meager profits". Featured fruits and vegetables such as rainbow peppers, due to their concentrated production areas and strong seasonality, are highly susceptible to unsalable situations caused by overproduction or market fluctuations, leading to extremely unstable farmers' income. The intersection of policy incentives, market opportunities, and industrial pain points has created a historic window for the cross-border integration of "Agriculture × Beauty": on the one hand, the beauty industry is in urgent need of stable, safe, and story-telling natural pigment raw materials; on the other hand, agriculture requires high-premium, sustainable, and brand-oriented downstream channels. Against this backdrop, cross-border exploration driven by the dual wheels of "pastoral aesthetics + beauty technology" is opening up new paths for the upgrading of the agricultural product value chain and the revitalization of rural industries.

2. Current Situation and Problem Analysis of the Cross-Border Integration of "Agriculture + Beauty"

2.1. Limited Room for Improving the Added Value of Agricultural Products

Featured fruits and vegetables such as rainbow peppers are mostly produced in hilly areas such as Yunnan, Guangxi, and Sichuan. Affected by factors such as concentrated harvesting periods and large transportation radii, traditional sales mainly rely on wholesale markets and fresh food e-commerce platforms, resulting in narrow bargaining space. According to data from the National Agricultural Product Business Information Public Service Platform of the Ministry of Agriculture and Rural Affairs, the field purchase price of rainbow peppers has remained in the range of 10–20 yuan per kilogram in the past three years, and even dropped below 8 yuan in bumper harvest years, which is much lower than the daily average wage of local laborers. Low profits have trapped farmers in the dilemma of "increasing production without increasing income". Once substitutes appear on the urban consumer side or logistics are blocked, unsalable and vegetable-destroying phenomena are likely to occur, with weak risk resistance capacity. At the same time, such featured fruits and vegetables with both ornamental and edible value are rich in natural pigments such as anthocyanins and capsanthin, and have high-value potential. However, due to the lack of deep processing channels, they can only passively accept market price suppression as "primary raw materials", and the agricultural value chain has long remained in the short-chain link of "planting – transportation – wholesale".

2.2. Fragile Supply Chain of Natural Pigment Raw Materials

Compared with synthetic pigments, plant pigments are more susceptible to natural factors such as light, temperature, and soil pH, leading to significant seasonal fluctuations in output and color value, as well as notable quality differences between different batches of raw materials from the same plot. Currently, the cultivation of rainbow peppers is mainly dominated by scattered family operations, lacking unified post-harvest processing standards. Mechanical damage during transportation can cause pigment oxidation, further amplifying quality fluctuations. For beauty brands, the unstable supply of raw materials (intermittent availability and inconsistent quality) forces enterprises to increase safety stock, resulting in simultaneous rises in capital occupation costs and raw material scrapping risks, which directly places natural lipsticks in the awkward situation of being "acclaimed but not commercially successful". Meanwhile, plant pigments are time-sensitive. The existing four-level circulation chain of "farmland – agent – wholesale market – factory" is lengthy, and each additional link will magnify the loss of color value. Additionally, the high inventory strategy adopted by brands to ensure supply is prone to forming a reverse cycle of "inventory – scrapping – price suppression" due to deviations in sales forecasts. Ultimately, all natural and market risks are passed

on to the planting end, resulting in severely insufficient supply chain resilience.

2.3. Insufficient Maturity of Natural Color Cosmetics Technology

Plant pigments generally have photosensitive, thermosensitive, and pH-sensitive characteristics, and are prone to fading after light exposure. However, lipsticks need to withstand multiple tests such as saliva, friction, and high temperatures, making color locking extremely challenging. The current industry-standard solutions of using synthetic color bases or titanium dioxide as primers conflict with the claim of "100% natural"[1]. If microencapsulation and other encapsulation technologies are adopted, it will increase equipment investment and switching costs. In addition, customized small-batch production has strict requirements for formula accuracy. Changing production lines in traditional production requires processes such as solvent cleaning and equipment verification, which incur high time and energy consumption costs. This makes it difficult to simultaneously achieve the three goals of "natural + personalized + cost-controllable", and natural lipsticks have been unable to break through the niche market.

2.4. Lack of Collaborative Mechanism for Industrial Integration

The agricultural end, processing end, and beauty end act independently, resulting in obvious dislocation in discourse systems: the agricultural context focuses on per mu yield and purchase price, while the beauty context emphasizes color value and stability, lacking universal communication indicators. Farmers have no knowledge of core requirements such as "color value" and "heavy metal indicators", cooperatives cannot convert beauty standards into planting norms, and brands can only "rush to purchase goods during the season" due to the lack of a sound quality control system, leading to frequent breakpoints in the entire chain of "raw materials – R&D – products – market". At the same time, the core demands of the three parties differ: brands pursue maximum profits, cooperatives pursue maximum scale, and farmers pursue stable income. Moreover, there is a lack of contractual designs such as cross-shareholding and profit redistribution, as well as shared databases and third-party arbitration mechanisms. The cooperative relationship only remains at the level of short-term spot transactions, making it difficult to form a sustainable supply ecosystem.

2.5. Superficial and Short-Term Farmer-Assisting Models

Currently, most cross-border projects adopt a blood-transfusion-based "procurement + donation" approach: brands purchase raw materials at a price slightly higher than the market, then donate part of the profits to the village collective, and withdraw from the cooperation after completing corporate social responsibility (CSR) indicators. Farmers can only obtain one-time premiums in the planting stage and are unable to share high-value-added benefits from downstream links such as processing, branding, and distribution. Once the brand's sales fall short of expectations, the minimum purchase guarantee often becomes an empty promise. Meanwhile, the assessment of relevant projects mostly focuses on "how many households are driven and how much per capita income increases in the current year", ignoring long-term investments such as skill training, standard promotion, and brand co-construction, resulting in poor sustainability of "linking and driving farmers". The deeper contradiction lies in that farmers lack a voice in downstream decision-making of the industrial chain, being unable to participate in formula formulation, pricing negotiations, and profit distribution. The farmer-assisting mechanism has always remained at the level of "external blood transfusion", lacking the "endogenous blood-making capacity", and is prone to collapse in the face of market fluctuations.

2.6. Blank in User Education: The Perceptual Gap That "Natural Equals Safe but Not Effective"

Consumers have extremely low awareness that peppers can be used on the lips and naturally hold doubts about the color retention power and safety of plant pigments. Existing promotions mostly emphasize "additive-free and edible" but avoid core experience issues such as easy fading and unsaturated color development, making it difficult to break the stereotype that "natural equals safe but ineffective". [2] For rainbow pepper lipsticks to enter the mainstream market, it is necessary to transform pastoral stories into technical narratives, prove the high color development and stability of natural pigments through visual content, and provide low-threshold participation methods such as customized samples and interactive experiences. Otherwise, it will be difficult to shake the immediacy advantage of ready-made lipsticks, and consumers' willingness to customize will always remain in the wait-and-see phase.

3. Countermeasures and Suggestions

3.1. Construct a Discourse Exchange System and Connect Broken Nodes of the Value Chain

To address the issue of value chain disconnection caused by the dislocation of discourse systems between agriculture and the beauty industry, a collaborative bridge should be built with unified standards as the link. Promote beauty brands, cooperatives, and farmers to jointly formulate the Classification Standards for Natural Pigment Raw Materials of Rainbow Peppers, converting core demands of the beauty industry such as "color value", "heavy metal content", and "pesticide residue indicators" into actionable planting, harvesting, and preliminary processing operational norms for farmers. The standards shall clarify the ripeness, harvesting time, and storage conditions of rainbow peppers corresponding to different color value grades [5]. Meanwhile, the three parties have established a communication platform, regularly organizing technical training and demand matching meetings to enable farmers to understand the specific market requirements for raw materials and help brand owners grasp the actual situation at the planting end. The three parties jointly establish a universal industry evaluation language for rainbow peppers similar to the sugar content of mangoes, to realize the value of high-quality raw materials and promote the extension of the agricultural value chain from the short chain of "planting - transportation - wholesale" to the long chain of "planting - processing - brand - market".

3.2. Optimize Supply Chain Layout and Enhance Industrial Risk Resistance Capacity

To solve the problems of fragile supply chains, risk terminalization, and inventory paradox, a dual-pronged approach combining digital tools and contractual mechanisms is required. On the one hand, we shall build a cold chain logistics network for direct connection between production areas and factories, reduce the four-level circulation chain of "farmland – agent – wholesale market – factory", co-establish production area preprocessing centers in major rainbow pepper producing areas, equip them with refrigeration, sorting, and preliminary processing equipment to realize immediate processing after harvesting, and minimize color value loss [3]. On the other hand, we shall establish long-term procurement agreements featuring "minimum protective price + market premium sharing". Brands dynamically adjust procurement volumes according to production plans to avoid capital occupation and scrapping risks caused by blind stockpiling [5]. Meanwhile, we shall set up a supply chain risk fund, with contributions from brands, cooperatives, and farmers in proportion, to respond to emergencies such as natural disasters and market fluctuations. This will spread the risks scattered at the planting end across the entire chain and strengthen supply chain resilience.

3.3. Strengthen Technological R&D and Innovation to Break Through Development Bottlenecks of Natural Color Cosmetics

To address the insufficient maturity of natural color cosmetics technology, it is necessary to construct an industry-university-research collaborative innovation system to achieve the three goals of "natural, personalized, and cost-controllable". We shall cooperate with scientific research institutions to focus on tackling key technologies for plant pigment stabilization, learn from advanced industry experience to develop natural color locking technologies suitable for rainbow pepper pigments [4], improve the color retention capacity of lipsticks without adding synthetic color bases, and solve the problems of photosensitivity and thermosensitivity. Meanwhile, we shall introduce flexible production equipment and intelligent formula systems, optimize production processes, and reduce line change costs for small-batch customization. We shall realize efficient production of multi-color and small-batch orders [3] through precision batching and rapid equipment cleaning technologies. In addition, we shall encourage beauty enterprises to set up some R&D and test bases in production areas, train farmers to participate in technical operations in the preliminary raw material processing link, promote the transfer of technological achievements to the field, and improve the stability of raw material quality.

3.4. Improve Organizational Collaboration Mechanisms and Fill the Contractual Vacuum

To address the issues of lacking collaborative mechanisms for industrial integration and weak organizational coordination, it is imperative to establish an industrial community featuring "benefit sharing and risk bearing". An interest linkage model should be constructed, with long-term mechanisms such as cross-shareholding and profit redistribution established. Farmers are encouraged to invest in cooperatives with rural land management rights and labor force, and the cooperatives then conduct equity cooperation with beauty brands. This enables farmers to not only gain income from the planting link but also share high-value-added profits from processing, branding, distribution and other downstream links [5]. Meanwhile, a shared data platform should be built to record real-time data throughout the entire process of rainbow pepper planting, harvesting, processing, and testing, clarifying the rights and obligations of all parties regarding raw material standards, quality control requirements, and delivery times [4]. Third-party arbitration institutions should be introduced to formulate default determination and compensation standards. When quality disputes arise, fair rulings will be made based on data, promoting the transformation of cooperative relationships from short-term spot transactions to long-term collaborative partnerships characterized by co-establishing standards, sharing premiums, and jointly bearing risks.

3.5. Deepen the Reform of Farmer-Assisting Models to Achieve Endogenous Capacity Building

To tackle the superficial and short-term problems of farmer-assisting models, it is necessary to promote the transformation of the farmer-assisting mechanism from "external blood transfusion" to "endogenous capacity building". The blood-transfusion-based farmer assistance model of "procurement + donation" should be upgraded to a capacity-building-oriented one of "skill training + standard promotion + brand co-construction" [4]. Beauty brands and cooperatives jointly carry out skill training on planting technology, preliminary raw material processing, and quality testing to improve farmers' professional competence; the government adjusts the assessment indicators of farmer-assisting projects, increasing the weight of long-term development indicators such as skill training coverage, standard promotion area, and brand co-construction effectiveness. Meanwhile, farmers should be endowed with a voice in the downstream of the industrial chain, allowing farmer representatives to participate in product formula formulation, pricing negotiations, and profit

distribution. This enhances farmers' sense of ownership and improves the sustainability of the farmer-assisting mechanism.

3.6. Strengthen User Education and Guidance to Reshape Consumer Perception

To break consumers' cognitive misunderstandings about natural color cosmetics, a dual-drive user education system of "pastoral stories + technical narratives" should be constructed. We shall utilize new media formats such as short videos and live streams to showcase the entire process of rainbow pepper planting, pigment extraction, stability testing, and blind test comparison. We shall prove the high color development and stability of natural pigments through visual content, and bridge the perceptual gap that "natural equals safe but not effective" [3]. We shall launch low-threshold experience activities, provide customized samples of lipstick colors, and carry out "pastoral color DIY" interactive activities to reduce consumers' decision-making costs; we shall cooperate with beauty bloggers and agricultural experts to conduct popular science live streams, answering consumers' core questions about safety and color retention. Meanwhile, we shall integrate farmer-assisting stories into brand marketing, highlight the social responsibility attribute of products, attract consumer groups that value environmental protection and public welfare, promote natural color cosmetics from niche to mainstream markets, and provide market support for the cross-border integration of "Agriculture + Beauty".

4. Conclusion

Against the backdrop of the intersection of the digital economy and the rural revitalization strategy, this study focuses on characteristic agricultural products and explores the path to realize the leapfrog development of the value chain through cross-border integration with the beauty industry. The study systematically analyzes the historic opportunities brought by the convergence of policies, markets, and industrial pain points, conducts an in-depth analysis of the core issues in the current practice of "Agriculture + Beauty" integration, and finally proposes systematic countermeasures. By conducting an in-depth analysis of the typical case of rainbow pepper lipstick, this study reveals the structural challenges faced by the current industrial integration, such as the dislocation of discourse systems, fragile supply chains, prominent technical bottlenecks, lack of organizational collaboration, and insufficient market awareness. These challenges indicate that the real difficulty of cross-border integration lies not in the proposal of the concept, but in how to establish a systematic solution that can break through industrial barriers and achieve value symbiosis and sustainable circulation. To this end, we propose and demonstrate a systematic path based on standard mutual recognition, driven by technological innovation, centered on mechanism innovation, and soul-centered on value co-creation, aiming to build a sustainable, scalable, resilient, and vibrant new "pastoral beauty" ecosystem. The cross-border integration of "Agriculture × Beauty" is not a simple splicing of industrial chains, but a systematic reconstruction from concepts, technologies to organizations and markets. Against the backdrop of the digital economy and rural revitalization resonating in harmony, this integration contains profound significance in addressing the low-value-added dilemma of agriculture, responding to the wave of consumption upgrading, and stimulating the endogenous momentum of rural areas.

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