Research on the Construction of the Full Industrial Chain for Ecological Agriculture in Sichuan Province

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Abstract: China has affirmed its commitment to prioritizing and strengthening the agricultural sector. It is poised to significantly boost agricultural efficiency, invigorate rural areas, and raise farmers' incomes by industry-integrated full industrial chain. Sichuan province must leverage its agricultural resources while addressing ecological constraints to establish a comprehensive ecological agriculture system. The level of conservation and utilization of agricultural resources in Sichuan continues to improve, as efforts to promote green development in agriculture are being carried out through pilot demonstrations. Sichuan aims to ensure coordinated development between agricultural economy, rural ecological sustainability, and social progress by cultivating new value-added industries. Promoting a dignified and competitive agriculture business can be accomplished through the full industrial chain development of ecological agriculture. Achieving this goal involves the institutionalization of value chain management within the agricultural framework. The effective coordination of various stakeholders plays a pivotal role in the successful establishment of an integrated agricultural value chain.

1. Introduction

The Chinese government has made it clear that we must firmly uphold and practice the concept that lucid waters and lush mountains are invaluable assets, and plan development from the perspective of harmonious coexistence between man and nature. Promoting the full industrial chain development of ecological agriculture is essential for implementing the CPC Central Committee's policies and advancing high-quality agricultural development. According to data from the Ministry of Agriculture and Rural Affairs' central network, Sichuan Province has seen Chengdu and Guangyuan cities recognized as National Agricultural Product Quality and Safety Cities. Meanwhile, counties and districts including Anzhou District of Mianyang, Cangxi County of Guangyuan, Xichong County of Nanchong, Linshui County of Guang 'an, Yuechi County of Guang' an, Dachuan District of Dazhou, Jingyang District of Deyang, Emeishan City of Leshan, Hongya County of Meishan, Huaying City of Guang 'an, Lixian County of Aba Tibetan and Qiang Autonomous Prefecture, Qu County of Dazhou, Shehong City of Suining, Tongjiang County of Bazhong, Xuanhan County of Dazhou, Cuiping District of Yibin, Yanting County of Mianyang, Jianyang City of Chengdu, and Mingshan District of Ya' an have been designated as National Agricultural Product Quality and Safety Counties.

Ecological agriculture is an integration of traditional, conservation-minded farming techniques with modern scientific advances that maximizes use of on-farm renewable resources instead of imported and nonrenewable resources, while earning a return that is large enough for the farmer to continue in an ecologically harmless, regenerative way. Ecological agricultural products of Sichuan Province include livestock breeding, premium grain and oil crops, and organic fruits and vegetables. Sichuan's agricultural development faces constraints from geographical limitations and supply-side factors. There is a nascent local market for ecological agricultural products in Sichuan. Some areas persist in using traditional pesticides, plastic mulch, and chemical fertilizers to chase high yields, resulting in environmental pollution and escalating negative impacts. It has become imperative for

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Sichuan to establish a comprehensive ecological agricultural value chain .

2. Theoretical Framework of the Full Industry Chain of Ecological Agriculture

An ecological agriculture that is regenerative, holistic and ethical; expressing bio-diverse landscapes with biologically enriched soils, that provide healthy food and create vibrant communities [1]. Ecological agriculture uses ecologically based pest controls and biological fertilizers derived largely from animal and plant wastes and nitrogen-fixing cover crops. Modern ecological agriculture was developed as a response to the environmental harm caused by the use of chemical pesticides and synthetic fertilizers in conventional agriculture, and it has numerous ecological benefits[2]. Developing a full industrial chain for ecological agriculture not only enhances the added value of eco-friendly agricultural products but also contributes to advancing ecological civilization. From the enterprise perspective, variations in the number of green enterprises and cooperative structures significantly impact supply capacity. Corporate capital conditions and workforce size determine operational scale, which in turn affects product availability. Compared with conventional agriculture, ecological agriculture uses fewer pesticides, reduces soil erosion, decreases nitrate leaching into groundwater and surface water, and recycles animal wastes back into the farm. These benefits are counterbalanced by higher product costs for consumers and generally lower yields [3]. The challenge for future ecological agriculture will be to maintain its environmental benefits, increase yields, and reduce prices while meeting the challenges of climate change and an increasing world population.

3. Development Blueprint of Sichuan's Specialty Agricultural Industry Chain and Challenges in Building Full Industrial Chain of Ecological Agriculture

3.1. Development Blueprint for Sichuan's Specialty Agricultural Industry Chain

Development Blueprint for Sichuan's Specialty Agricultural Industry Chains Sichuan Province's "100 Billion Yuan Advantageous Specialty Agricultural Industry Development Plan" focuses on key sectors including livestock, grain and oil crops, vegetables, fruits, tea, sericulture, aquaculture, forestry and bamboo, condiments, and food-drug co-production chains. The plan outlines 10 strategic roadmaps to strengthen and fill gaps in these agricultural value chains. For example, the tea industry will establish five specialized clusters: premium green tea in Southwest Sichuan, high-altitude ecological tea in Northeastern Sichuan, red gongfu black tea, jasmine tea in Central Sichuan, and high-quality black tea production zones in Western Sichuan. The fruit industry will develop five major specialty zones: late-ripening citrus in the basin, late-ripening mangoes in Panxi, citrons in Central Sichuan's hilly areas, premium kiwifruit in Longmen Mountain Range, and late-ripening lychee and longan in Southern Sichuan.Scale forms the foundation of Sichuan's ecological agriculture development, but more crucially, it requires deepening development by tapping into value-added opportunities through upstream and downstream industrial chains, particularly in advanced processing and brand building. Taking the ecological agriculture industry as an example, Sichuan will focus on three major advantageous silkworm regions—Panxi, Southern Sichuan, and Central-Northern Sichuan—continuously expanding four key industrial chains: seed industry support, high-quality cocoon production, premium silk processing, and comprehensive resource development.

3.2. Challenges in Building Full Industrial Chain of Ecological Agriculture in Sichuan Province

For decades, the public policies and big corporations that shape our food and agricultural system have pressed farmers to manage their land like food factories—places where inputs in the form of seed, fertilizer, pesticides, or animal feed are converted to outputs in the form of marketable food products. This model of agriculture is marked by practices such as monoculture (planting the same one or two crops over a large area year after year), raising crops and livestock in isolation from each other, and leaving farmland bare and vulnerable to erosion and nutrient loss between commercial

crops.The industrial model ignores a crucial fact: farms are ecosystems—complex, interdependent networks of living things. Farmers succeed by managing their ecosystems to produce food efficiently. But if we want that success to continue over the long term, we must also manage farm ecosystems sustainably, nurturing their resilience and self-regenerating capacity.

The main obstacles to ecological agricultural product supply stem from the following factors. First, in the production process, the high production cost of ecological agricultural products will lead to supply obstacles. At the same time, the production process of ecological agricultural products requires strict requirements, so the backward production technology of enterprises leads to supply obstacles of ecological agricultural products. Second, in the processing link, in the development of ecological agricultural products, enterprises do not fully develop the products in depth, and the low added value will lead to obstacles in the supply of ecological agricultural products. Third, in the circulation link, the weak awareness of quality and safety of enterprises will lead to obstacles in the supply of ecological agricultural products. Fourth, during the sales process, enterprises must address market access for ecological agricultural products. Underdeveloped markets and limited distribution channels create supply barriers. Consumer purchasing power constraints and insufficient awareness of ecological agricultural products further hinder supply. Inadequate brand management and maintenance also contribute to supply challenges. Currently, Sichuan's ecological agricultural products face low brand recognition, with promotional campaigns lacking long-term strategic planning. Fifth, for enterprises, government support, government subsidy and preferential policies are very important. If enterprises lack government policy support, the government subsidy to farmers is small and the preferential policies are not implemented properly, it will lead to obstacles in the supply of ecological agricultural products.

4. Exploring the Pathways in Building the Full Industrial Chain of Ecological Agriculture in Sichuan Province

4.1. The Logic and Key Points of Constructing the Full Industrial Chain of Ecological Agriculture

The competition of modern agricultural development is in essence the competition of industrial chain, and the integration of industrial chain should be taken as an important part of the supply-side structural reform of agriculture[4]. The development of three major types of agricultural industrial chain is gaining momentum. First, the processing chain is continuously strengthened; second, the service chain develops rapidly; third, the functional chain is booming vigorously. In addition, the integration mode of agricultural industrial chain is becoming diversified with various types such as professional market-driven type, farmer cooperative organization-driven type, leading enterprise plus cooperative bases plus farmer household type, industrial cluster-driven type and functional expansion type. The prominent problems existing in the development of Sichuan's agricultural industrial chain are as follows. First, the overall competitiveness is not strong: the overall processing chain is short, and the driving capacity is inadequate; the service chain development lags behind, and the upper-, middle- and lower-end chains are imbalanced; the development of functional chain has just made a start. Second, the organization and integration level of industrial chain is low, and the upper-end chain is dispersed. Third, the linkage and distribution mechanism of industrial chain is imperfect. Fourth, the system of policy support and factor support is not perfect. Overall, the dairy industrial chain's integration and the degree of market concentration is high with relatively strong competitiveness; the degree of pig and vegetable industrial chain's organization and integration is low with weak competitiveness; the food industrial chain's competitiveness is relatively weak.

4.2. The Key Path of Ecological Agriculture Chain Development

Policy options for enhancing the competitiveness of China's agricultural industrial chain are as follows. First, we need to promote the integration of different types of agricultural industrial chain with targeted measures. Second, we need to vigorously strengthen carrier construction, and actively

cultivate industrial chain clusters. Third, we need to positively forge the principal entity of the industry, and enhance the competitiveness of the leading enterprises. Forth, we need to enhance the level of integration of the industrial chain, and flesh out the interest binding mechanism. Fifth, we need to improve policies and service support system in the following aspects: (1) We need to construct industrial chain-based financial service chain. (2) We need to build industrial chain-based innovation chain. (3) We need to cultivate industrial chain-based multi-level talent team. (4) We need to improve the industrial chain-based financial support mechanism. (5) We need to strengthen the construction of industrial chain infrastructure.

5. Recommendations

5.1. Innovation Development of Sichuan's Ecological Agriculture Industry Chain

With a focus on reducing the use of chemical fertilizers and pesticides, comprehensive utilization of crop straw, resource utilization of livestock and poultry manure, and the reduction and recycling of plastic film, Sichuan has been consistently carrying out the protection and management of agricultural environments. Sichuan has adopted a proactive policy aimed at fostering collaboration between governmental and non-governmental partners. This collaboration is built upon the innovative concept of public-private community partnership (PPCP). Through PPCP, Sichuan aims to create a harmonious and mutually beneficial network that brings together diverse stakeholders to enhance the agricultural value chain and, in turn, uplift the entire agriculture sector. Sichuan establishes crucial prerequisites for fostering new economic growth drivers of ecological agriculture industry chain development. Cross-industry collaboration is encouraged to form an innovative, spiraling development pattern to amplify cluster effects. It enhances production quality, efficiency, and benefits across the full industry chain. Strong market demand, a uniquely favorable climate, quality-driven premium pricing, and standard enhancements are the core advantages that provide powerful support for the accelerated the full industry chain of Sichuan's agricultural sector. Enterprises are the primary implementers of technological innovation, facilitating precise alignment between scientific advancements and industrial demands.

5.2. Expanding and Efficiently Transforming Ecological Product Value

Sichuan's ecological agriculture focuses on sustainable development through building a complete industrial chain. In the future, enterprises of ecological agriculture are the key participants and proponents to facilitate green and sustainable development in China. Enterprises necessitate to explore sustained business models to reduce the continuous economic input in environmental remediation and operation, improve themselves in philosophy, technology, operation, management, services and evaluation, and create more social and economic benefits after achieving ecological benefits from agriculture industrial chain.

5.3. Eco-agricultural Product Brand Promotion

Brand promotion is vital for Sichuan agricultural products to explore the market and improve the quality and efficiency. Eco-agricultural products are goods produced to reduce harm to the environment. They're typically produced by using sustainable materials, ethical production methods, and processes that minimize waste, pollution, and carbon emissions. Eco-agricultural products must meet strict standards in China for how their producing process, packaging, delivery, use, and disposal affect the environment. These products often are certified by third-party organizations to verify their sustainability claims. Eco-agricultural products might feature items made with natural or organic ingredients, products sourced using fair trade practices, creative alternatives to animal ingredients, and food made from imperfect produce. Depending on where you sell, labeling requirements may differ. Eco-friendly is a umbrella term referring to a brand or agricultural product's minimal impact on humans, animals, and the planet. Producing and selling eco-agricultural products involves some upfront work to ensure they meet safety and labeling requirements unique to each region.

5.4. Build a Digital Ecological Agriculture Platform

In March 2023, Sichuan initiated the development of the Western Ecological Product Trading Platform, which is positioned as a comprehensive service platform. Its functions include brand certification of ecological products, supply and demand matchmaking of ecological rights and interests, and ecological green financial services. The platform is a new starting point for Sichuan to accelerate the transformation of ecological values into economic benefits. In December 2025, the Sichuan Agri-Trade Service Platform was officially inaugurated. The platform integrates full-chain data covering production, certification, logistics, finance, and legal services, providing enterprises with comprehensive "one-stop" trade facilitation. The platform aims to attract enterprises across the industry chain, establishing itself as the 'smart brain' and digital trade ecosystem driving agricultural products' expansion beyond Sichuan and into global markets. Sichuan are driving intelligent transformation of the ecological agriculture through comprehensive optimization of industrial chain development, market data analysis, and operational risk assessment. From farm to fork, there are many complexities in the food production supply chain but there have been growing pressures on producers to improve transparency and traceability, and support farmers – especially smallholders – to adopt more sustainable practices. The ambition of a traceability system for agricultural products is to establish a trusted and scalable method for gathering supplier data across the province, that allows global brands to engage with responsible suppliers to help expand their own sustainability and responsibility goals. This will assist with reducing emissions, biodiversity loss and environmental impact of supply chains, reduce unsustainable agricultural practices and land degradation through more effective monitoring and smart procurement contracts. The current methods of visibility of the supply chain are no longer enough to meet regulatory requirements and customer expectations. From farmers and agricultural traders needing certification audits and identifying sustainability risks within the supply chain, to governments looking to implement and monitor biodiversity strategies and make land use management easier and more effective. By transforming provincial supply chains, and working in greater collaboration, this will help to improve the economic, social, and physical environment by tracking environmental impacts of supply chains and identifying assets to build trust and transparency for monitoring and reporting.

6. Conclusion

The development of the full industry chain of ecological agricultural in Sichuan not only demonstrates the province's practical adaptation to ecological economy, but also vividly reflects agriculture's response to consumers' food safety demands through quality-driven and green development. To systematically advance this initiative, it is essential to leverage policy guidance, market forces, and industrial collaboration. By breaking down barriers in green agricultural supply chains and achieving full integration of all nodes and elements within the system, we can continuously refine the entire ecological agricultural industry chain.

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