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Sharing and Co-Creating Value: Innovation in Platform-Based Agricultural Service Models Driven by Service Demand Collaboration—A Case Study of the JN Life

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Abstract: Platform-based agricultural service models have increasingly become a primary approach to agricultural socialized services in China. This study investigates a service-demand-driven platform-based agricultural service model through the case of JN Life initiated by nine ecological farms. Based on the theory of value co-creation, it traces the development of the JN platform ecosystem across three phases: emergence, formation, and expansion. The study examines how farm members and key stakeholders of the JN platform actively collaborate throughout these phases, transitioning from value propositions to institutional arrangements, resource integration, and achieving value co-creation. This process is referred to as an endogenous (vs. exogenous) platform-based agricultural service model. The findings provide valuable insights into advancing the sustainable development of ecological farms and agricultural socialized services, as well as enhancing collaborative innovation in the platform ecosystem.

Keywords: agricultural socialized services; platform model; value co-creation; resource sharing

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1. Introduction

Smallholder farmers cultivate 75% of the world's farmland and produce 70% of the world's food, playing a key role in achieving the sustainable development goals [1]. In China, more than 98% of farmers operate on a small scale. They face challenges in effectively participating in the market, and socialized services are a critical solution. In recent years, China's agricultural socialized services have rapidly developed, numbering over 1.07 million in 2023 and serving more than 91 million farming households [1], with a focus on platform-based agricultural service models [2–4]. These models integrate and consolidate resources by providing physical marketplaces or virtual trading spaces, attracting stakeholders to participate and forming new economic ecosystems [5]. Compared to the traditional model where services are provided by a single supplier, the platform-based agricultural service model demonstrates several distinct advantages [3,5–7]. It connects a diverse range of service providers, enabling the formation of a comprehensive agricultural socialized service network that spans extensive geographical regions and covers the entire production process. In addition, this model attracts and matches service providers and recipients efficiently, significantly reducing transaction costs for both parties. Also, by leveraging the effects of network externalities, the platform ensures that users benefit from high-quality services at lower costs, thereby enhancing their overall utility. Platform-based agricultural service models are widely applied in the production process, particularly in

land transfer, where they help smallholder farmers access agricultural services provided by service companies or agents, such as agricultural machinery leasing and labor leasing. This helps address the high input burdens associated with large-scale land operations [8].

Although scholars have recognized the value of developing platform-based agricultural service model, most emphasize that such models require initiation or leadership by core service providers, including leading agricultural enterprises [2,9,10], key service entities [11–13], third-party platform enterprises [3,14], and cooperatives [15,16]. We refer to this approach as the "exogenous platform-based agricultural service model". This model is characterized by a core leader or leadership group with distinct advantages in areas such as technology, resources, managerial expertise, social reputation, and branding. These advantages enable the leaders to effectively mobilize the participation of various stakeholders [6,10,17], thereby integrating service resources to form the platform. As such, this represents a service-provider-driven platform model [18]. However, on such platforms, service demand entities function merely as passive recipients, leaving their resources and capabilities underutilized [19]. Taking third-party platform-based companies as an example, China has established mature ecological agricultural platforms such as "Wotu". This platform, led by an ecological enterprise, helps small ecological farms showcase and sell their products to a broader consumer base. This platform mainly provides consumer resources and offers little assistance with farm production and management; moreover, there is minimal direct communication among the farms.

In practice, each service demand entity holds its own resources and capabilities, which, if effectively connected and shared through the platform, could be fully leveraged, thereby further promoting the sustainable development of agriculture. Widjojo et al. [20] also emphasize the importance of enhancing the capacities of all participants within an ecosystem. Small-scale farms not only face sales challenges but also encounter difficulties in management and even psychological barriers. For example, individual farms struggle to meet the diverse needs of consumers, and many face isolation [21]. These issues require collaboration among multiple entities to find solutions. To distinguish it from the "exogenous platform-based agricultural service model", this study introduces the concept of the "endogenous platform-based agricultural service model". This model emphasizes that platform members, as service demand entities, are active participants who not only receive agricultural services but also provide services to other platform participants, making them value co-creators engaged in close cooperation.

Although previous studies have highlighted the need to move beyond the assumption that agricultural producers act solely as service demanders and have examined the practices where agricultural producers both receive outsourced services and provide services [22,23], these works have rarely focused on collaborative actions among service demand entities. Specifically, how cooperation among service demand entities emerges and how they drive the formation of platform ecosystems and value co-creation remain largely unexplored. Value co-creation theory emphasizes that value is not solely created and delivered by firms but is jointly created by firms and their key stakeholders, including customers (consumers), employees, and suppliers, to generate collective or shared value [24]. In this process, relevant stakeholders are typically attracted by a shared value proposition and establish common institutional arrangements to facilitate resource integration, thereby co-creating shared value [25].

Based on this, this study adopts the theory of value co-creation and conducts a longitudinal single-case study of JN Life (hereafter referred to as "JN") to explore the process and mechanisms through which the endogenous platform-based agricultural service model achieves value co-creation. This platform was jointly established by nine small-scale ecological farms (service demand entities), which connected and shared their resources while

integrating and leveraging external resources. This approach eventually attracted other service providers, forming an agricultural service platform ecosystem characterized by value co-creation. This paper focuses on how these small-scale service demand entities, without the leadership of a core enterprise, drive the construction of the platform ecosystem and achieve value co-creation, highlighting the differences between the endogenous and exogenous platform-based agricultural service models.

This study makes two main theoretical contributions. On the one hand, it introduces the new "endogenous platform-based agricultural service model", providing a fresh theoretical perspective for the development of agricultural socialized services. On the other hand, it expands the application of value co-creation theory in the agricultural field, offering new empirical evidence on how endogenous platform-based agricultural service models promote value co-creation. Exploring this question holds significant theoretical and practical implications for the innovative development of agricultural socialized services and the sustainable development of small-scale farmers. Further, this paper takes the small farmer group of ecological farms, which takes the organic concept as the main operating and production target, as the research object, aiming to provide reference models and paths for agricultural green production.

2. Theoretical Background

2.1. Concept, Components, and Characteristics of Platforms

A platform is a framework that connects individuals and organizations to achieve common goals or share resources [26]. It is less formal and hierarchical compared to a company, but it fosters closer connections than traditional market relationships [27]. Platforms operate as ecosystems, and their core components generally include four types of participants [28]: (1) platform owners: these entities control the platform's structure and rules, determining who can participate and how; (2) platform providers: they supply the interface between the platform and its users; (3) producers: these participants provide goods or services on the platform; (4) consumers: these users purchase goods or services from the platform. In the case of JN, which is an agricultural service platform established by nine cooperating farms, the member farms serve as platform owners, providers, producers, and consumers. Additionally, platform producers also include various agricultural service providers, such as agricultural product suppliers, logistics companies, and agri-tech enterprises.

For a long time, most businesses have adopted linear production or service models, where value is created and transferred in a unidirectional, sequential manner, with the starting point being the producer or service provider and the endpoint being the consumer. However, in platform-based models, various users—including producers, consumers, or those who play both roles—use the resources provided by the platform to connect and interact with each other. Through these interactions, they trade, consume, or co-create value. These activities do not follow a direct line from producer to consumer but instead occur in multiple places and through various means, creating, altering, trading, and consuming value, all facilitated by the connections enabled by the platform [26]. Based on existing literature, this study summarizes the characteristics of the platform model as follows: (1) effective connectivity: platforms connect numerous suppliers and consumers, improving communication efficiency [29,30]; (2) optimal utilization of idle resources: platforms can channel idle capacity into the market, transforming users originally identified as consumers into providers of products or services, thereby increasing supply and creating value [28]; (3) resource bridging: platforms attract and match suppliers with consumers, reducing transaction costs for both parties [7,29], and are even expected to replace traditional supply chains [31]; (4) network effects: each user on the platform benefits from the platform's

use by other users, enabling the platform to experience non-linear growth in utility and value [7,26]; (5) leveraging data tools to create community feedback loops: many platforms use technology to collect feedback on product or service providers, offering a review mechanism visible to all platform participants. Feedback from other consumers allows users to more effectively find products or services that meet their needs [28]. These characteristics can effectively alleviate common issues in the agricultural service market, such as high transaction costs for service acquisition, unreasonable service supply–demand structures, and the underutilization of some service resources [7]. They are also key factors driving the rise of platform-based agricultural service models.

In recent years, with the development of new technologies and industries, research on platforms has become increasingly widespread, including studies on sharing platforms [32,33], information and digital platforms [34–36], and B2B platforms [31]. Regarding agricultural service platforms, research has mainly focused on specific models of platform-based agricultural services [9,10], the impact on land scale and operations [8,37], and issues related to digitization and technology [4]. However, studies on the interactions among platform members are relatively limited, particularly concerning how value is co-created through these interactions.

2.2. Value Co-Creation in Platform Ecosystems

Value co-creation refers to the process through which value is collaboratively created by interacting with and integrating resources among stakeholders [38,39]. Value creation is based on the development of ecosystems, promoting the co-creation of value by all participants [36]. As previously discussed, platforms operate and exist in the form of ecosystems. Therefore, this study focuses on the processes and mechanisms of value co-creation within the JN platform ecosystem. In this context, value co-creation in platform ecosystems is defined as the process through which platform participants interact and integrate resources to jointly create value.

The existing literature has extensively explored how value co-creation can be achieved. For example, Vargo and Lusch [40,41] developed the classic service-dominant (S-D) logic in marketing, emphasizing that the core of this logic is the idea that customers become co-creators of value. This includes a series of processes, such as co-creation of value, procedures, tasks, mechanisms, activities, and interactions. Furthermore, Vargo and Lusch [25] argued that service ecosystems attract more stakeholders by offering value propositions, and through shared institutional arrangements, they facilitate resource integration and service exchanges to create collective value. Gong et al. [42] pointed out that value proposition is the prerequisite for value co-creation. Zhang et al. [43] proposed a model for the modern agricultural value co-creation process, structured as "social mobilization (willingness)—resource orchestration (action)—value co-creation (outcome)". Thus, value propositions, institutional arrangements, and resource integration are three key mechanisms for value co-creation in platform ecosystems. These mechanisms include the following:

First, value co-creation requires the establishment of a clear value proposition [44,45]. The value proposition is a statement of how the platform will benefit stakeholders and represents the core idea of the platform ecosystem. Its role is primarily reflected in two ways: (1) it attracts or invites stakeholders and actors to join and participate in value co-creation; (2) it serves to connect and maintain relationships among all participants. Without a clear or defined value proposition, participants in the ecosystem may become fragmented, unable to build consensus either in terms of behavior or cognition, resulting in a lack of cohesion. An excellent value proposition should create greater opportunities for co-creation and bring value to suppliers through revenue, profits, referrals, and other means [46].

Second, shared institutional arrangements provide a framework for participants to follow in the value co-creation process [47]. Once a clear value proposition is established and participants are attracted to join and engage in value co-creation activities, the platform must create a shared institutional framework to coordinate actions among participants, given their diverse values and cultural understandings. Institutional arrangements are defined as "a set of interconnected institutions within an ecosystem" [25]. They create order, reduce uncertainty, and establish stable expectations of others' behaviors, thus facilitating the coordination of value co-creation activities within the platform ecosystem. However, actors in the ecosystem may interpret or apply institutional arrangements differently, which can impact the effectiveness of their interactions [48].

Finally, resource integration can overcome the limitations of individual resources [20] and provide the momentum for value co-creation. In the ecosystem, participants offer specific resources to one another, while goods, raw materials, knowledge, or capabilities by themselves are not resources; they only become resources when their potential is fully realized [49]. Therefore, the integration of resources by platform participants is central to the value co-creation process within the ecosystem [48]. Actors interact and integrate their own resources with those of others, thus forming highly interdependent relationships [49,50].

In summary, this study establishes a research framework for value co-creation in platform ecosystems, structured as "Value Proposition → Institutional Arrangements → Resource Integration → Value Co-Creation" (see Figure 1). Specifically, the platform-driving entities propose the value proposition, attracting diverse participants to join and gradually form the platform ecosystem. These participants interact and integrate resources under shared institutional arrangements, leading to value co-creation. As participants join the platform and receive benefits, their recognition of the value proposition strengthens, which in turn encourages more relevant stakeholders outside the ecosystem to join. This process expands the platform ecosystem, ultimately forming a self-sustaining, growing cycle of value co-creation.

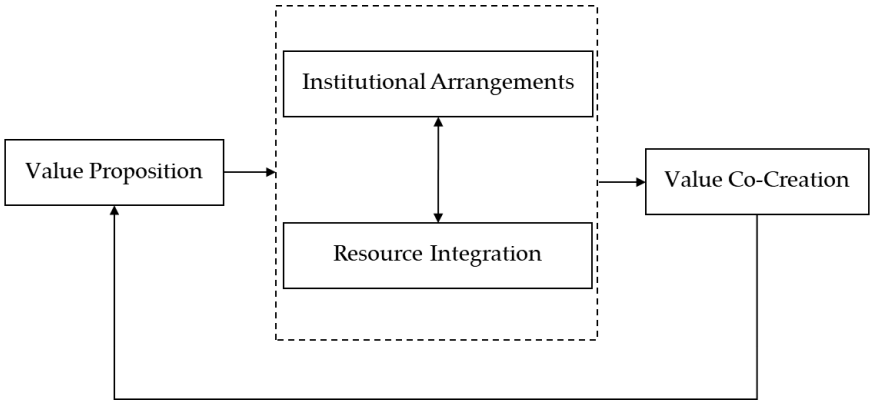

Figure 1. Research framework for value co-creation in platform ecosystems.

3. Research Methodology

3.1. Research Methodology Overview

This study adopts a longitudinal single-case study approach for several key reasons. First, the objective is to explore how service demand-side stakeholders collaborate to facilitate the formation of an agricultural service platform ecosystem and achieve value co-creation. Since this involves examining the "how" question, the case study methodology is particularly suited to address this inquiry [51]. Second, existing literature predominantly focuses on value co-creation in platform ecosystems led by core enterprises, with limited research on how collaborative efforts among platform participants drive value co-creation.

Given this gap, a case study approach is ideal for theory-building in underexplored areas [52]. Finally, this study focuses on the dynamic process of value co-creation within agricultural service platform ecosystems. A longitudinal approach provides detailed insights into how this process evolves over time [53], helping to uncover the various stages of ecosystem development and the mechanisms that drive its continuous transformation.

3.2. Case Selection and Overview

3.2.1. Case Selection

This study selects JN as the case for analysis based on its typicality, theoretical suitability, and data availability. First, JN was initially established as a platform-based agricultural service organization by nine loosely connected, struggling eco-farms. Through the integration of internal and external resources and service exchanges, JN has enabled value co-creation. This has allowed the participating farms to build confidence in ecological farming and overcome operational challenges, achieving sustainable profitability. As a result, JN has earned a strong reputation and high visibility within the eco-farmer community. Second, JN was self-organized by the farms and has continually attracted external stakeholders, including logistics companies, suppliers, distributors, agricultural technology firms, and peer farms, gradually evolving into a platform ecosystem where value is co-created among participants. Its evolutionary process also exhibits distinct phases, aligning well with the focus and context of this study. Third, the research team has maintained strong communication and ties with the founding members of JN, facilitating field interviews and case tracking. Since its inception, JN has created an official WeChat account that provides public access to information on member farm profiles, activities, key events, and insights, making relevant data readily available. In addition, JN's social media platforms, online stores, news reports, and conference presentations have accumulated a wealth of research material, all of which are easily accessible and ensure reliable data for the case study.

3.2.2. Case Overview

JN was established in June 2017 as an agricultural service enterprise jointly funded by nine eco-farms. Over the past five years, JN has adhered to the guiding principles of "ensuring that eco-farmers live with dignity, helping conscientious consumers make informed purchasing decisions, and ensuring the rational protection of resources and land". By aggregating and connecting member companies and resources both within and outside its ecosystem, JN has developed and formed a platform ecosystem that provides strategic planning, brand development, supply chain optimization, and channel expansion services to its member farms. This has ultimately resulted in a symbiotic and mutually beneficial ecosystem.

As shown in Table 1, by early 2021, the number of consumer members for farms joining JN had increased several-fold, and in some cases, by as much as ten times. The number of agricultural products sold grew five-fold to fifty-fold, with each farm establishing its flagship products and significantly increasing the proportion of external sales. Logistics costs per order dropped by two to nine CNY, leading to profitability for all members and an expansion in operational scale. Furthermore, JN has helped over 100 fellow farmers promote eco-friendly agricultural products, increasing sales by approximately CNY 18 million and providing healthy, safe ecological products to over 10,000 households.

Table 1. Changes in the operational status of each member farm after joining JN [1].

Farms	WJCY Farm [2]		LX Farm		HD Farm		HL Farm		XCYX Farm		FQ Farm	
Operational Changes	Before	After [3]	Before	After	Before	After	Before	After	Before	After	Before	After
Land Area (Acres)	30	290	40	40	20	100	30	50	30	60	20	20 + 2000 acre pasture
Number of Customers	2000	3600	100	1300	30	400	40	400	800	2400	150	1000
Number of Products Sold	100	500	10	500	10	300	10	500	60	500	20	500
Export Proportion [4]	3%	30%	0	80%	0	90%	3%	90%	10%	50%	0	40%
Annual Profit [5]	Marginal profit	Several hundred thousand CNY	Significant losses	Several hundred thousand CNY	Loss	CNY 100,000–150,000	Break-even	More than CNY 150,000	Marginal profit	CNY 500,000	Loss	Several hundred thousand CNY

Note: [1] Data Source: Own survey data. [2] Among the initial nine member farms, three exited the farming operation due to personal reasons around May 2018 and shifted to other industries. Therefore, this study only surveys the remaining six farms. [3] "Before" refers to the period before the establishment of JN, i.e., May 2017; "Now" refers to May 2021. [4] "Exports" refers to sales of agricultural products made to external platforms or channels in addition to meeting the farm's own customer demand. "Export proportion" is the sales revenue of exported products as a percentage of the total farm product sales revenue. [5] For annual profit, the farmers did not provide specific figures; thus, the number used here is based on the descriptions of farm operational conditions provided by the farmers during interviews.

3.3. Data Collection

This study utilized three data collection methods: semi-structured in-depth interviews, field observations, and secondary data. Interviews were the primary data source, while observations and secondary data served as supplementary sources to deepen the understanding of the research context and provide cross-validation. This approach enhanced the validity of the case study [51].

3.3.1. Semi-Structured In-Depth Interviews

The researchers conducted two rounds of interviews. The first round took place in October 2019 and primarily involved the leaders of the JN platform and the heads of its member farms. Among the original nine member farms, three had withdrawn from the operation before May 2018 for personal reasons. As a result, the focus of the interviews was on the managers of the remaining six farms: LX Farm, HL Farm, FQ Farm, XCYX, WJCY, and HD Farm. The second round of interviews was conducted in May 2021 and included not only the JN leaders and heads of the six farms interviewed in the first round but also newly joined consumer shareholders and 15 consumer members of the farms. In terms of participant selection, this study employs a single-case research design focusing on the value co-creation model of the JN. As a result, interviews were conducted with the heads of all farms on the platform. For consumer selection, one consumer shareholder and 15 regular consumers were chosen as supplementary data sources. Throughout the case study, the required analytical data reached saturation, indicating that the data collected was both solid and representative. Regarding the implementation of the survey, due to the impact of the pandemic, interviews were conducted through a combination of in-person, phone, and video calls. A detailed overview of the interview content and data collection methods is provided in Table 2.

Table 2. Detailed interview contents and data collection methods.

Interview Round	Interviewee	Duration	Method	Content
First Round of Interviews (October 2019–November 2019)	JN Leader	210 min	On-site visit to headquarters and semi-structured interview	Development history, philosophy and positioning of the platform, main activities, collaboration arrangements among member farms, platform management methods, how value co-creation is achieved, external partner recruitment, relationship cultivation, etc.
	LX Farm Leader	106 min	On-site visit to the farm and semi-structured interview	Basic farm information, motivation for joining JN, interaction with the platform and other member farms, changes in farm operations after joining JN, personal insights on JN, etc.
	HL Farm Leader	135 min		
	FQ Farm Leader	90 min		
	XCYX Leader	110 min		
	WJCY Leader	98 min		
	HD Farm Leader	117 min		
Second Round of Interviews (May 2021)	JN Leader	221 min	On-site visit to headquarters and semi-structured interview	Main activities conducted, changes in shareholder members, management system, partners and operational status, difficulties and solutions during development, etc.
	LX Farm Leader	186 min	On-site visit to the farm and semi-structured interview	Interaction with the platform and other member farms, recent changes in farm operations after joining JN, personal insights on JN, etc.
	HL Farm Leader	124 min		
	FQ Farm Leader	35 min	Video and semi-structured interview	
	XCYX Leader	30 min		
	WJCY Leader	40 min		
	HD Farm Leader	53 min		
	New Consumer Shareholders of JN	265 min	Face-to-face semi-structured interview	Motivation for joining JN, interaction with the platform and other member farms, etc.
	15 Consumers from LX, HL, HD Farms	320 min	Phone and WeChat video and semi-structured interview	Motivation for becoming farm members, experience of consuming farm products and services, perceptions and evaluations of JN, etc.

During the interviews, the researchers clearly explained the study's purpose and the data collection process to the respondents. With their consent, all interviews were recorded and transcribed into text. To ensure that no important interview content was overlooked and to guarantee the reliability of the interviews, each interview involved two to three researchers: one conducted the interview, while the others took notes and, when necessary, supplemented the questions. After each interview, the researchers immediately compared key facts and information. If any uncertainties arose, they followed up with the same respondent via WeChat or phone to verify and clarify the interview data.

The interview data relied primarily on retrospective reports from the respondents, which inherently carries some limitations. To enhance the accuracy of these reports, the study adopted several measures based on the approach of Plowman et al. [54]. First, the study used free recall rather than forced reporting, meaning that respondents were not required to answer questions they could not recall. Second, the same questions were posed to different respondents, allowing for cross-verification of individual reports.

3.3.2. Field Observations

The researchers conducted field visits to the JN Life Hall and multiple member farms alongside the founding members. During these visits, they took detailed notes on observations. The field observations not only provided relevant content for the research questions but also offered experiential insights into the interactions among the JN founding members, thereby deepening the researchers' understanding of the dynamics within the organization.

3.3.3. Secondary Data

The researchers collected all available secondary data related to JN. This included documents provided by JN, publicly accessible information from JN's official WeChat account, the founding members' social media, member farm online stores, and other digital platforms. Additionally, data from the founding members' speeches at meetings, news reports, and other relevant materials were also gathered. To ensure the reliability of secondary data, the author cross-verified data collected from various formal sources and validated it against the interview data to filter out valid information. Furthermore, in the data analysis, the study primarily relied on direct responses from interviewees as the main data source, while secondary data served as supplementary references to corroborate the interview findings.

3.4. Data Analysis

The study employed a text analysis method to analyze the collected data. First, the oral data from the interview recordings, emotional reactions, and contextual details were transcribed into text and integrated with the secondary data to form a comprehensive dataset. Next, preliminary concept identification was conducted, and the text was categorized through first-level coding. The researchers carefully read through the text, selecting content relevant to the study and defining initial concepts based on the themes and relationships within the data. During coding, the language used by the respondents was employed as much as possible to avoid over-interpretation. The next step was axial coding. In this phase, the researchers examined the first-level codes through the perspective of value co-creation theory, seeking deeper meanings within the initial categories. These were then grouped into second-level codes aligned with the theoretical framework. Finally, the second-level codes were further synthesized into theoretical dimensions to establish the final third-level codes: value propositions, resource integration, institutional arrangements, and value co-creation. The process of data analysis was not linear but iterative and cyclical, refining the understanding of the theoretical relationships as the study progressed [55]. The coding process was initially carried out independently by two authors. After completing the individual coding, the authors discussed and summarized the results, followed by a second round of independent coding. This process continued until the coding results showed minimal differences. Subsequently, colleagues who were not involved in the coding were consulted regarding the coding logic to ensure a more rigorous and reliable outcome. Through continuous interaction between the value co-creation theory and the JN case, the researchers gradually developed the "Three-Stage JN Platform Ecosystem Formation and Value Co-Creation Framework". The coding process is illustrated in Figure 2.

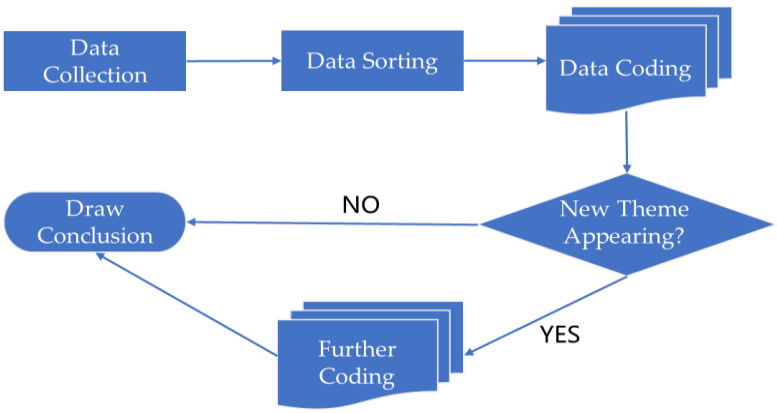

Figure 2. Data analysis process.

4. Results

Through analysis, this paper identifies three stages in the development of the JN platform ecosystem (see Figure 3). The first stage is the ecosystem's emergence phase, during which nine farms formed the value proposition of "collective strength" and collaboratively established the JN platform. The second one is the ecosystem's formation phase, where JN leveraged the connection and sharing of farm resources to mobilize external service resources, attracting logistics companies, agricultural technology firms, agricultural product suppliers, brand management teams, and other service providers. This gradually led to the development of a system in which all parties co-create value. The third stage is the ecosystem's expansion phase, during which JN began collaborating with external agricultural product distributors to explore new markets. This strategy enabled member farms to achieve sales growth even amid the pandemic. Additionally, JN attracted new investors, which facilitated the expansion of both the member farms and JN itself, thereby establishing a sustainable cycle of value co-creation and growth.

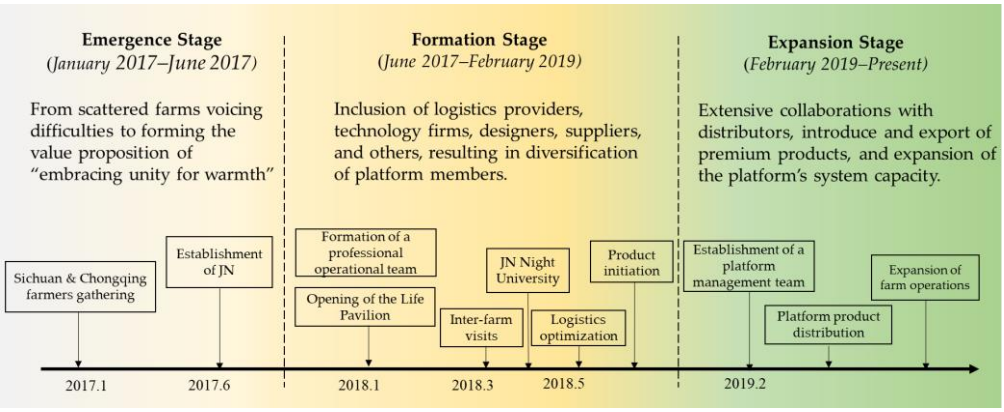

Figure 3. Key events and stages in the development of the JN platform ecosystem.

4.1. Emergence Stage of the JN Platform Ecosystem (January 2017–June 2017)

In this stage, the farms collectively developed the value proposition of "collective strength" to address operational challenges. Transitioning from independent operations to collaboration, they co-founded the JN platform and established essential institutional norms, including responsibility and rights structures for member farms, and product standards. The creation of the platform linked previously dispersed farm resources, enhancing the utilization and value of existing assets within the system. As a result, farm operators no longer worked in isolation. Instead, they coordinated their actions through a shared value proposition and appropriate institutional arrangements. As illustrated in Figure 4, prior to the establishment of JN, the farms in the system (F1, F2,. . . Fn) operated independently and interacted solely with their respective consumers (C1, C2,. . . Cn). However, after the formation of JN, the relationships among the farms underwent a fundamental transformation. Each farm established connections through the platform. They transitioned from operating as independent entities in competition to sharing resources and engaging in cooperative interactions, thereby becoming partners in value co-creation.

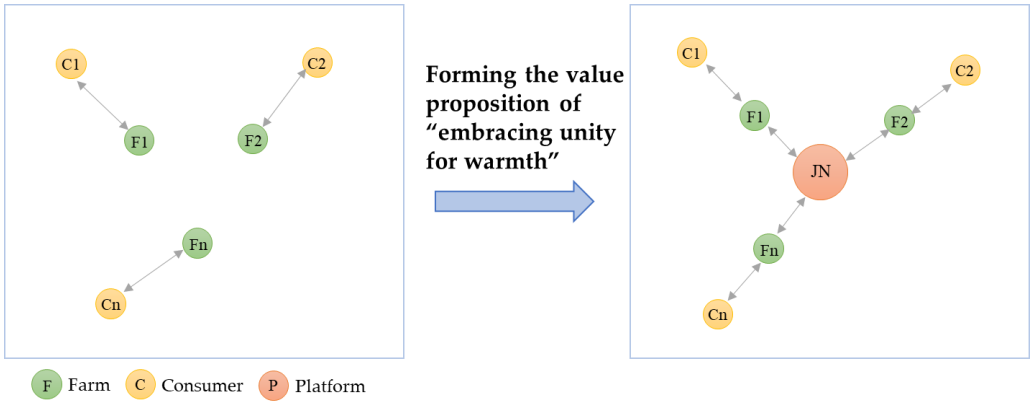

Figure 4. Structural changes of the JN platform ecosystem in the emergence stage.

4.1.1. Formulation of the "Collective Strength" Value Proposition

Before the establishment of JN, the farms operated independently and faced significant operational difficulties, particularly in production and sales. At the production level, the issues included (1) unclear positioning, with farm operators uncertain about the farm's development direction, the products to produce, and the quality standards for products; (2) insufficient human resources, as operators struggled to balance agricultural production, marketing, brand development, and customer management due to limitations in time, energy, and capacity; and (3) lack of expertise in ecological agriculture, with most operators having no prior experience in this field and learning on the job. At the sales level, the challenges included (1) limited product variety, which failed to meet diverse consumer demand; (2) insufficient sales channels, as the small scale and inconsistent product quality made it difficult to connect with external distributors; and (3) low product commercialization, characterized by simple packaging, lack of brand design, and inconsistent product quality. These issues led to poor operational performance, with seven out of the nine farms operating at a loss. Additionally, years of focusing solely on farming and limited interaction with the outside world eroded the operators' confidence in their agricultural ventures.

In January 2017, over twenty ecological farm owners from the Sichuan and Chongqing regions gathered, providing an opportunity for farm operators to exchange experiences and discuss ways to overcome their operational difficulties. As one of the founding members stated, "Through the interactions, everyone realized the challenges of practicing ecological agriculture, and the discussions often turned into sessions of sharing hardships". This meeting led to a shared understanding: the difficulties faced by ecological farms were systemic issues, not problems that could be solved by individual farms alone. This realization sparked the idea of farm collaboration as a collective approach to addressing these challenges. After several discussions, they reached a consensus to establish a "collective strength" value proposition, aiming to create an agricultural service platform that would foster resource interaction and help tackle both common and individual challenges.

4.1.2. Institutional Arrangements: Clarifying Shareholder Rights and Responsibilities and Establishing Platform Product Standards

Guided by the "collective strength" value proposition, the nine farms jointly invested to establish JN Life in June 2017. Simultaneously, to regulate interactions among the member farms, the platform established clear rights and responsibilities, which were primarily two-fold: (1) the "collective" principle, meaning the platform would connect the consumer demand of the farms without sharing their customer resources; in other words, the platform would not interfere with each farm's existing customer base; (2) the cooperative management approach, wherein the share price was set at CNY 30,000 per share, with no limit on the amount of investment. Investors were entitled to dividends

based on their shareholding, while decision-making followed a "different shares, one vote" structure, ensuring equal voting rights for all shareholders, regardless of the number of shares held.

Additionally, the platform established product quality standards and promotion principles. First, whether the products were provided by member farms or external suppliers, the platform required compliance with organic product standards. While organic certification was not mandatory, the platform implemented a participatory guarantee system (PGS), periodic consumer sampling, and random third-party inspections to ensure product quality. Second, the platform adopted a selective product promotion strategy. It prioritized recommending products from member farms but also compared offerings from both internal and external sources, selecting the best for promotion. This approach encouraged member farms to improve their technology and product quality. The product system thus became a shared framework for interaction among the platform's stakeholders, improving the consistency of the products and services offered by member farms. It also served as a guideline for integrating external resources and attracting new actors to the platform.

4.1.3. Resource Integration: Transforming "Individual Resources" into Platform "Shared Resources"

The value proposition not only connected the dispersed farms but, more importantly, linked the individual resources and capabilities of each member farm, transforming them into shared resources available to the entire platform. First, the platform integrated financial resources. JN was co-funded by the nine member farms with additional external capital to meet its initial operational funding needs. Second, the platform facilitated the connection between consumer demand and product resources. Importantly, linking consumer demand does not involve sharing customer bases; rather, it focuses on meeting consumer needs that individual farms are unable to satisfy. This approach benefits the farms by increasing the sales of their agricultural products while protecting their existing customer bases. For example, WJCY Farm, which specializes in vegetable home delivery, can introduce products from other member farms to its platform to meet the diverse needs of its customers. In this process, the other farms do not directly interact with WJCY's consumers but still benefit from the demand, while WJCY expands its product range and strengthens customer loyalty. Third, the platform connected human resources. Each farm operator brings years of experience in farm management and may possess specific expertise in areas such as production techniques, farm operations, or WeChat marketing. By integrating and sharing human resources, the platform leverages the collective knowledge and skills of the operators to provide strategic insights. Additionally, it addresses seasonal labor shortages by redistributing labor across farms, optimizing workforce allocation, and ensuring that farms are better equipped to handle peak-season labor demands.

4.1.4. Value Co-Creation: No Longer Alone on the Agricultural Journey

The result of value co-creation in this phase is reflected in the development of a comprehensive solution to the production and sales challenges faced by each farm. In other words, the establishment of JN provided a means for members to get "collective strength". This approach differs from the traditional division-of-labor method [29], which typically breaks down farm production and sales issues into isolated problems and seeks support from various external service providers. Instead, it emphasizes addressing both shared and individual challenges collectively, focusing on a "systematic problem-solving" approach [56].

The outcome of value co-creation is also evident in the emotional support provided to farm operators. With the establishment of JN, the farms no longer operated in isolation or within a relatively closed environment. Instead, they became interconnected through

the platform, collectively addressing the challenges and no longer navigating the path of ecological agriculture alone. As one founding member expressed, "I think the first benefit of having a platform is that my farm does not feel isolated anymore. I feel that if something comes up, there are people or teams who can help me solve it through discussion and collaboration".

4.2. Formation Stage of the JN Platform Ecosystem (June 2017–February 2019)

During this stage, member farms actively engaged in the platform's activities and management with enthusiasm, establishing institutionalized communication mechanisms. In terms of resource integration, the platform utilized the power of resource connections to mobilize external service resources. At the same time, through the platform's shared resource mechanism, the resources of member farms were optimized and reorganized, enhancing their production and sales capabilities. As shown in Figure 5, from the emergence phase to the formation phase of the JN platform ecosystem, the farms (F1, F2,. . ., Fn) not only interact and connect through the platform but also establish further interactions among themselves. In addition, various agricultural service entities—such as logistics companies, agricultural product suppliers, brand management teams, agricultural technology firms, and peer farms—were drawn to the platform by its value proposition. These stakeholders continuously participated in resource integration and service exchange processes, co-creating value and gradually forming a collaborative ecosystem on the platform.

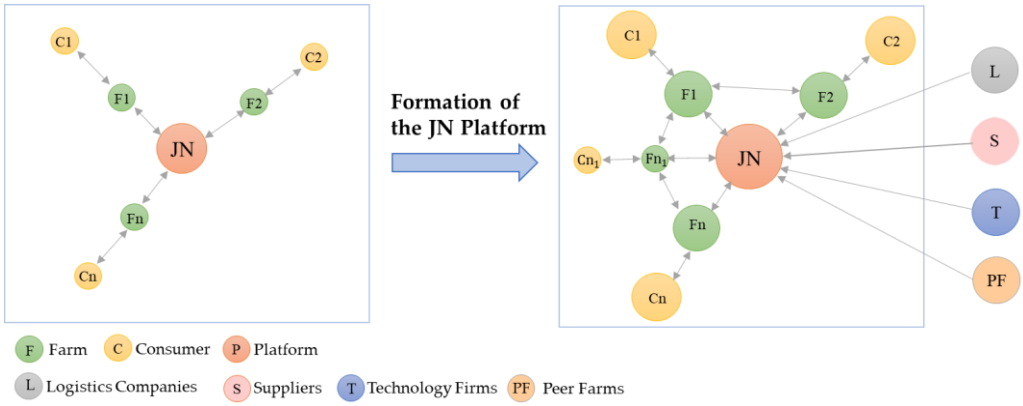

Figure 5. Structural changes to the JN platform ecosystem in the formation stage.

4.2.1. Institutional Arrangements: Collective Management and Establishment of Institutionalized Communication Mechanisms

After the establishment of the JN in June 2017, a collective management model was adopted to foster member participation and enthusiasm. Under this model, members took turns managing the JN Life Pavilion, which served as both a physical store and an office space for external display and communication. This arrangement facilitated smooth platform operations, with all decisions made collectively. While the co-management approach successfully encouraged member involvement, its limitations gradually became apparent. First, management efficiency was low. Differences in members' experiences, backgrounds, and perspectives often led to heated discussions, frequent disagreements, and constant changes in decisions. As one founding member recalled, "During our time at the Life Pavilion, we took turns managing, and everyone had the opportunity to voice their opinions. One day, one shareholder would suggest displaying the products in a certain way, and the next day, another would propose a different arrangement. The changes were constant, and the store manager didn't know how to handle it". Second, the time and effort required for platform management left members with little capacity to focus on their own farms' operations. In addition to their collective participation in platform

management, institutionalized communication mechanisms were established during this period. Three primary mechanisms were implemented: (1) Monthly JN Night University: With the motto "Cultivate Excellence, Humility Leads to Far-reaching Success". JN Night University held monthly sessions to address the practical needs of member farms. Expert trainers or industry peers were invited to lead these sessions, providing valuable insights and knowledge. (2) Monthly farm visits: Each month, one member farm, usually facing production challenges or requiring assistance, was selected for a visit. All shareholders would visit the farm for on-site discussions, facilitating problem diagnosis, experience sharing, and solution exploration. This mechanism also helped address labor shortages and strengthened interpersonal relationships among members. (3) WeChat group for communication and interaction: Two WeChat groups were created for JN shareholders, one for important notifications and another for casual interactions. These groups helped break down time and space barriers, enabling real-time communication and fostering stronger emotional connections among members.

4.2.2. Resource Integration: Adjusting Internal Resources and Leveraging External Resources

During the emergence stage, the platform initially connected the resources of individual farms. However, it was crucial to further deploy and organize these resources effectively to achieve a "1 + 1 > 2" effect. Case analysis showed that, after integrating the resources of the member farms, JN focused on optimizing internal resources and leveraging external service resources.

Adjusting internal resources involves the rational allocation and development of each member farm's capabilities. This process primarily focuses on three key areas: (1) Promoting complementary advantages among member farms. Through internal discussions and comparisons of strengths and weaknesses, each member farm identified its unique advantages and limitations. This allowed farms to define their niche, focus on developing core products, and abandon those products that were not suitable for their operations. For instance, after joining JN, HD Farm evaluated its product line and realized it was better suited to cultivating root vegetables like carrots and sweet potatoes. As a result, it concentrated on growing these crops, while other farms reduced or stopped cultivating them, minimizing competition and optimizing the collective resources on the platform. (2) Cultivating specialized products. JN identified and nurtured specialized products from member farms. Initially, each farm declared its key products for development, and the platform supported them in areas such as production technology, brand planning, and product promotion. This process, referred to as "Product Project Initiation", allowed the platform to play a vital role in helping farms develop and refine their specialized products. (3) Establishing a product system. JN formed a product team responsible for conducting Participatory Guarantee System (PGS) assessments and certifications for both member farm products and those from external suppliers. Products meeting the platform's quality standards were introduced and endorsed, with member farms responsible for distribution. This system contributed to the development of a unified product framework for the platform, ensuring neutrality and adherence to rigorous standards in product selection and promotion.

Leveraging external resources involves using the platform's collective resources to attract additional external resources, thereby expanding and enhancing the original resources. This strategy primarily includes three key aspects: (1) Introducing professional operational teams. To strengthen the brand and competitiveness of member farms' products, JN invested platform capital to bring in specialized operational teams in early 2018. These teams supported packaging design, product strategy development, and brand management for each member farm. Each farm was entitled to four free packaging designs, applicable for

various scenarios such as gift packages or household use, covering both fresh and processed products. (2) Optimizing the supply chain. First, the platform improved agricultural product logistics and distribution by aggregating order resources from its member farms, which enhanced its negotiating power with logistics companies. This enabled the platform to partner with Jitu Express and SF Express, securing high-quality and cost-effective logistics services for the farms. Second, it selected high-quality agricultural product suppliers by pooling the consumption demand resources from its member farms, attracting external suppliers. After evaluating and selecting suppliers, JN introduced external suppliers whose products met its standards, thereby expanding the product range available for sale across its member farms. (3) Attracting partnerships. JN actively sought external collaborations to broaden its resource network. For example, it formed a technical collaboration with an agricultural technology company in Chengdu and engaged in interactive exchanges and experience sharing with other agricultural peers.

4.2.3. Value Co-Creation: Enhanced Production and Sales Capabilities and Improved Business Confidence

The outcome of value co-creation in this phase is primarily reflected in the enhanced production and sales capabilities of the member farms. By integrating both internal and external resources, JN attracted a variety of stakeholders—including logistics companies, suppliers, professional operational teams, technology firms, and peer farms—into its ecosystem. These participants provided a comprehensive range of services, including production technology, supply chain optimization, brand development, and business planning. As a result, the production and sales capabilities of the member farms were significantly enhanced, as evidenced by the following:

(1) Development of best-selling flagship products. Through product project initiation and brand strategy planning, several flagship products emerged as best-sellers. These included LX Farm's "Lulala Chili Sauce", WJCY's "First Choice Rice" and "Creamy Pumpkin", HL Farm's "Golden Pre-served Eggs", XCYX's "Sausages", HD Farm's "Sweet Potato Vermicelli", and FQ Farm's "Yak Meat".

(2) Improvement of agricultural production techniques. For example, LX Farm enhanced its chili sauce production by experimenting with factors such as soil quality, chili varieties, harvesting time, ingredient combinations, fermentation processes, packaging designs, and transportation logistics. Similarly, FQ Farm initially faced challenges in producing quality grapes due to poor soil and farming techniques. After joining the platform, they improved their soil and farming methods through knowledge exchange and training, eventually producing premium grape varieties like "Sunshine Rose".

(3) Expansion of product range. By integrating external suppliers, the platform significantly expanded the product offerings available to each member farm. This not only enriched the range of products but also introduced a series of well-known "star products" to consumers. Examples include "Bananas sold out in 5 s", "A whole pig sold out in 12 s", "Fresh ginseng sold out in minutes", "70 acres of jelly oranges sold out overnight", "2600 pieces of small Zheng lychees consumed in 20 days", and "Tens of thousands of tomatoes sold annually".

(4) Significant reduction in logistics costs. As shown in Table 1, the logistics cost per order decreased by CNY 2–9. One founding member shared, "For example, shipping Xinjiang's red persimmons directly cost 78 RMB with only a 5-kg package. After optimizing the supply chain, we can now offer a 10-kg package specifically tailored for us. Through 'last-mile delivery', the 5-kg package now costs only 68 RMB, saving us 10 RMB per package. The key is that the 10-kg package is more cost-effective at 108 RMB".

(5) Increased consumer loyalty. Interviews with consumers revealed that 83% reported, "The farm has brought increasingly diverse product options, making it more convenient for

me". Nearly all consumers expressed that they had recommended the member farms to their friends and family.

The enhancement of production and sales capabilities directly translated into economic benefits for the farms. Research indicates that all member farms experienced substantial sales growth during this phase. For example, HD Farm's sales increased by 80%, while XCYX saw a 30% increase in sales. Moreover, with the platform's support, the farms gradually developed their flagship products, which helped clarify their market positioning. This, in turn, enabled farm operators to recognize their growth potential and strengthened their confidence in continuing ecological farming. As the head of HD Farm stated: "After joining JN, the farm is no longer directionless; we now have a clear plan. Our farm has refined its flagship products, and we see hope in continuing to pursue ecological farming".

4.3. Expansion Stage of the JN Platform Ecosystem (February 2019–Present)

In this stage, the inefficiencies associated with joint participation in platform management and the inability of shareholders to focus on farm operations led the platform to establish dedicated teams for daily operations and management. From the formation phase to the expansion phase of the JN platform ecosystem, new features in resource integration are shown in Figure 6. The platform leveraged external market resources, enabling member farms to begin selling their agricultural products externally. This introduced two new pathways: JN → Peer Farmer and JN → Agricultural products distributors. The significant increase in sales triggered the expansion of member farms' business scale, which in turn expanded the overall resource base of the platform system. This not only attracted more external service entities but also encouraged consumers (Cn) to invest as shareholders, further enhancing the value derived from resource utilization. As a result, the entire platform service system entered into a continuous growth cycle of value co-creation (see Figure 6).

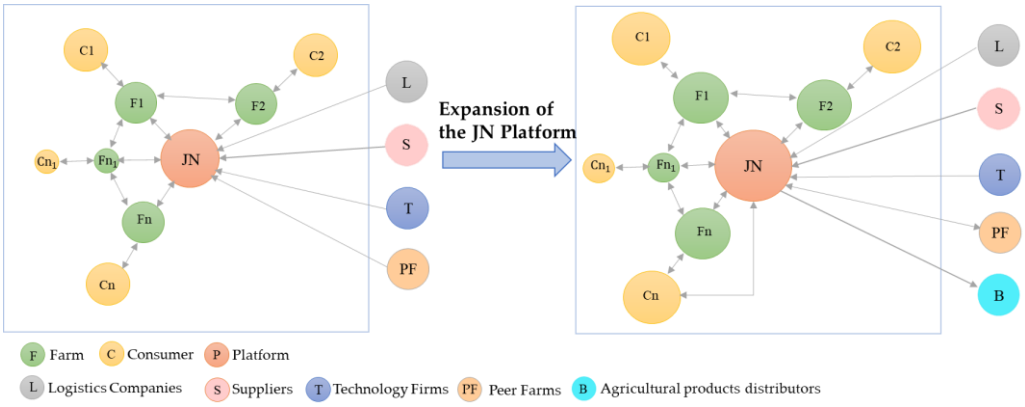

Figure 6. Structural changes to the JN platform ecosystem during the expansion stage.

4.3.1. Institutional Arrangement: Establishment of Dedicated Management Teams, Shareholders Return to Focus on Farm Operations

The inefficiencies of the full shareholder participation model, which caused decision-making delays and diverted shareholders' time and energy from agricultural activities, highlighted the need for a more corporate approach to platform management. In February 2019, JN established a dedicated management team led by two shareholders, while the remaining shareholders stepped back from day-to-day operations. One shareholder involved in platform management explained, "Mr. Fang primarily handles external relations for the platform, while I focus on internal management. In essence, only two shareholders are actively engaged in operations, while the others are supported by hired staff". This transition to a corporate-style management structure significantly improved operational efficiency, allowing most shareholders to return to their farms and concentrate

on agricultural production, while the platform continued to function as an enabling entity, supporting the survival and growth of each member farm.

4.3.2. Resource Integration: Leveraging External Markets, Continuous Expansion of Platform Resources

During the consolidation phase, the optimization and reorganization of resources enabled each farm to develop market-competitive flagship products, establishing a solid foundation for sales to external markets. As one shareholder noted, "Once we launched a few key products, external sales partners became more confident in collaborating with us". Beginning in May 2019, the platform initiated extensive partnerships with external ecological agricultural product distributors, including XMD Farm, SH Farm, QRLP from Shaanxi, YX Center from Yunnan, and various platforms in Hubei, Chongqing, and Tianjin. This shift marked JN's evolution from a self-sufficient operation to one focused on large-scale external sales. By May 2021, export ratios had significantly increased: HD and HL farms reached 90%, while LX, XCYX, FQ, and WJCY farms achieved export ratios of 80%, 50%, 40%, and 30%, respectively (see Table 1).

The significant increase in sales prompted member farms to expand their operational scale. As shown in Table 1, by May 2021, all farms except LX saw growth in their land operating areas. For example, FQ farm leased an additional 20,000 acres of pastureland, while WJCY expanded its planting area by 260 acres. At the same time, the platform's growing scale and improved market reputation attracted more external service providers, leading to a continuous expansion of the overall ecosystem. Notably, over 60 ecological agricultural product suppliers contributed nearly 500 product categories to the platform. JN also formed partnerships with logistics companies such as JD Express, SF Express, Jitu Express, Zhongtong Express, and China Post, offering tailored logistics solutions for various business types. Additionally, over 50 ecological farms established partnerships for exchanges and collaborations in areas such as ecological concepts, production techniques, business strategies, and products. Moreover, due to the platform's notable development achievements, this phase also saw the addition of new shareholders, including two farms and two consumer shareholders. The inclusion of these new partners strengthened the overall resource pool of the JN system, providing a solid foundation for sustained value co-creation.

4.3.3. Value Co-Creation: Farms Achieve Full Profitability, Strong Recognition of the "Collective Strength" Value Proposition

The aggregation and accumulation of various service resources through the JN platform have driven the continuous expansion of the entire ecosystem. Different service entities, through the platform, engage in resource integration and service exchange, creating a cycle of value co-creation that fosters sustained growth. According to JN's estimates, in the more than four years since its establishment, the platform has alleviated food safety concerns for over 10,000 families nationwide. It has directly or indirectly protected approximately 23,000 acres of land (including 20,000 acres of pasture and 3000 acres of arable land), supported over 100 ecological farming partners in promoting their products, and increased sales by approximately CNY 18 million. Furthermore, the platform has saved consumers more than CNY 2.5 million in unnecessary costs. Each JN member farm has experienced a 2–4 times growth, reaching a desirable and sustainable operational state. Notably, in 2020, despite the challenges posed by the pandemic, JN managed to break even by the end of the year. Remarkably, this was achieved without increasing the financial burden on member farms and while simultaneously reducing unnecessary expenditures for consumers. Due to these accomplishments, all interviewed shareholders expressed strong support for JN's "collective warmth" value proposition. They emphasized how JN provided both warmth

and hope during the most challenging times for their farms. In their view, the platform has allowed them to support one another and move forward together on the path of ecological agriculture. This result also indicates that the endogenous agricultural service platform formed based on service demands has promoted the sustainable development of small-scale green agricultural producers.

5. Conclusions and Implications

5.1. Conclusions

The existing literature primarily focuses on exogenous platform-based agricultural service models, typically led by core service providers. In contrast, this study explores a new model that has emerged in practice: the endogenous platform-based agricultural service model, driven collectively by service-demanding entities. Using the JN platform as a case study and applying the theory of value co-creation, this paper traces its ecosystem development through three stages: emergence, formation, and expansion. Following the logical sequence of "value proposition—institutional arrangement—resource integration—value co-creation", the paper demonstrates how the JN platform ecosystem accomplishes value co-creation and supports the sustainable development of smallholder farmers. The case analysis reveals several valuable research findings, which are discussed in terms of the characteristics of the endogenous platform-based agricultural service model, the foundation of value co-creation, and the mechanisms for realizing value co-creation.

5.1.1. Characteristics of the Endogenous Platform-Based Agricultural Service Model

The case of JN highlights significant differences between the endogenous platform-based agricultural service model and the more commonly studied exogenous platform-based agricultural service model. A comparison of these two models is presented in Table 3. In the endogenous platform-based agricultural service model, although numerous service demand entities are merely small-scale green agricultural producers, they can likewise serve as the drivers of the platform. Their roles within the platform ecosystem are dynamic. They not only receive agricultural services but also provide services for other participants on the platform, thus being value co-creators. The relationships among these service-demanding entities are no longer independent; rather, they are closely intertwined, collaborating and co-existing. They continuously conduct service exchanges with other external service entities under shared institutional arrangements, thus realizing their respective sustainable development. In contrast to the standardized services typically provided in exogenous models, the services in the endogenous model are tailored to meet the specific, individualized needs of each service-demanding entity.

Table 3. Comparison between exogenous and endogenous platform-based agricultural service models.

	Exogenous Platform-Based Agricultural Service Model	**Endogenous Platform-Based Agricultural Service Model**
Driving Entity	Core service providers	Service demand entities
Service Providers	Governments, enterprises, cooperatives, and other service organizations	All platform participants
Role of Service Recipients	Value destroyers	Value co-creators
Relationship Among Service Recipients	Independent	Collaborative and symbiotic
Service Provider–Recipient Relationship	Transactional, intermittent	Relational, continuous
Service Content	Standardized	Personalized

The differences between these two service models do not necessarily imply that the endogenous platform-based agricultural service model is superior to the exogenous model. In the case of the JN model, the need for extensive interaction between platform entities

may limit the number of members involved. This limitation could potentially be addressed by clarifying more consistent value propositions, more rational institutional arrangements, and more efficient resource integration. In practice, the choice between these two models can be made based on different circumstances and objectives. As mentioned earlier, the exogenous model has already been widely applied in large-scale agricultural production. The standardized service content of the exogenous model may lead to higher production efficiency, while the endogenous model emphasizes close interaction between platform entities to achieve shared value.

5.1.2. The Foundation of Value Co-Creation in the Endogenous Platform-Based Agricultural Service Model

The second key finding of this study is that resource sharing among service-demanding entities is essential for forming the platform ecosystem and enabling value co-creation. The case study demonstrates that JN does not rely on a single core enterprise to lead the platform. Instead, small-scale ecological farms share their resources and leverage these assets to attract additional service providers, thereby promoting the sustainable development of both the farmers themselves and the platform. Without the resource-sharing practices among the farms, JN would have struggled to attract external service providers and create the ecosystem necessary for facilitating value co-creation.

Specifically, the resources shared by the farms include both tangible assets, such as capital, and intangible assets, such as consumer demand and human resources. The sharing is crucial for enabling value co-creation. It facilitates resource transformation in three key ways. First, resource sharing shifts from weakness to strength. Individual small farms often struggle with limited resources, leading to high service costs or difficulty accessing essential services when negotiating with external providers. By connecting and pooling resources across multiple farms, JN was able to leverage these combined assets to attract external service providers, such as logistics companies, suppliers, and technology firms. This collaboration reduced service costs, introduced new resources, and created synergies in a "1 + 1 > 2" effect, enriching the resource pool of smallholder farmers. Second, resource sharing helps transform "useless" resources into "useful" ones. For example, a single farm's limited product range may not meet diverse consumers' needs, leaving certain consumer demand resources underutilized. However, by sharing these unmet demand resources through the platform, they can be redirected to other farms or suppliers that can fulfill them. This approach maximizes the use of existing resources, increasing their overall value. Third, resource sharing transforms resources from mere ownership to active application. Farm operators in this study, with their years of experience and specialized knowledge, share their expertise, creating added value for the platform. This demonstrates how the practical application of shared knowledge contributes to value co-creation, enhancing the collective capacity of the platform's ecosystem and supporting the sustainable development of smallholder farmers.

5.1.3. The Mechanism of Value Co-Creation in the Endogenous Platform-Based Agricultural Service Model

The third key finding is that the value proposition, institutional arrangements, and resource integration form the core mechanism for value co-creation within the JN platform ecosystem. Both resource integration and institutional arrangements display dynamic evolutionary characteristics, evolving at different stages of the platform's development. These changes enable the platform to adapt, optimize, and sustain value co-creation processes as it grows.

First, JN attracted member farms' participation by proposing the value proposition of "Collective Strength". Unlike the value propositions typically initiated by core enterprises

in the existing literature, JN's value proposition was co-developed collectively by the small-scale ecological member farms. It emerged from a collaborative process where the farms identified shared challenges and worked together to find solutions. By connecting their individual issues, the farms recognized common causes and underlying similarities, ultimately leading to the formulation of the value proposition. This was embodied in the JN agricultural service platform, offering a systematic solution to the farms' problems and supporting the sustainable development of smallholder farmers. Therefore, it is clear that a value proposition must address real problems or, at a minimum, offer tangible benefits to participants in order to effectively attract their engagement and foster value co-creation. Moreover, the study reveals that as participants begin to benefit from their involvement in the JN platform, their recognition and endorsement of the value proposition strengthen. This, in turn, attracts more external stakeholders, expanding the platform ecosystem and creating a continuous cycle of value co-creation.

Second, the stable operation of the JN platform ecosystem relies on shared institutional arrangements, which include clear definitions of shareholder rights and responsibilities, platform product standards, PGS certification principles, internal management systems, and formalized communication mechanisms such as JN's "night school", farm visits, and WeChat groups. These arrangements provide participants with clear rules, reducing uncertainty and enabling stable expectations about each other's behavior. Additionally, the case study shows that these institutional arrangements evolve dynamically as the platform ecosystem develops. Initially, JN used a shared management model among shareholders, which effectively encouraged their participation. However, this model also highlighted the platform's resource constraints and the need for extensive experimentation with operational strategies during its early stages. As operations stabilized, the inefficiencies and time demands of the shared management model became evident. In response, JN adapted its internal structure by establishing a dedicated operations team, allowing shareholders to step back from day-to-day management. This shift in JN's internal management system shows that institutional arrangements not only influence participants' behaviors and interactions but also evolve alongside them [57]. Thus, institutions, participant behaviors, and the ecosystem itself develop concurrently.

Finally, the case study reveals that JN's resource integration occurs through three primary methods: connecting resources, adjusting resources, and leveraging resources. Specifically, during the emergence stage, resource integration primarily involves connecting the resources of member farms to create a platform network. In the formation stage, JN adopts a dual approach: it attracts external service entities while also optimizing the internal resources of member farms. In the expansion stage, the platform leverages external sales resources, expanding market access for member farm products and boosting sales. This, in turn, encourages member farms to grow, enlarging the platform's resource base and fostering a continuous cycle of value co-creation. These three methods of resource integration evolve sequentially, highlighting the dynamic and contextual nature of resource integration throughout the platform's development.

5.2. Practical Implications

In 2024, the Guiding Opinions from the Ministry of Agriculture and Rural Affairs of China, which emphasize the importance of agricultural socialization services for green production and the promotion of rural ecological revitalization, provided valuable insights for policies and practices related to agricultural socialization services and sustainable green agriculture. This study's findings offer several recommendations: Firstly, it is crucial to fully recognize the endogenous needs of small-scale ecological farmers. These stakeholders can build platform service ecosystems through cooperation, rather than relying solely on

external forces, to address their production and operational challenges, thereby fostering sustainable growth of green agriculture. Secondly, in practice, actively promoting the development of endogenous platform-based agricultural service models can stimulate the resource value of various agricultural entities, providing new pathways for upgrading agricultural socialization services. Thirdly, relevant policies should guide the resource-sharing practices of service-demanding entities. These resources include not only tangible ones, such as funds and agricultural equipment, commonly mentioned in policies, but also intangible ones, such as consumer demand and human resources. Skillful and adequate use of these resources can facilitate the realization of value sharing and co-creation within the platform. Finally, to achieve value co-creation in an endogenous platform-based agricultural service model, platform managers must not only propose value propositions that help participants solve problems and benefit all stakeholders but also establish rules embedded within participant interactions that all must adhere to. Furthermore, through various methods, such as connection, adjustment, and leverage, the platform can integrate resources and provide the momentum for value co-creation.

5.3. Theoretical Contributions

This study presents a longitudinal single-case analysis of the JN, focusing on a platform-based agricultural service model driven by service-demanding entities. The key theoretical contributions are as follows: First, from an agricultural service model innovation perspective, this research introduces the "endogenous platform-based agricultural service model", which contrasts with the exogenous model. This new model provides a fresh theoretical perspective on the development of agricultural socialization services and opens new research directions for the sustainable development of small-scale farmers. It has the potential to advance and deepen related theories in the agricultural field. Second, using value co-creation theory, the study examines how the endogenous platform-based agricultural service model facilitates value co-creation. This research not only broadens the application of value co-creation theory to agriculture but also offers new empirical evidence and theoretical insights, expanding the theory's relevance across different industry contexts.

5.4. Future Research

Although this study employs a longitudinal single-case research design, which provides deeper insights into the issue at hand, it is undeniable that this method has limitations in terms of generalizability. In the future, conducting multi-case studies to obtain more broadly representative results would be a highly valuable research direction. Therefore, subsequent studies could expand the scope to include a wider range of cases. By comparing the commonalities and differences across these cases in similar contexts, it may be possible to further enhance our understanding of the endogenous platform-based agricultural service model, ultimately providing more comprehensive and effective theoretical support and practical guidance for addressing the development challenges faced by small-scale farms.

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