

## Article

# An Agricultural Supply Chain Coordination Model: The Case of Trinity Comprehensive Cooperation Organization in China

Jia Shi, Jiacheng Zhang , Naiyan Xie, Zhuodong Yang and Jianli Luo \* 

School of Business, Wenzhou University, Wenzhou 325000, China; sjia\_1112@163.com (J.S.); jc\_zhang2000@163.com (J.Z.); nyjt0615@163.com (N.X.); yangzhuodong0616@163.com (Z.Y.)

\* Correspondence: 00011074@wzu.edu.cn

**Abstract:** Farmer cooperatives play a significant role in increasing farmers' income, ensuring food security, and maintaining supply chain stability. While the number of cooperatives in China has increased rapidly in recent years, it is challenge for many small-scale cooperatives in China to achieve high performance due to resource and scale constraints. Taking Rui'an Meiyu's Trinity Comprehensive Cooperation Organization as an example, this paper makes improvement to the original Trinity Comprehensive Cooperation Model and innovatively proposes a new practicable model called "three areas of cooperation with multiple bodies" for small-scale cooperatives to adopt. According to our research, the following features have been identified: first, the formation motivations of the new model include four different aspects, and the formation process of it includes three specific steps. Second, the resource integration mechanism of the new model is composed of production coordination optimization, supply and marketing platform restructuring, and credit capital guarantees. Third, the new cooperative model can increase economic benefits and simultaneously promote sustainable agricultural development. This study further complements the literature on the Trinity Comprehensive Cooperation Model and offers many managerial and academic implications for cooperative members and policy-makers.

**Keywords:** sustainable development; supply chain coordination; farmer cooperatives; trinity comprehensive cooperation organization; case study



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## 1. Introduction

Farmer cooperatives show great significance in uniting farmers, stabilizing supply chains, and achieving economic and environmental performance [1,2]. Many countries attach great importance to agricultural development, especially the development of farmer cooperatives. The Chinese government always emphasizes the value of agriculture, and even put forward a rural revitalization strategy [3,4] in the report of the 19th CPC National Congress. Under such a background, China has witnessed rapid development in the quality and quantity of farmer cooperatives in recent years, especially after the introduction of the Trinity Comprehensive Cooperation Model (TCCM) [5,6]. The Trinity Comprehensive Cooperation Model is a rural reform model proposed by Chinese President Xi Jinping in 2006 [7,8] which commits to strengthening production, supply and marketing, and credit cooperation of farmer cooperatives. This model has achieved effective synergy in terms of unified production, open markets, and accessible agricultural loans [9,10]. However, the research of Jianling Cui shows that small-scale cooperatives have difficulty adopting the TCCM due to their resource limitations [11]. According to Qiang Jin, over 98% of farmer cooperatives in China are small in scale [12]. These cooperatives tend to have fewer resources and members, and do not have the capacity to set up the plethora of departments for multifunctional cooperation required by the TCCM.

On this basis, the present paper employs the case study method to explore a new model of small-scale cooperative agricultural cooperation, drawing on the resource-based and

resource dependence theories to conduct research and analysis. The purpose of this paper includes many aspects, such as theoretical research and practical experience, which can both enrich the theoretical connotation of trinity comprehensive cooperation and provide empirical reference for the practice of model application. The research purpose can be divided into the following two points. (1) It aims to solve the problem with small-scale cooperatives detailed above through the appropriate allocation of cooperative resources. In doing so, it offers small-scale cooperatives effective guidelines for solving the problem of insufficient resources and provides a reference for conducting theoretical research on new models of agricultural cooperation and enriching the existing trinity cooperation theory. (2) It aims to promote the rural revitalization strategy and accelerate the modernization of agriculture and rural areas in order to enhance the vitality of small cooperatives [3,4]. Therefore, this paper provides practical suggestions for agricultural development on the practical level, which can further enrich the practical connotations.

In an attempt to achieve the purpose of this paper, our research tackles these challenges in three ways: (1) by analyzing the current situation of small-scale cooperatives and exploring the basic characteristics and internal mechanism of the cooperation model; (2) by explaining the motivation and specific processes of production, supply and marketing, and credit cooperation in TCCM; and (3) by summarizing and discussing the advantages and characteristics of the resource integration mechanism, exploring its benefits, and making suggestions for other farmer cooperatives.

## 2. Literature Review

### 2.1. Agricultural Supply Chain Coordination

The agricultural supply chain mainly includes agricultural product production, agricultural product processing, third-party logistics enterprises, and agricultural product sales [13,14]. The study of supply chain management focuses on all the main bodies involved in all of the upstream and downstream flows, from the initial supplier to the ultimate customer [15]. Several scholars have linked the basis of control and systems theory with supply chain and operation management [16]. Based on the research perspective of game theory, scholars have put forward a supply chain model under the multi-stage design method [17], and a multi-dimension and closed-loop supply chain network for stage product project under uncertainty has been proposed [18]. As the supply of agricultural products moves through multiple links and involves multiple stakeholders, it is necessary for farmers, agricultural product processing enterprises, logistics enterprises, and other multiple stakeholders to promote the high-quality development of agricultural supply chains [19]. In recent years, scholars have carried out research on cooperative models of different subjects in the supply chain of agricultural products. Several scholars have explored the factors influencing the quality and safety of supply chains for agricultural products from the aspects of information sharing and resource integration [20], while others have analyzed the role of government supervision in the operation and management of agricultural supply chains by constructing a game model of the government, consumers, enterprises, and other multiple subjects in agricultural supply chains. Qiang Shen et al. suggest that the internet can be used to build a “trinity” cooperation supervision system that combines physical terminals and virtual subjects of agricultural supply chains in order to promote the quality and safety of the physical terminals [21]. Valeria Borodin said that the coordination ability of all subjects in the agricultural supply chain is not strong in view of the high default risk involved in trading agricultural products. Based on operational research theory, scholars have optimized management uncertainty in agricultural supply chains [22]. In Renzhu Yu’s research, it is suggested that coordination should be carried out from the aspects of production, channels, consumption, and more [23].

### 2.2. Farmer Cooperatives in China

In recent years, many scholars have paid attention to the importance of farmer cooperatives in promoting the development of China’s agricultural economy. Faced with

the problems of numerous farmers and limited arable land, Chinese agricultural is challenged in realizing the goals of intensification, specialization, and industrialization [24,25], which make cooperatives a potential solution to gather farmers together and break this dilemma [26,27]. In 2007, the Law of Farmer Specialized Cooperatives was promulgated in China, which indicates that Chinese farmer cooperatives have officially entered the stage of rapid development [28]. A specialized farming cooperative is an emerging form of cooperative implemented to promote China's rural revitalization [29]. After years of development, it has changed from unitary to comprehensive and from traditional to modern. It can connect with enterprises, farmers, markets, and other operating or serving subjects, and is an important driving force in promoting China's rural economic development [30,31]. However, scholars believe that the overall scale of Chinese farmer cooperatives is too small, the degree of organization is low, and the ability to drive the development of agriculture is insufficient [32]. The "Trinity Comprehensive Cooperation Model" (TCCM) is a new type of rural cooperation model proposed by Chinese President Xi Jinping in 2006 to establish "trinity cooperation" in terms of the three aspects of production, supply and marketing, and credit. TCCM is conducted by Trinity Comprehensive Cooperation Organization (TCCO), which consists of the Farmer Cooperative Economic Organization Federation (FCEOF) and its cooperatives, aiming to enhance the role of cooperatives in agricultural supply chain coordination and promote cooperative performance. Guangcheng Wei discussed the performance of the TCCO from two dimensions (initiators and farmers) in promoting the development of trinity cooperation [30]. Meanwhile, others have explored the positive role of the TCCO in enhancing intensive production, market competitiveness, and cooperative income [31,32] and its role in enhancing organizational structures, services for farmers, and supply-demand matching [33,34]. Although the TCCM can promote the development of the agricultural economy, several scholars have found defects, such as resource limitations, resource mismatches, and unsustainable development, especially in small-scale cooperatives [26].

### 2.3. Research Gap

Collating the relevant studies, we find that most of the literature mainly focuses on resource sharing, information sharing, and government supervision to analyze the development of agricultural supply chains, while there are few studies on the relationship between farmer cooperatives and agricultural supply chains. Meanwhile, the TCCM is only in the promotion stage, the FCEOF is in the phase of exploration, and the existing literature mainly discuss the effect of large-scale cooperatives with reference to the three aspects of production cooperation, supply and marketing cooperation, and credit cooperation. Few scholars have carried out detailed research on how small-scale cooperatives can be guided to develop and achieve high performance. Although small-scale cooperatives share common features with large-scale cooperatives, there are significant differences in their redevelopment goals, governance, and composition which make it very difficult for small-scale cooperatives to find a specific model to adopt in agricultural supply chain coordination. This study tries to bridge the gap based on the original TCCM, and a new cooperative model is designed to remedy the problem of insufficient internal resources and unsustainable development among small-scale cooperatives, enabling greater efficiency in supply chain coordination.

## 3. Materials and Methods

We approached our case study, the case of Rui'an Meiyu Trinity Comprehensive Cooperation Organization (Meiyu TCCO), through document analysis and semi-structured interviews. The case study method is well-suited to answering research questions such as "how it changes", "why it changes", and "how to achieve the desired results". The boundary between the phenomenon and the actual environment of the TCCO concept is not clearly defined, and accurate, direct, and systematically controlled variables of econometric

analysis could not be designed, which makes the case study method highly suitable for our research.

### 3.1. Document Analysis

As our first step, we performed a document analysis based on data sources from archives, e-mail, and the internet. The analysis units of the research group were the latest TCCO, including the farmer cooperatives and their corresponding Farmer Cooperative Economic Organization Federation (FCEOF). As trinity cooperation originated in Zhejiang Province, the research group selected most cooperatives in Zhejiang Province to improve the reliability and validity of the research. The specific selection criteria were as follows: the selected case had to (1) adopt to the TCCM; (2) perform production, supply and marketing, and credit functions; (3) cover different regions and industries in a representative manner. After further screening and investigation, Meiyu Vegetable Cooperative and its corresponding Mayu FCEOF were selected for the case study. Table 1 is a summary of the data collected by the research team.

**Table 1.** Data collection from the literature and archives.

Information Source	Phenomenon Abstract
Rui'an Website	Meiyu Vegetable Base has become the most significant modern agricultural park in Wenzhou, and Meiyu Vegetable Cooperative has been listed as one of the typical cases of the nine types of farmer cooperatives in China.
Zhejiang News Website	Hong Bangqian, secretary of the Party branch of the Meiyu Vegetable Cooperative, said: "After listening to Party history and learning Party lessons, we have learned more about the [Trinity] reform and made Party members and farmers more determined to develop this year.
China Farmer Cooperative Website	Rui'an Rural Commercial Bank has launched the "three excellent" support policies of quota priority, preferential interest rate, and optimized procedures, with a comprehensive credit granting of CNY 50 million to cooperatives and total loan support of CNY 15 million. Through the model of "professional cooperatives + farmers", Rui'an Agricultural Bank has granted an overall credit extension of CNY 35 million to the cooperatives, including 500 households.
.....	.....

Please see the Supplementary Materials for more information.

The document analysis included a variety of recourses, such as internal publicity materials, meeting minutes, internal publications, external news reports, and materials and journal articles on cooperatives. By consulting CNKI and using database and network resources to search for articles about related theories and concepts, we obtained relevant information about farmer cooperatives in order to fully understand the development status of cooperatives. In addition, we collected the domestic and foreign literature related to the position of farmer cooperatives' position in the coordination of agricultural supply chains. Finally, the documents were sorted, analyzed, and used to achieve reasonably comprehensive and detailed data to lay a foundation for further research.

### 3.2. Semi-Structured Interviews

More specific information on the case of Rui'an Meiyu Trinity Comprehensive Cooperation Organization (Meiyu TCCO) was obtained by semi-structured interviews, mainly with key members of the cooperatives. We visited and researched the exemplary Farmer cooperatives several times during 2019–2021, conducting face-to-face interviews and field surveys with relevant persons in charge of the Mayu FCEOF in Rui'an, Wenzhou, as well as local farmers in the Meiyu Vegetable Cooperative.

We obtained information from a variety of sources, and used practical research to support our research. The main interviews covered the following topics: the operation

condition of the cooperative, the future development direction and supply chain logistics system of the cooperative, the arrangement of loan funds and the income of the cooperative, changes in the membership, and more. Table 2 is a summary of interview records collected by the research team.

**Table 2.** Interview data collection.

Case Enterprise	Interview Time	Interviewees	Interview Content
Farmland	25 min	Local farmers	A sense of experience, attainment, satisfaction
Wanke Company	180 min	Principal	Operation process, cooperation model, sales channel, profit model, service scope, the current situation
Meiyu Vegetable Cooperative	345 min	The director, Cooperative's member	Cooperation model, service model, dividend system, future planning, technical guidance, sales model, profit
Rui'an Xingmin Rural Insurance Mutual Aid Association	210 min	Chairman	The current situation, type of insurance, preferential policies, service scopes
...	...	...	.....

Please see the Supplementary Materials for details on the interviews.

By employing diverse forms of information and information acquisition methods, the differences between sources were fully compared and screened until they were consistent in order to maximize the authenticity and integrity of the data. The various types of collected and returned information were collated and summarized to provide an in-depth analysis of typical cooperatives by analyzing how the Mayu FCEOF and the surrounding small-scale cooperatives actively cooperate to achieve high performance. We sought to explain where the strengths and weaknesses of their collaborative model of production, supply and marketing, and credit lie by conducting further comparative analysis, thereby refining a specific framework for farmer cooperatives to participate in agricultural supply chain coordination in order to provide a further comparative analysis and refine the specific framework for farming cooperative participation in agricultural supply chain coordination. This can provide a practical model of collaborative agricultural production services that can be referred to in other regions of China.

## 4. Results

### 4.1. A New Model for Small-Scale Cooperatives

Meiyu Vegetable Cooperative was established as a small-scale cooperative in 1991, and had achieved high performance by 2018 in terms of production, supply and marketing, and credit after using TCCM, making it a typical case of a Rui'an Meiyu Trinity Comprehensive Cooperation Organization (TCCO). The Meiyu TCCO first started when Mr. Huang Ze-qiang, a villager of Disanjia Village in Meiyu Township (now a Meiyu Community in Mayu Town) took the lead in organizing the villagers to jointly purchase production materials, plant crops, and organize the exploration of product sales (Table 3). After several years of development, Meiyu Vegetable Cooperative has become the most famous cooperative in Rui'an, and the Meiyu TCCO has brought huge benefits (Table 4).

Rui'an Meiyu Trinity Comprehensive Cooperation Organization (Meiyu TCCO) is composed of a number of small cooperatives, including Meiyu Vegetable Cooperatives, as well as the Mayu Farmer Cooperative Economic Organization Federation. Mayu FCEOF, known as Mayu Agricultural Service Center, is a joint economic organization that provides various kinds of agricultural services for farmers. Mayu FCEOF is fully funded by the government with CNY 18 million, and it covers an area of nearly 40 mu, constituting a comprehensive platform for agricultural services and providing members with one-stop services such as standardized guidance, agricultural technology promotion, agricultural product exhibition, credit guarantees, farmers' training, and rural e-commerce incubation.



Relying on the Mayu FCEOF platform, it promotes the integration of resources for agricultural services and facilitates the “unification” of agricultural-related services [33]. In addition, it conducts the “government platform + social services” model, which aims to integrate the forces and resources of all parties. In doing so, it enhances the synergy between the FCEOF and a number of surrounding cooperatives to achieve high performance.

**Table 3.** The development of cooperatives.

Year	Event
1991	The agricultural cooperation in Meiyu first started
2001	Mr. Huang Zeqiang organized 94 farmers from 18 villages in Meiyu to set up a vegetable cooperative
2010	The Meiyu Agricultural Products Origin Trading Market was established
2011	Rui'an Huimin Rural Fund Mutual Aid Association was established
2013	Wenzhou Wanke Company was established
2018	Rui'an Xingmin Rural Insurance Mutual Aid Association was established

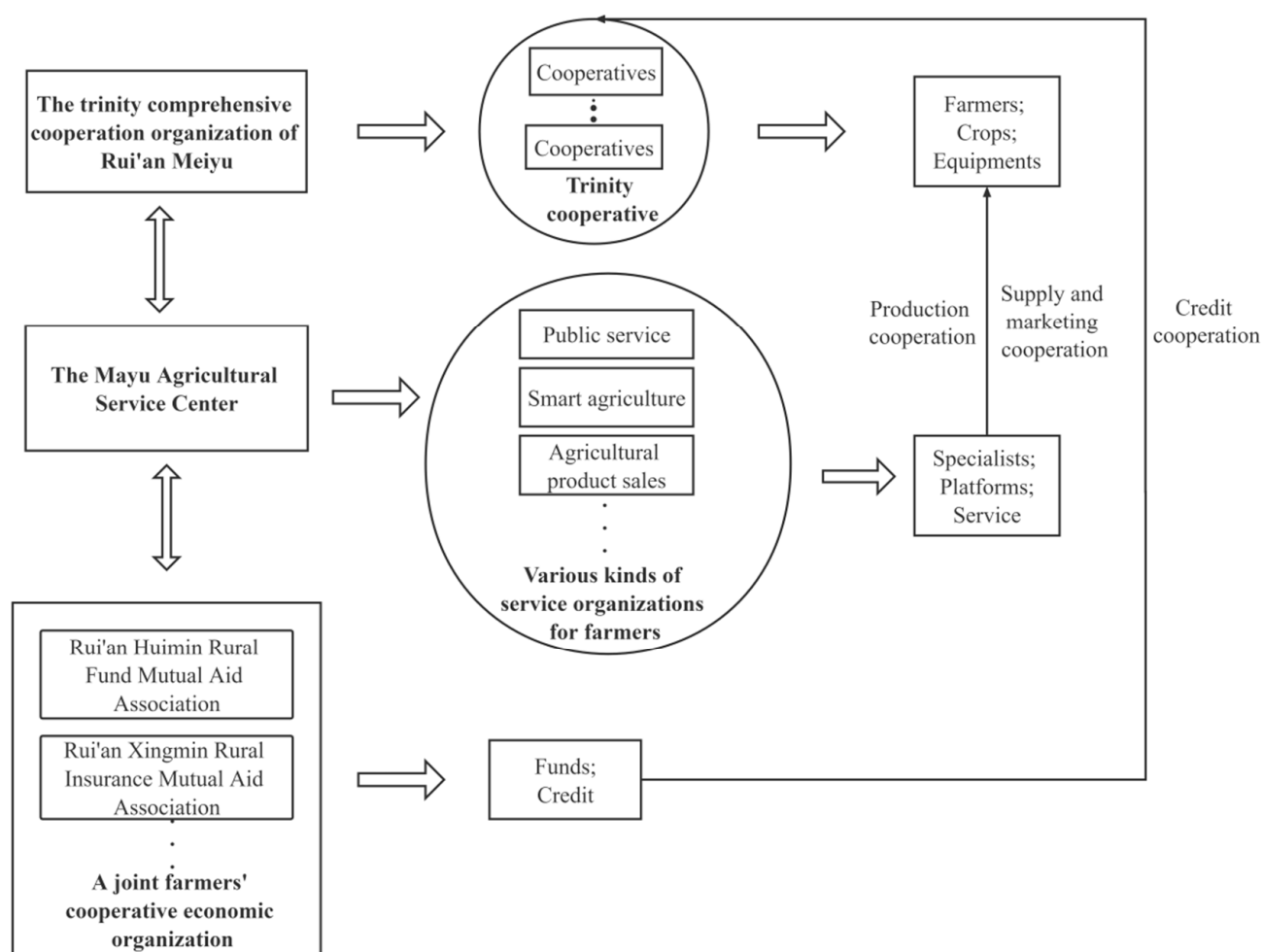
**Table 4.** Improvement in production, supply and marketing, and credit in Meiyu TCCO.

	Specific Manifestations	Before Applying the Model	After Applying the Model
<b>Production</b>	Number of community members (persons)	94	762
	Base area (mu)	450	7500
	Administrative villages (pcs)	9	41
	Average yield per acre (yuan)	7500	13,500
	Average yield of tomatoes per acre (kg)	4000	5800
	Value added in agriculture (billion yuan)	10.9	22.3
	Per capita income of rural residents (yuan)	9439	26,000
<b>Supply and marketing</b>	Distribution business (million yuan)	1800	2600
	Wanke Agriculture Annual Sales (million yuan)	1200	3100
<b>Credit</b>	Amount of special loans disbursed for tomato cultivation (yuan)	1500~2000	2000~3000
	Net profit margin on assets of Rui'an Huimin Rural Fund Mutual Aid Association (%)	1.01	4.18
	Loans related to agriculture (billion yuan)	42.10	722.84
	Agricultural-related loan guarantees (households)	1255	2737

Meiyu Vegetable Cooperative has achieved high performance by cooperating with other cooperatives in surrounding areas to carry out initial resource complementation. The Mayu FCEOF provides comprehensive services for the development of cooperatives by bringing together the three service functions of production, supply and marketing, and credit into one organization (Figure 1). This combination has formed a new model of agricultural cooperation that can be used for reference in China's agricultural sector. In this new cooperative model, we can see that the three important agricultural cooperation aspects of production, supply and marketing, and credit are accomplished by the union of small resource-limited cooperatives and Mayu FCEOF in a model called “three areas of cooperation with multiple bodies” (i.e., the TCMB model).

Other agricultural organizations play an important role in the TCMB models. Rui'an Xingmin Rural Insurance Mutual Aid Association is the first rural insurance mutual organization to provide insurance for agricultural products, agricultural cargo, and small loans to farmers, and provides insurance fund application for bank deposits and government bonds and other businesses approved by the China Banking Regulatory Commission as well. Its members have covered growers in the whole of Mayu town, with a premium income of CNY 210,000, insurance coverage of CNY 5,616,900, and claims of CNY 95,000 from when it first opened. In accordance with the principle of closed operation, the Rui'an Huimin Rural

Fund Mutual Aid Association is committed to solving the financial problems encountered by small and medium-sized farmers in the production process, and has thus far lent a total of CNY 505 million. Wanke Company is a large comprehensive agricultural technology industry chain integration enterprise integrating production, processing, distribution, and sales. It has established a set of quality tracking, tracing, and traceability mechanisms and system which has built up a good information sharing platform for regulators, producers, and consumers of agricultural products.



**Figure 1.** The trinity comprehensive cooperation organization developed by Rui'an Meiyu.

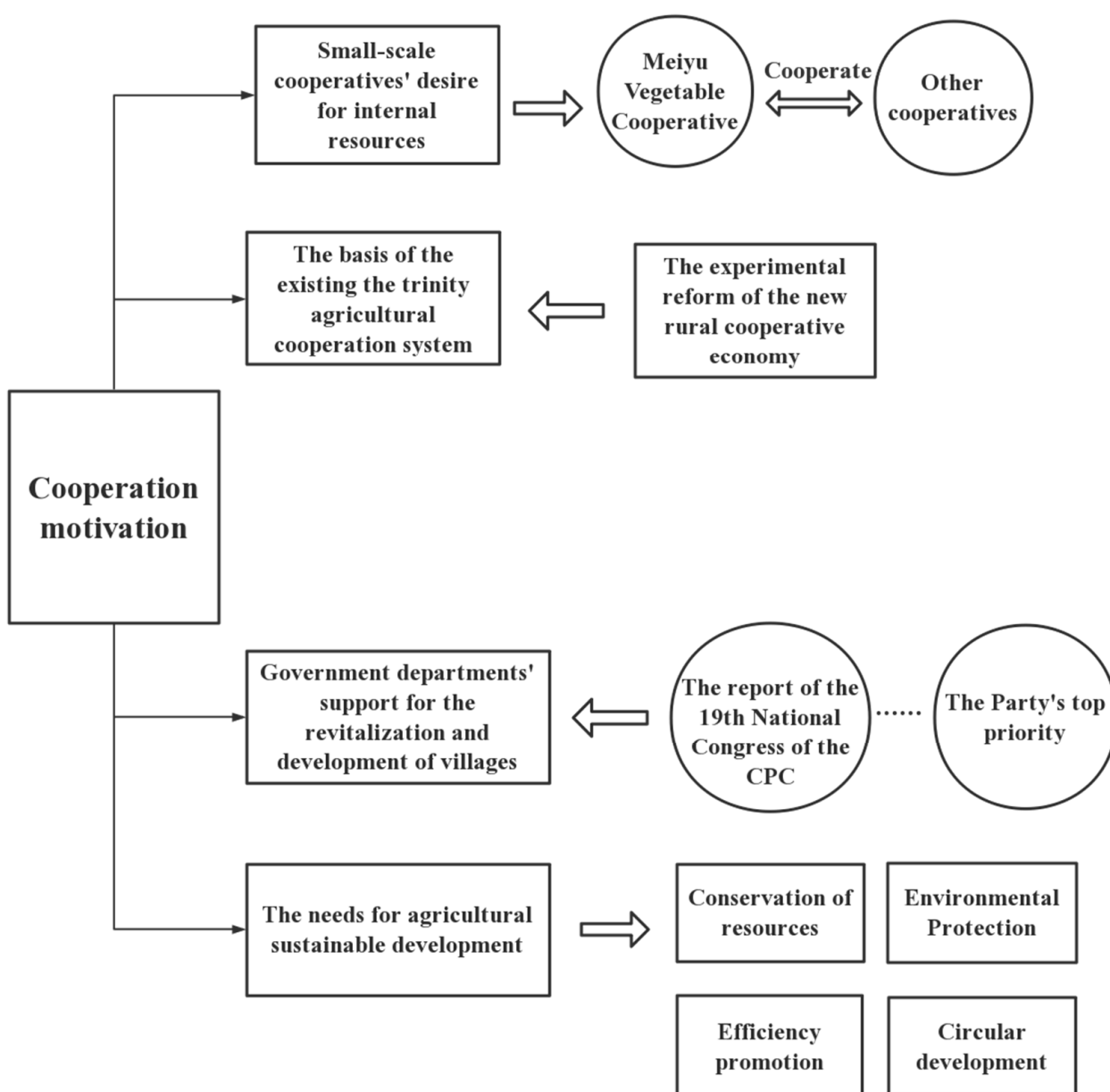
Although the concept of the TCMB model has never been put forward by any research, it has already been applied in agricultural production practice. Established in 2019 in Xiangyang city, Hubei Province, the Integrated Rural Services Mutual Society has strengthened the collective economy in the form of mutual aid and cooperation by raising funds for its members in the inner ring through a farming cooperative which generated new business income of more than CNY 100,000 in the same year and strengthened the villagers' sense of identity [34]. Similar examples can be seen in the USA. The function of cooperatives in the USA has gradually shifted from traditional production to vertical integration [35], resulting in integrated cooperatives covering pre-production, production, and post-production operations, focusing on adding value to agricultural products [36] and in fact forming a new generation of cooperatives that assist farmers in better agricultural cooperation in the areas of production, supply and marketing, and more.

Additional cases can be seen both in China and abroad, such as the "five standard" management in Huangshan City, Anhui Province [37]; the characteristic mutual assistance of multiple new agricultural operation entities in Tengzhou City, Shandong Province [38];

the new agricultural collectivism in France [39]; and Farmer Organizations (FOs) in the north-west of Cameroon [40]. It is evident that the TCMB model has achieved good performance in promoting economic development and sustainable agricultural development, which has certain promotion value and universal applicability.

#### 4.2. The Formation Motivation of the TCMB Model

Through investigation and research, we found that the motivation of the “three areas of cooperation with multiple bodies” (the TCMB) model are mainly derived from small-scale cooperatives’ need for internal resources, the basis of the existing trinity agricultural cooperation system, and government departments’ support for rural revitalization and development [41] (Figure 2).



**Figure 2.** Cooperative motivation.

##### 4.2.1. Small-Scale Cooperatives’ Desire for Internal Resources

In the process of agricultural production, small-scale cooperatives have to overcome their lack of internal resources [42,43]. However, under the existing agricultural cooperation



model it is generally difficult to adapt to the lack of resources and secure mutual assistance among various agricultural organizations. After successfully navigating its bottleneck period, Meiyu Vegetable Cooperative chose to cooperate with other cooperatives, and took the lead in setting up mutual fund and insurance departments and cooperating with Mayu FCEOF. Meiyu Vegetable Cooperative pursued the TCMB model, improving its market competitiveness and increasing socialized services through unions and alliances [44], further developing comprehensive cooperation in production, supply and marketing, and credit activities [45] in order to further promote the development of China's agricultural economy.

#### 4.2.2. Basis of the Existing Trinity Agricultural Cooperation System

During his tenure as the secretary of the Zhejiang Provincial Party Committee, Xi Jinping pushed forward the experimental reform of the new rural cooperative economy in Wenzhou Rui'an, which integrates "production cooperation, supply and marketing cooperation, and credit cooperation". Subsequently, trinity comprehensive cooperation has been successfully utilized and developed in Zhejiang Province. Additionally, an organization to implement trinity comprehensive cooperation was founded (i.e., the Farmer Cooperative Economic Organization Federation), forming the foundation of the existing trinity agricultural cooperation system. It provided theoretical guidance for agricultural cooperation and produced encouraging results. On the basis of the existing trinity model, the new TCMB model of agricultural cooperation in combination with the practical needs and conditions of small-scale cooperatives has been continuously innovated and improved upon to inject new energy into the development of China's agricultural economy.

#### 4.2.3. Government Departments' Support for the Revitalization and Development of Villages

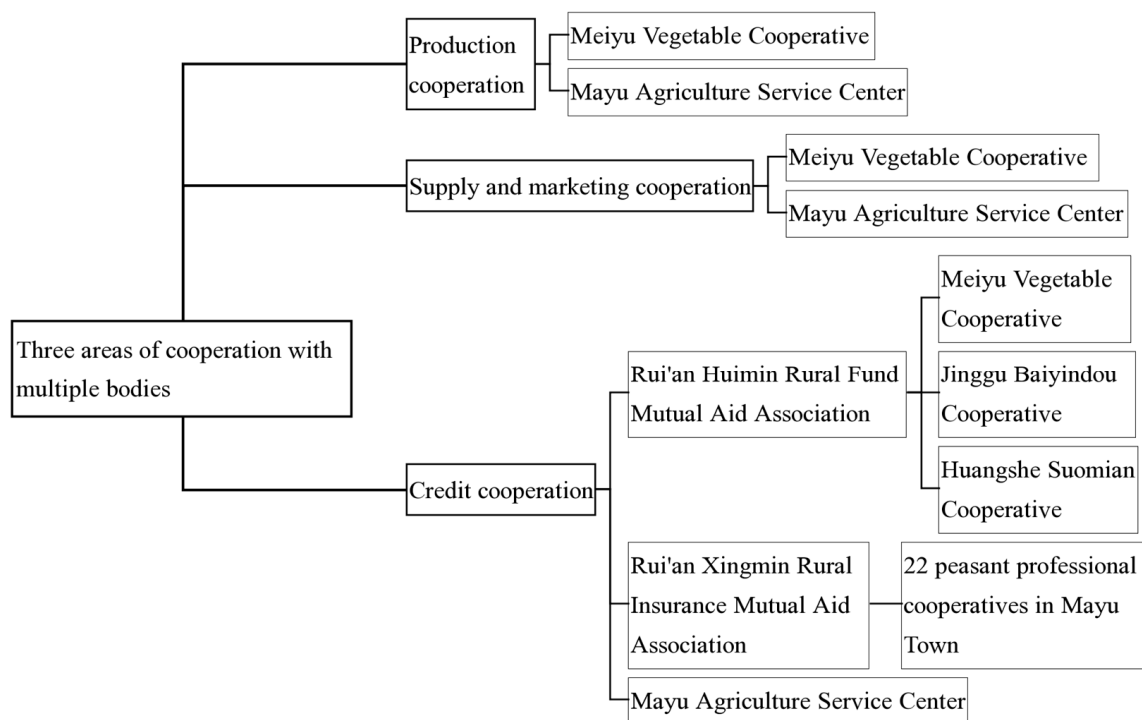
General Secretary Xi Jinping pointed out in the report of the 19th National Congress of the CPC that the issue of agricultural and rural farmers is a fundamental concern for the national economy and the people's livelihoods [46]. The Party's top priority is solving the "three rural issues" (i.e., the agriculture, rural areas, and farmers' issues) and implementing the rural revitalization strategy [47]. Against the backdrop of rural revitalization and development, China's government departments pay great attention to those issues related to "agriculture, rural areas, and farmers". They start from the grassroots level, listening to the needs of front-line workers and management personnel, and complement these efforts with a high degree of cooperation and related support in order to identify and address any issues through investigation and exploration, thereby promoting the continuous upgrading of the agricultural development model and laying the necessary policy and resource exchange foundation for the development of the TCMB cooperation.

#### 4.2.4. Needs for Agricultural Sustainable Development

Sustainable development is the focus of current society. The coordinated development of the TCMB model can further promote sustainable development. In the process of promoting agricultural development, technology and management methods are used to reduce the dependence of agricultural systems on external resources; more attention must be paid to the protection of the ecological environment in order to realize the green and sustainable development of agriculture. Under the requirements of scientific development, the combination of production, supply and marketing, credit, and other service functions can effectively promote the sustainable development of rural areas. This is conducive to the sustainable development of agriculture and can truly achieve the goal of sustainable development. Through the effective use of resources, the overall development of agriculture will have a better space for development.

#### 4.3. The Concrete Process of the TCMB Model

This section focuses on the Mayu Agricultural Service Center and describes the Meiyu Vegetable Cooperative's collaborative endeavors in detail from three aspects: production cooperation, supply and marketing cooperation, and credit cooperation (Figure 3).



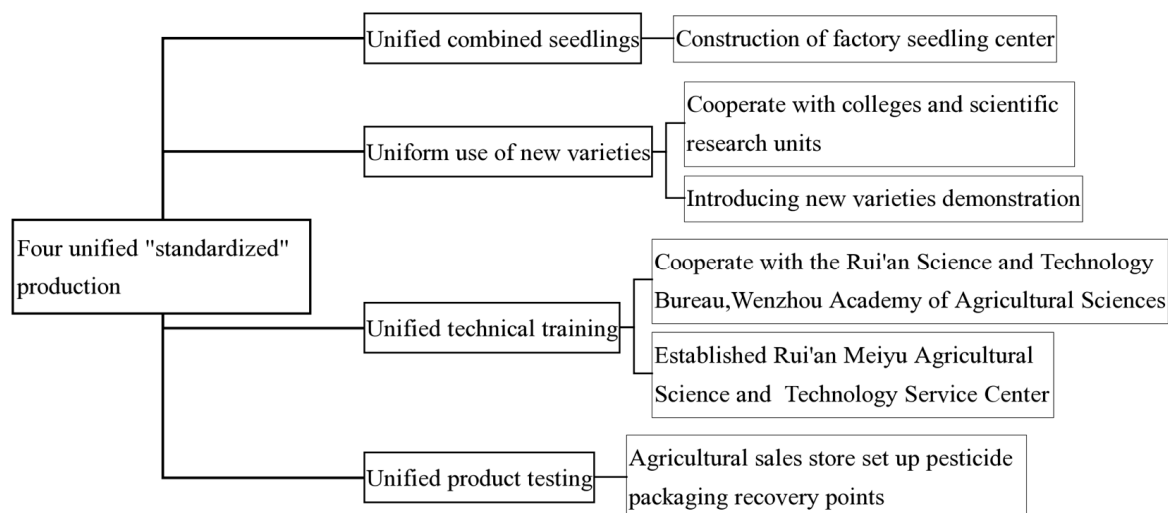
**Figure 3.** The architecture of the TCMB.

##### 4.3.1. Scientific and Technological Momentum to Facilitate Production Cooperation

Mayu Agricultural Service Center implements the “enterprise marketing” model of “cooperative + company + farmers + market”, while the Meiyu Vegetable Cooperative established the Wanke Company. The Meiyu Vegetable Cooperative is committed to comprehensively deepening digital reform and making production cooperation more intelligent. Through the application of modern agriculture and smart agriculture techniques, the Wanke Company's operations are integrated, forming a business model of “cooperative + farmer” [48].

- By implementing “standardized” production to create quality products [49,50] (Figure 4), the model promotes the standardization of production management through “four unifications”. The first is to unify joint seedling cultivation to improve the survival rate of seeds and seedlings. A factory seedling center was established to raise the germination rate by 10%, raise the seeding rate by 15%, and reduce the seeding cost by CNY 0.2 per plant and the production cost by CNY 400 per mu. The second is the unified use of new varieties of plants to ensure efficient crop production. The main way this is achieved is through cooperation with universities and scientific research institutes to introduce new demonstration varieties and carry out popularization after trial planting. For example, the new varieties introduced from Israel, such as FA-189 and Xianzhengda–Beiying, yield an average of 5800 kg per mu, 1800 kg higher than the average yield of the original 903 varieties. The third unification is the unification of technical training. In cooperation with the Rui'an Municipal Bureau of Science and Technology and the Vegetable Research Institute of the Wenzhou Academy of Agricultural Sciences, the Meiyu Agricultural Science and Technology Service Center in Rui'an was established to allow experts to come to the base in order to provide ad hoc guidance services [51]. Fourth, unified product testing is required to ensure the quality and safety of agricultural

products. Pesticide packaging recycling points were established in agricultural material stores to carry out the unified treatment of pesticide residues in order to prevent secondary pollution from pesticide residues [52].



**Figure 4.** Four unified “standardized” production elements.

- Promoting “large-scale” development achieves cost reduction and efficiency in agriculture [53]. The Meiyu Vegetable Cooperative cooperates with the economic cooperatives of the neighboring four towns, sub-districts, and 41 villages, and guides the peasants to transfer their land management right to the co-operative and pool their agricultural byproducts, further accelerating the agricultural modernization and moderate-scale operation processes.
- By accelerating the “digital transformation” to promote the development of smart agriculture [54], new technologies such as network technologies, Internet of Things technologies, and automation equipment are applied to achieve full intelligent control and operation [55]. Additionally, a water and fertilizer integrated intelligent control system was introduced to achieve agricultural informatization and automation. For example, in the construction of the National Modern Agricultural Industrial Park and the Demonstration Zone of Modern Ecological Cyclic Agriculture in Zhejiang Province, the integrated intelligent control system for water and fertilizer and the comprehensive utilization system for crop straw were introduced successively, thus realizing agricultural informatization and automation while minimizing the ecological and environmental impact.

#### 4.3.2. Sales Channels to Promote Supply and Marketing Cooperation

Meiyu Vegetable Cooperative expands the “Internet Plus” marketing model to enhance the circulation and service capacity of agricultural products. At the same time, it relies on the Wanke Company to develop the market, vastly improving the sales of agricultural products. In addition, Mayu Agricultural Service Center set up an e-commerce service platform that market entities such as Shenlu Seed Industry (the largest agricultural enterprise in southern Zhejiang) and large agricultural materials chain supermarkets can enter for free. This serves to attract leading agricultural enterprises and professional cooperatives to join, thus facilitating unified branding and expanding the sales market.

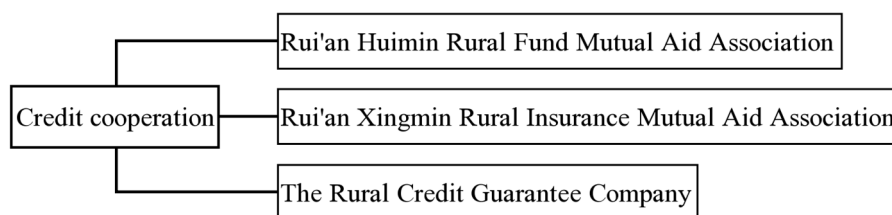
- In order to reduce total production costs through the unified procurement of agricultural materials [56], the Ministry of Agricultural Materials Supply established a unified procurement and supply system. Meanwhile, the “second rebate” system and a group buying plan of production materials were implemented by the cooperative members. By purchasing from manufacturers directly, purchasing costs are reduced

and members' risk of purchasing counterfeit or poor quality products is eliminated. In 2019, the unified supply of agricultural materials reached CNY 5.6 million, with a second rebate of CNY 100,000, greatly reducing the production costs of farmers and improving their sense of achievement.

- Market awareness can be enhanced through precise brand positioning. Through the selection of high-quality agricultural products, the uniform use of trademarks, the standardized use of grading packaging, and the improvement of product added value, two brands ("strong green" tomato and "green impression" vegetables) were created. "Strong Green" tomatoes entered the Hong Kong market and were sent on the polar exploration ship "Xue Long" to provide provisions to researchers in the Antarctic. Meanwhile, "Green Impression" fine vegetables cooperated with the high-end market to launch more than 200 kinds of fine vegetables, which were sent to the Antarctic as well. In 2019, the cooperative's distribution business turnover reached more than CNY 18 million and the export business of local vegetables reached more than CNY 12 million. The farmers benefited greatly from this, further promoting cooperation.
- By innovating new sales models, integrating resources, and leveraging advantages, cooperatives have formed a number of online and offline sales channels. With regard to the offline models, cooperatives have signed vegetable distribution agreements with the canteens of large enterprises in Rui'an City, such as Huafeng Group and Rui'an Tobacco Company, to undertake fruit and vegetable logistics and distribution operations within 150 km of the farms. In 2020, the distribution business achieved a turnover of more than CNY 26 million. For online markets, the cooperative has built rural e-commerce industry clusters through e-commerce sales channels, such as "Rui'an Purchase" and "Fengshou Purchase" [51].

#### 4.3.3. Financial Channels to Achieve Credit Cooperation

Meiyu Vegetable Cooperative develops mutual aid finance both by itself and through working with departments and financial institutions such as Rui'an Municipal Supply and Marketing Cooperative, Financial Office, and Rui'an Rural Commercial Bank (Figure 5) to intensify the innovation and input of financial products to the agricultural cooperative, rural areas, and farmers in order to produce solutions to financing problems [57]. The focus is on building the "Two Wings" service function of the NCMS. This pertains to the development of stereoscopic services, including 1. industrial operation services integrating production, supply and marketing, and credit guaranteed by the farmer cooperation fund, and 2. horizontal and vertical investment operation services led by asset operation companies [48].



**Figure 5.** Credit cooperation model.

- The Rui'an Huimin Rural Fund Mutual Aid Association in Rui'an City has grown to become the largest Rural Mutual Aid Cooperative approved by the CBRC in the province. After its establishment, the mutual financial cooperatives has followed the concept of "facing the needs of agriculture, rural areas and farmers, and achieving a mutual aid and win-win situation" to produce a dislocated development and differentiated service pattern in conjunction with other financial institutions. Loans were first given to leading industries, with emphasis on supporting grain and vegetable production in Mayu Town and contributing to the new model of "mutual financial cooperative farmers" in Mayu Town.

- Jointly funded by 21 cooperatives and two natural persons, Rui'an Xingmin Rural Insurance Mutual Aid Association was established as the first insurance mutual-aid organization embodying the meaning of “trinity cooperation” in China. These respectively correspond to three types of insurance, namely, production, supply and marketing, and credit, and provide guarantees that protect the production of farmers. To date, the mutual-aid group has 3552 members, CNY 1 million of registered capital, and CNY 5 million of operating funds. It has launched insurance products within the three types of insurance, namely, agricultural product insurance, freight insurance for agricultural products, and peasant household small-sum loan guarantee insurance. A total of 755 people are insured, realizing a premium income of CNY 5 million and remedying part of the difficulties peasant households face in accessing financing [51].
- Leveraging a diverse range of financial products to provide access to financing, the Rural Credit Guarantee Company, affiliated with the Rui'an Municipal Supply and Marketing Cooperative, provides guarantee services to cooperative members at a low rate and has provided guaranteed credit to 350 credit accounts for a total of CNY 37 million. The Rui'an Rural Commercial Bank has introduced the “three preferential” supporting policies, with priorities given in terms of quotas, preferential interest rates, and optimized procedures. To date, comprehensive credit of CNY 50 million has been granted to cooperatives, providing loans of CNY 15 million in total. The Rui'an Agricultural Bank has established a credit model by adhering to the “professional cooperatives + farmers” structure and granted overall credit of CNY 35 million to cooperatives, with 500 households receiving credit, thus providing farmers with financial convenience.

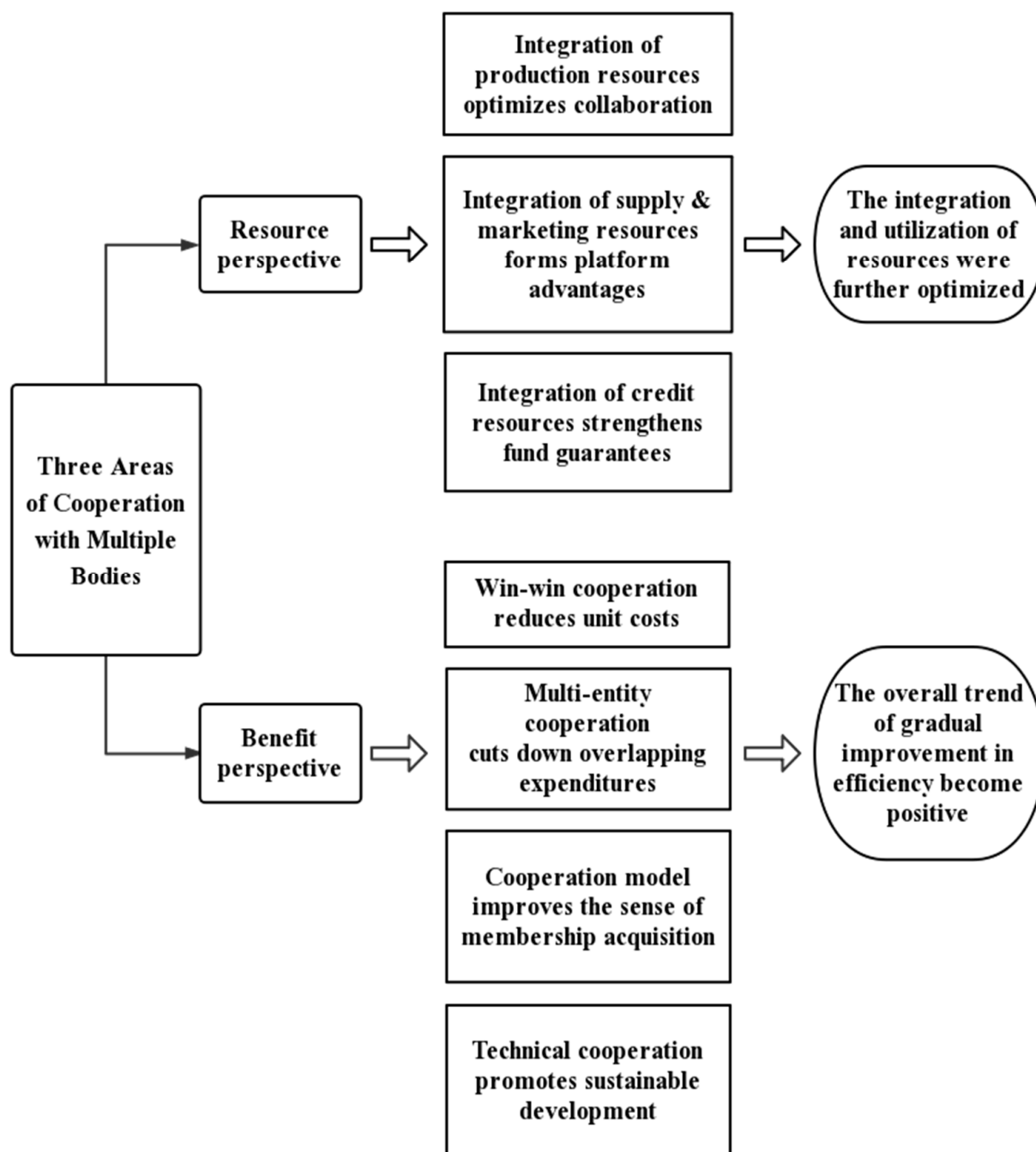
## 5. Discussion

The TCMB model is designed to pay attention to fully and efficiently integrating and utilizing all aspects of existing resources. As such, it puts forward a model for cooperating with many cooperatives by means of the IUCN, which departs from the existing model of cooperation. In doing so, it better solves the problem that the original cooperation model followed by small-scale cooperatives does not adapt to the real context of the situation. By taking advantage of various subjects related to agricultural production and operation, the construction of the TCMB cooperation model can better produce scale effects, integrate resources, reduce production costs, optimize supply and marketing platforms, form financial advantages, obtain complementary innovations, and enhance overall competitiveness. This model has many merits in terms of resources, benefits, and other perspectives (Figure 6), and is worthy of further research and promotion.

This section discusses the resource integration mechanism and cooperative performance by combining the case of the Mayu Agricultural Service Center and other cooperatives, including Meiyu Vegetable Cooperative, from the perspective of resources.

### 5.1. The Role of the TCMB from the Perspective of Resource Integration

Against the background of accelerated market changes and increasingly fierce global competition, market dynamics pressure enterprises to continuously shorten delivery periods, improve quality, reduce costs, and improve services. Hence, it can be seen that the degree of business refinement of enterprises is becoming progressively higher. It is difficult for a single enterprise to meet the rapidly shifting demands of the market by exclusively relying on the integration of its internal resources. Actual demand forces different entities such as suppliers, manufacturers, distributors, and retailers to gradually move towards cooperation. An effective way to solve the problem of “resource prosperity and resource poverty” [58] in resource-based regions is to promote the coordinated and balanced development of resource-based industries and non-resource-based industries [59,60].

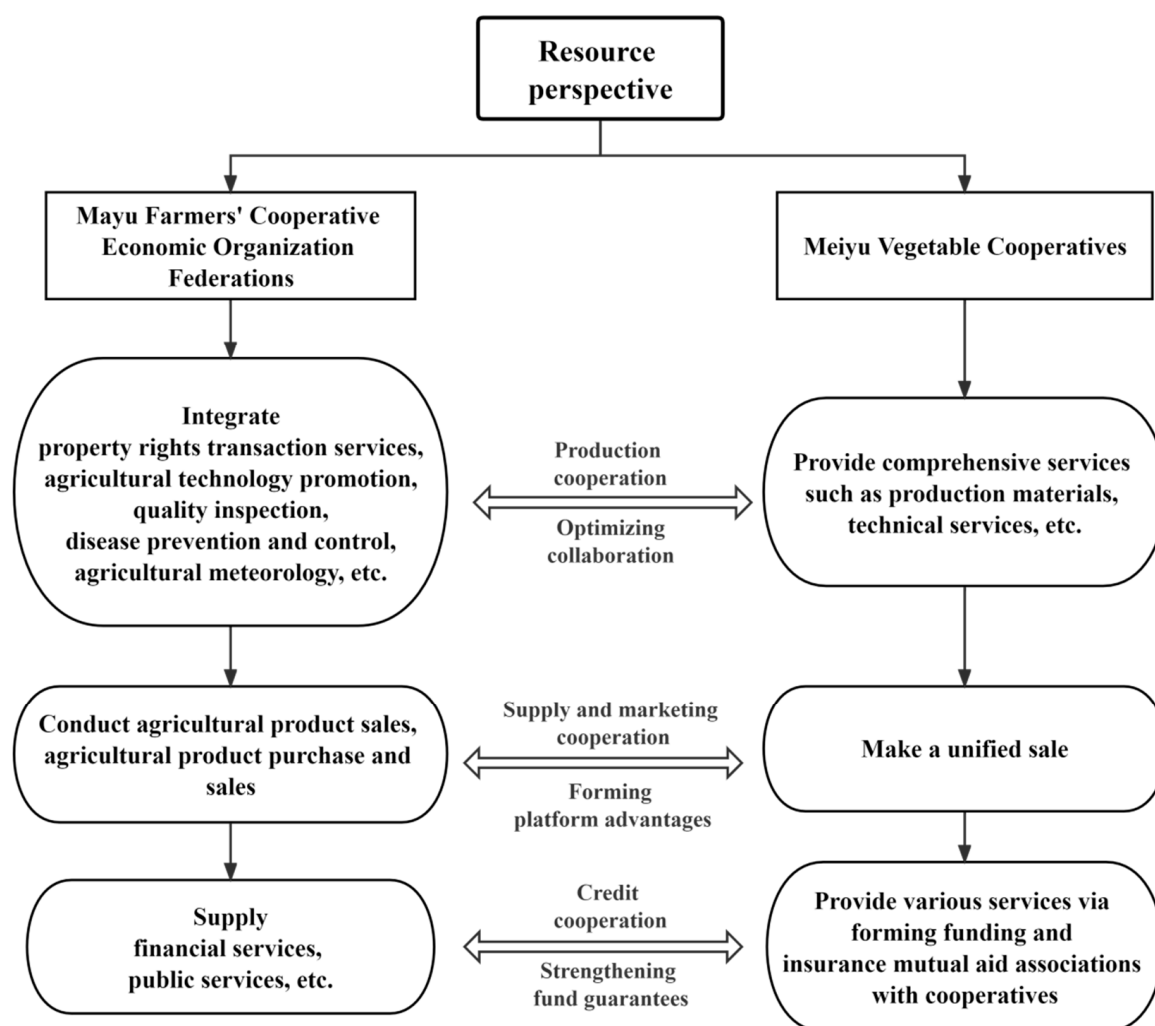


**Figure 6.** Beneficial patterns in the TCMB cooperation.

The TCMB model fully capitalizes on resource integration and win–win cooperation. By relying on resource-based theory, resource-dependent theory, and other theoretical bases, it guides cooperatives to engage in resource-complementary production cooperation, supply and marketing cooperation, and credit cooperation, among other aspects (Figure 7), fully exploiting the core resources and linkages of all departments to realize higher related performance [61,62].

The following is an analysis of the actual situation of multi-body cooperation between Mayu Agricultural Service Center and various cooperatives, including Meiyu Vegetable Cooperative, from a resource perspective.





**Figure 7.** Analysis of the cooperation model from a resource perspective.

#### 5.1.1. Integration of Production Resources Optimizes Collaboration

Production cooperation has been attained by Mayu Agriculture Service Center and Meiyu Vegetable Cooperative. The implementation of standardized production methods and the provision of professional skills training to relevant personnel have improved the survival rate. The use of network and Internet of Things technologies has accelerated the digital transformation of agriculture. As a result, rural areas are moving further in the direction of smart agriculture [63]. The integration of production resources between rural cooperative unions and cooperatives has formed a “cooperative + farmers” business model. This makes up for the original resource gap in the production of various departments, and further promotes the development of small-scale cooperatives in terms of production standardization, scale, digitalization, and other aspects [64,65].

#### 5.1.2. Integration of Supply and Marketing Resources Forms Platform Advantages

Supply and marketing cooperation are jointly undertaken by Mayu Agricultural Service Center and Meiyu Vegetable Cooperative. Meiyu Vegetable Cooperative has expanded the “internet + marketing” model and thereby improved the circulation service capacity of its agricultural products. By working in conjunction with the Wanke Company, the Meiyu Vegetable Cooperative has secured good sales platform resources, improving the sales volume of its agricultural products. By exploiting its e-commerce service platform, Mayu Agricultural Service Center has expanded the visibility of its agricultural products, formed a better brand effect, and provided a platform resource advantage for the agricultural

products produced by the Meiyu Vegetable Cooperative. To an extent, these channels make up for the previous lack of a sales platform, supply and marketing channels, and other resource deficiencies of small-scale cooperatives such as Meiyu Vegetable Cooperative by realizing the sharing and integration of core resources.

#### 5.1.3. Integration of Credit Resources Strengthens Fund Guarantees

Credit cooperation is jointly carried out by the Mayu Agricultural Service Center, Rui'an Huimin Rural Fund Mutual Aid Association, and Rui'an Xingmin Rural Insurance Mutual Aid Association. The Rui'an Huimin Rural Fund Mutual Aid Association is made up of the Meiyu Vegetable Cooperative, Jinggu Baiyindou Cooperative, and Huangshe Suomian Cooperative. Meanwhile, the Rui'an Xingmin Rural Insurance Mutual Aid Association consists of 22 farmers' professional cooperatives in Mayu town. This arrangement fully reflects the idea of resource integration and utilization in the TCMB by combining the limited resources of various departments together to form a greater synergy and achieve win-win cooperation in accordance with the concept of "facing the needs of agriculture, rural areas and farmers, and achieving a mutual aid and win-win situation".

### 5.2. Benefits of the TCMB from the Perspective of Benefit

Due to the lack of internal resources in small-scale cooperatives, the original farming cooperative mechanism is not suitable for all cooperative types. Rigidly applying an improper cooperative model is a certain contradiction that will produce opposite results to those desired. The TCMB model efficiently integrates resources from many cooperatives through the FCEOF to attain satisfactory performance. Resources and information are integrated to a certain extent, increasing the capacity for production, supply and marketing, and credit cooperation [54]. The FCEOF possesses the service and operation functions to assume government functions, implement socialized services, public policy, and information sharing, and perform the basic service functions of the trinity cooperative mechanism [66].

#### 5.2.1. Win-Win Cooperation Reduces Unit Costs

The Mayu Agricultural Service Center and Meiyu Vegetable Cooperative collaborate on various matters. Through the coordination and cooperation of different departments on various aspects, each link in the agricultural production chain and supply chain is jointly completed by the most efficient cooperative. Moreover, the cooperative positioned at each node is better able to develop by focusing its resources. When all cooperatives do this, it forms a scale economy effect [26]. To a great extent, the transaction costs of small-scale cooperatives such as Meiyu Vegetable Cooperative are reduced, the operating benefits are improved, and win-win cooperation among various agricultural entities is promoted.

#### 5.2.2. Multi-Entity Cooperation Cuts down on Overlapping Expenditures

Cooperation between the Mayu Agricultural Service Center and Meiyu Vegetable Cooperative reduces overlapping expenditures while cutting down on the costs of cooperation between enterprises as well as on the organizational costs that often arise when a large number of enterprises do not cooperate.

With regard to savings on the cost of cooperation between enterprises, the TCMB mechanism guides the scattered agricultural business entities to work towards unity, brings them into closer contact with each other, increases their degree of interconnectivity when engaging in resource sharing, and realizes the centralized management of both the production and supply and marketing platforms. To maximize their own interests, cooperative entities should reduce cooperation costs generated in the process as far as possible in order to achieve cost savings on cooperation between enterprises from the perspective of benefit.

From the point of view of lowering the costs of enterprise organization, the Meiyu Vegetable Cooperative, which was originally under-resourced, has made up for its lack of internal and core resources by collaborating with cooperatives that possess complimen-

tary resources. Multi-entity cooperation can better facilitate integrated operations, which simplifies processes originally followed independently by each cooperative. This reduces the expenses generated by each link and each process in the original cooperative in the independent state, and forms a better scale effect, producing internal organizational cost savings from the perspective of efficiency.

#### 5.2.3. The Cooperation Model Improves the Sense of Membership Acquisition

Rui'an's practices have proven that the new rural TCMB cooperation system formed under the leadership of the new rural cooperative economic organization can benefit more farmers [67,68]. Integrated farmer cooperatives are now equipped with a variety of functional departments, such as agricultural technical guidance, purchase and sale, credit, insurance, life services, and more. As such, they can provide a full range of socialized services for agricultural operators and local residents. This makes the popularization of agricultural science and technology rapid and efficient, producing good quality crops with high yields [69]. The supply of agricultural means of production is high in quality and low in price. Meanwhile, agricultural products are directly sold on the wholesale market to ensure that farmers' interests are not lost. In addition, cooperative finance and insurance services provide timely and sufficient financial support for production, supply and marketing, and life services, which in turn provide a wealth of accurate information to support financial and insurance businesses [70].

#### 5.2.4. Technical Cooperation Promotes Sustainable Development

Through its own platform and resource advantages, the Mayu Agricultural Service Center has provided a great deal of complementary help to the Meiyu Vegetable Cooperative and other related cooperatives, realizing standardized production and promoting sustainable development by using advanced agricultural science and technology. Combined seedling breeding greatly improves the survival rate of seedlings, reduces production inputs, and achieves good control of production costs. Meanwhile, through the cooperative advantages of resource integration, farmer cooperatives have introduced new varieties such as FA-189 by learning and using scientific farming methods and technologies, crop yields have been greatly improved, efficient crop production has been realized, consumption has been reduced, pollution has been reduced, and higher economic and social performance has been achieved. Digital transformation cooperation has realized the informatization and automation of agriculture while minimizing the impact of agricultural pollution on the ecological environment. Through the joint cooperation of various departments, fixed and general departments such as pesticide packaging recycling points have been set up to deal with pesticide residues in a unified manner, thereby saving resources, protecting the environment, and promoting sustainable development to a large extent.

## 6. Conclusions and Policy Recommendations

### 6.1. Research Conclusions

This paper is premised on the assumption that the original trinity cooperative model cannot meet the development needs of small-scale cooperatives. Starting with the core problem of insufficient resources within such cooperatives, this paper integrates previous research and uses resource-based theory, resource dependency theory, and other related theories. These are combined with actual Chinese agricultural development needs and the development of small-scale cooperatives to innovatively propose a new agricultural cooperation concept called "three areas of cooperation with multiple bodies" (the TCMB). The present paper selects typical cases of agricultural collaboration between the Mayu Agricultural Service Center and various cooperatives to gather valuable front-end data through repeated visits and continuous practical research. The collected data demonstrate that the TCMB is an effective model that is well-suited to the development of small-scale cooperatives. The model's inherent mechanism and advantages are described in detail from the perspective of both resources and benefits.

Although the TCMB model can solve the problem of insufficient resources in small-scale cooperatives, it does have several limitations. As the Trinity Comprehensive Cooperation Model remains in the development stage in China, the existing sample size was not sufficient to conduct a large-scale statistical study; therefore, future research should be conducted in the following two directions: (1) to focus on the further development of the TCCM and obtain additional case data in order to further test the characteristics and universality of the TCMB; and (2) to collect more relevant samples based on the existing foundation in order to further quantify the TCCM by means of econometric research methods.

## 6.2. Policy Recommendations

In this paper, we provide the following policy recommendations:

- (1) Advocating for a new type of agricultural cooperation and providing a conducive policy environment and institutional guarantees: government function plays an important role in realizing the balanced development of resource-based and non-resource-based enterprises. The relevant government agencies should make plans and publish guidance to advocate for resource complementarity between different cooperatives. Additionally, they should promote finding a balance between resource-based and non-resource-based cooperatives, thus breaking the “resource curse”. They should actively build a collaborative service model of “farmer cooperatives + joint cooperatives + cooperatives + farmers” to reduce any uncertainty between resource-based and non-resource-based cooperatives in the process of cooperation and innovation. This will provide a policy environment and institutional guarantees that are conducive to cooperation and development.
- (2) Actively improving the service function to provide convenient information resources for farmers: the government should actively improve its service function for agriculture in order to build a “service-oriented government” [71]. Rather than interfering too heavily in specific agricultural production and management processes, government can establish channels, platforms, and guidelines for agricultural development. Moreover, the government can set up a professional information service platform, construct an agricultural information communication network, make full use of modern scientific and technological achievements, and integrate each link of key agricultural information resources. It is expected that doing this will provide farmers and related agricultural organizations with more transparent professional information.
- (3) Optimizing the forms of complementary resources and strengthening the coordination of cooperative behaviors: cooperatives should identify the key elements and resources they need and seek out organizations that can complement each other in order to establish cooperative partnerships. At the same time, cooperatives should integrate various resources with different organizations. Through different cooperation methods in their different production stages, they can enhance the degree of ability matching between partners, promote organic connections between them, and ensure the diversity and hierarchy of cooperation. An information sharing mechanism should be established to overcome the drawbacks of mutual blockade of supply chain enterprises stemming from information asymmetry. The cooperative innovation behavior management mechanism should be improved [72] in order to enhance the degree of behavioral coordination among synergic cooperatives to contribute to better resource integration.
- (4) Actively implementing independent innovation to achieve transformation, development, and progress: the TCMB model offers benefits to small-scale farmer cooperatives. It allows them to continuously integrate their resources, form close cooperation organizations, carry out characteristic transformation and development, and adapt to their operating state, thus realizing the large-scale development of agriculture. In the cooperation process, cooperative entities such as cooperatives and rural cooperative associations can learn from each other, gain timely insights into market opportunities, and make forward-looking decisions that will be beneficial for their own development.

With the deepening of cooperation, both parties can reach an agreement to carry out exchange and learning activities during different stages of cooperation. This is not limited to the exchange of cooperation projects; it can allow for frank exchanges of enterprise management experience, human resource management, and other aspects in order to further bolster the additive benefits of innovation.

- (5) Strengthening cooperation and communication mechanisms to consolidate the steady development of relations: in the process of agricultural production and operational cooperation, synergic cooperatives should cultivate trust [73,74]. As part of this, they must demonstrate loyalty, abide by their commitments, avoid opportunism (i.e., breach of contract and “free riding”), and strive to achieve a win–win situation. With this in mind, it is necessary to strengthen willingness to cooperate among agricultural cooperation entities by establishing and improving the contract supervision mechanism [75]. Finally, a fair and reasonable interest distribution mechanism should be established in order to avoid conflicts between parties. This will render the goals of the cooperative entities more unified and coordinated and promote the long-term and stable development of cooperative innovation relations between resource-based cooperatives and non-resource-based cooperatives.

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