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Supply chain re-engineering: a case study of the Tonghui Agricultural Cooperative in Inner Mongolia

CASE STUDY

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Abstract

Benefits of cooperative organization in agriculture come from price advantages in procurement and marketing, cost reductions and efficiency gains from sharing of productive assets and processes, and improved access to and increased efficiency in using credit, logistics, and information. Efficacy of strategic activities designed to capture these advantages is investigated empirically in a case study of the Tonghui Agricultural Cooperative in Inner Mongolia, an autonomous region of China. Information from interviews, on-site visits, evaluation of cooperative, member and partner information, and participation in the advising process are used to evaluate the impact of efforts to re-engineer the supply chain for independent farmers through cooperative organization. Specific examples of marketing channel development and operation for Wallace melons and mutton represent implementation of strategic plans. The case also reviews the cooperative's credit system, designed increase access to and reduced cost of funds for members, use of alternative market venues, and horizontal expansion through tourism.

Keywords: cooperative, China, supply chain, agricultural marketing, financing
JEL code: P13, Q13, Q14

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> Cooperative position and strategy are viewed here as the ability of cooperatives to successfully find or develop economic benefits for their farmer members in a modern, market-oriented food supply chain.
>
> – Hohler and Kuhl, 2014: 581

1. Introduction

Cooperatives are economic and social organizations developed on the principles of voluntary membership, democracy, equality and mutual benefit to members. Since the 19th century, cooperatives in fields such as agriculture, industry, finance, insurance, medicine, transportation, science, and education have organized in more than 160 countries. The International Cooperative Alliance, established in London in 1895, is now one of the world's largest non-government organizations with 292 member organizations in 95 countries (https://ica.coop). Cooperatives are most widely used in agriculture where they have successfully been established to provide farmers and herdsmen production and marketing advantages not available to them individually.

There is an array of literature aimed at assessing the financial performance of cooperatives (Hohler and Kuhl, 2014; Lerman and Parliament, 1990; Parliament *et al.,* 1990; Sexton and Iskow, 1993; Soboh *et al.*, 2009, 2011). However, the more interesting question is 'why?', that is, what are the underlying causes of failure or sustained success of cooperatives? A theoretical model seeking an explanation is based on the expected impact of various characteristics and behaviors of cooperatives on performance. Included are those factors that increase revenues such as increased unit price due to market power, quality improvements, or branding and those that decrease costs such as reduced cost of inputs due to market power, sourcing additional vendors, or reduced transactions costs and efficiency gains resulting from technology adoption, through shared knowledge and experience, and in logistics (USDA, 1980).

Although there is no recipe for sustained success that can be applied generally, there are some relatively consistent findings within the literature about the source of advantages associated with cooperative behavior and these are consistent with this basic economic model. Holloway *et al.* (2000) and Roets (2004) concluded a cooperative organizational structure reduced costs, including transactions costs, in Africa. Abebaw and Haile (2013) identified efficiency gains from technology adoption among cooperative members in Ethiopia. Hohler and Kuhl (2014) identified sources of growth and success of farmer cooperatives in Europe to be consolidation and coordination, though vertical expansion and/or development of relationships within their marketing channel. They in particular noted the value of increased control over the quality and amount of product supplied that comes from coordination.

Also telling is information from the literature about causes of failure of cooperatives. These causes can, in general, be categorized into those associated with membership, decision-making, leadership, financial difficulties, and lack of government support. Membership issues include insufficient membership, make-up of membership as dominated by larger operations, an unstable membership, and lack of understanding and education among members about the cooperative structure and its functioning (Garrido, 2007; Machethe, 1990; Ortmann and King, 2007; Sexton and Iskow, 1988). Democracy and efficiency of decision-making are related challenges. Van der Walt (2008) identified conflict between members as a contributing factor to cooperative failure. Ortmann and King (2007) discuss the control problem that results from a misalignment between member and management interests and the influence cost problem wherein members with diverse interests work to direct management so that resources are not allocated in the best interests of the organization as a whole. Bernard and Spielman (2009) point out that those with lower levels of education and wealth are less likely to participate in the cooperative and more likely to be excluded from the decision-making process. Financing adds another challenge. The limited capital compensation feature leads to difficulties in financing capital projects and other initiatives and meeting cash flow requirements.

Sustained strong leadership is important to overcome these challenges (Ortmann and King, 2007; Van der Walt, 2008). If members are engaged and understand the benefits associated with working together, have

strong leadership that ensures they are provided with not only production, marketing and financial training, but that designed to help them understand cooperatives, they can be more effectively involved in the decision-making process (Ortmann and King, 2007; Machethe, 1990). Finally, is that this can best occur in a supportive external environment, including a proactive role by the government to support entrepreneurial activity such as the development of cooperatives (Ortmann and King, 2007).

From the literature, we identified the following cooperative characteristics or behaviors with potential to support successful and sustained performance in a newly developed cooperative: member understanding of and participation in cooperative governance; strong leadership; an efficient democratic process for decision-making; a large base of members with medium and/or small-sized farms; a willingness to coordinate the marketing channel by integration, partnerships, agreements, or other coordinating activities; and the support of government in that an environment that supports entrepreneurial activities and cooperatives. A democratic governance structure should be established in agricultural cooperatives to prevent the decision-making power from being monopolized in the hands of a small number of members or by management (Zhu *et al.,* 2015). Further, the cooperative must be both prepared and flexible as it faces new challenges and opportunities, including growth.

1.1 Cooperatives in China

In China, rural reform in the late 1970s established a rural management system based on household contract management (Li and Ping, 2003). In this basic system, although they co-existed with large-scale farms employing relatively modern agricultural methods, small-scale farmers held little wealth, had minimal market power, were specialized in production, used low-technology methods, and did not have access to current market information. They sold products through intermediaries and the products sometimes changed hands several times before arriving at the end consumer, contributing to the relatively high farm to retail price margin.

To help alleviate these challenges and improve the income of farmers, stabilize the price of agricultural production, and improve market efficiencies, China began to explore a wide range of cooperative economic organizations in the 1980s. Specialized farmer cooperatives have developed in China gradually since that time. The Law of the People's Republic of China on Farmers' Professional Cooperatives was approved in October 2006, and became effective on July 1, 2007. The law clarified the farmer cooperative's principal status in the market and provided regulations for their internal management system and behavior, further accelerating their development.

Six general trends typify agricultural cooperative development in China during the past three decades. First, the number has increased rapidly. By the end of October 2015, the number of farmer cooperatives registered with China's National Administration for Industry and Commerce reached 1.48 million. Nearly 100 million farmers (farm households) are members of farmer cooperatives, accounting for an estimated 47% of the farm population (Ministry of Agriculture of China, 2015). Second, the extension of farmer cooperatives into consumer markets has grown. By the end of 2014, about 370,000 farmer cooperatives had obtained quality certifications; nearly 700,000 had registered trademarks; and 230,000 had set up wholesale or retail operations. Third, the profitability of farmer cooperatives has gradually increased. The total unified sale value of agricultural products by all types of farmer cooperatives in China reached more than 750 billion Chinese Renminbi (¥) (approximately $119 billion), with surplus earnings of nearly 100 billion ¥ (approximately $16 billion). Fourth, the organizational forms of agricultural cooperatives have continuously innovated, and current cooperatives include those dedicated to rural land shareholding, community shareholding, labor, tourism, property management, and consumers. General cooperatives are also growing in number. Fifth, farmer cooperatives have played a growing role in agricultural production systematization and re-engineering, and optimization of the marketing channel for fresh and processed agricultural products. In recent years, many of the larger cooperatives have begun providing members with comprehensive services throughout the production and marketing processes including raw material procurement, new technology

adoption, information sharing, product grading and sorting, processing and packaging, transportation and brand management, as well as financial services (Kong *et al.,* 2012). Many scholars have argued that cooperatives can help mitigate challenges faced by farmers with small landholdings such as lack of market power, market venues and technical services (Hu *et al.*, 2015; Huang, 2011; Jia *et al.*, 2012; Yang, *et al.*, 2014). They have tended towards integration; horizontally, vertically, and both (Liao and Guo, 2015). Sixth, the role of cooperatives in leveraging the financial capacity of members is evolving and such is increasingly present as part of integrated agricultural cooperatives. This is important because there is considerable financial exclusion in rural areas (i.e. farmers have a difficult time securing funds from formal financial institutions). The World Bank's Community Development Fund pilot project in rural Shaanxi Province of China provides some support to the idea that cooperative finance is an effective way to provide farmers with credit services (Zhu and Ma, 2013). Cooperative finance can reduce the prevalence of lending through usuries, open financing options, concentrate idle money, cultivate farmers' saving practices, and improve life for farmers (Kong and Jin, 2012).

Despite the statistics and examples of the success of individual cooperatives in China, Hu *et al.* (2015) argue that there is considerable empirical evidence that most Chinese Farm Services Cooperatives are not organizations with viable operations under a cooperative structure. They looked at 45 cooperatives in 11 Chinese provinces over six years, selecting those that were established to demonstrate cooperative organization or had been recognized as success stories. They found many to be simply shells, organized for the purposes of receiving subsidies or for other similar reasons, and that others were operated as private firms with little or no benefit going to the farmer-members. Others had failed due to poor management or an unfavorable market. They concluded that government policy supporting the development of cooperatives has largely been ineffective.

Hu *et al.* (2015), among others, call attention to some problems that cannot be ignored in the rapid development of agricultural cooperatives in China, mainly as follows. First, the number of cooperatives in China is relatively large, but the scale is generally small. For example, the average registered capital of cooperatives is close to that of individual industrial and commercial households, which is approximately 5% of that of the average private enterprise (Ministry of Agriculture of China, 2015). Second, the services provided by existing cooperatives are mainly concentrated in the production of agricultural products, and the role played in the sales link is still relatively limited. Many lack financial, insurance, social security and other services. Third, the internal operating structure of most cooperatives is not mature enough to ensure that smaller shareholders maintain their voice in the cooperative, and there is a lack of effective external supervision. Finally, the legal structure supporting the development of cooperatives is not yet sound. As noted, current cooperative development falls under the Farmers' Professional Cooperatives Act which lacks specific rules. Land management, the tax system and other key areas related to rural success and potential for cooperatives also suffer from a lack of effective legal guidance.

1.2 Problem statement

Although evidence about the performance of cooperatives does not allow for drawing general conclusions, and is in fact sometimes conflicting, what is clear is that, with varying degrees of success, cooperatives have expanded their involvement in the marketing channel. Included are consolidated purchasing of inputs and sales of commodities, providing or facilitating financing, sorting of farm products, processing, logistics activities including storage and transportation, wholesaling and retailing, and branding. We look here at one cooperative in Inner Mongolia, China, Tonghui Agricultural Cooperative (TAC). Local farmers and herdsmen suffered from many of the same challenges that cooperatives are meant to address. Included are low education and literacy rates, lack of purchase and sales power and inadequate number of market venues, especially for sales, lack of availability of and ability to obtain financing, lack of market information, and poor logistics infrastructure. This paper covers the evolution, current situation, and future plans of TAC in an empirical application of the theory of cooperative establishment, investigating the performance of strategic and tactical decisions in improving income for farmer-members. Through extensive interviews

with managers, consultants, farmers and herdsmen, and participants in the marketing channel[1]; on-site visits, and participation in the advising process, we investigate how TAC worked to re-engineer its supply chain for fresh produce, crops, and livestock, and the products of each, and how material, information, and fund flows are linked within a developing cooperative which offers production, supply, marketing, and facilitating functions. The agricultural production and marketing channels have been improved however measured (e.g. efficiency, coordination) and the income and welfare of farmers and herdsmen has increased. Risks associated with agricultural production and operation, as well as that faced by upstream and downstream partners and facilitating industries are reduced due to the emphasis on coordinating activities and integration. Finally, the gap in rural financial funds is reduced.

This case study seeks to answer the following questions:

1. Specifically, how does TAC use the flow of information and capital, and its logistics system to integrate and coordinate the supply channel from the purchase and use of inputs to the end consumer to improve the welfare and income of local farmers?
2. Given that the development of many farmers' cooperatives in China has failed, what is different about the organization and strategic and tactical behavior of TAC that has led to success?
3. How has TAC impacted the rural economy?

The remainder of this paper is organized as follows. Next is a discussion of the concept of engineering and optimizing the supply chain. TAC is then introduced and evaluated using the principles described for cooperative success. Detailed examples of the marketing channel development of two products are provided. Examples of horizontal expansion into rural tourism and of the industry facilitating function of credit are explored. The paper finishes with discussion and conclusions.

[1] Contributing participants include the Chairman of the TAC Association, the TAC General Manager, the Chairman of ZhinongFumin Agriculture Co., Ltd., Deng County Agricultural Bank, Bank of China, Mengyin Village Bank, Dengkou County Rural Credit Cooperatives Credit Department. The authors visited TAC headquarters and facilities including the Wallace melon planting base, Dengkou sheep breeding base, and TAC warehouses and logistics facilities. TAC staff, farmers and herdsman including those responsive for the sheep breeding herd, and logistics staff were interviewed at length.

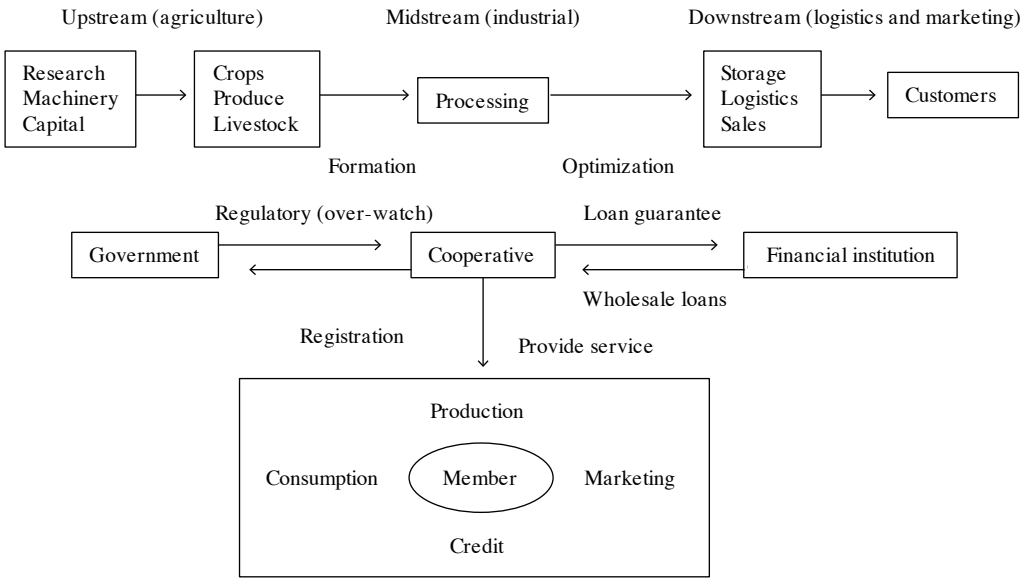

Figure 1. Cooperative agricultural product supply chain.

2. The cooperative supply channel

The supply chain of agricultural products runs through multiple stages that may include the supply of inputs, production, post-harvest preservation, processing, storage, wholesale, retail and consumption. Cooperatives can serve as an entity that brings together the many participants including farmers and herdsmen, researchers, government, the financial and agribusiness sectors, processers, logistics channel participants, and buyers including distributors, wholesalers, retailers, and the end consumer. The operation mechanism of cooperatives based on a supply chain of agricultural products serves to guide the discussion (Figure 1). The top shows the agricultural supply chain within which the cooperative operates and works to coordinate. The middle depicts government oversight of the cooperative and its guarantor role in member borrowing. Chinese cooperatives need to be registered with and are supervised by the State Administration for Industry and Commerce of the People's Republic of China. The rectangle at the bottom includes the supporting functions provided to members by the cooperative. Cooperatives provide their members with the services of production, supply and marketing, and provide financial support for the members directly or as a guarantor. Cooperatives also serve to integrate and coordinate, improving the efficiency of the marketing channel.

Market relationships are motivated by opportunity. The cooperative works to help participants exploit potential benefits of a coordinated marketing channel (Table 1). The cooperative can help farmers and herdsmen achieve the benefits of scale economies and provide technical expertise, improve access to credit and information, reduce risk, and open new marketing channels. Participating enterprises in the supply chain include agricultural input suppliers and those who purchase primary agricultural products directly. Through a stable relationship with the cooperative, transactions costs can be reduced, forecasting improved, and profits increased. In addition, the relationship with the farmers through the cooperative allows the firms to provide technical guidance and other services that help farmers and herdsmen meet specific quality requirements.

Financial institutions offer financing for the various participants in the supply chain. In rural China, financing efforts are hindered by inadequate information disclosure, high credit risk, high moral hazard, and high transactions costs and many farmers are unable to obtain operating loans from financial institutions. Coordinated activities allow for increased visibility on borrowers and reduced risks from additional guarantee mechanisms. Improved transparency also facilitates government oversight and the ability of the government to judge the need for and to distribute subsidies. This helps the government reach its objectives of improving the standard of living for farmers, promoting local economic development and enhancing its image. Consumers can also be beneficiaries. A coordinated marketing channel can improve quality monitoring and control, including that associated with ensuring food safety. In addition, supply chain management reduces the involvement of intermediate links and in other ways can reduce costs, which can reduce cost for consumers.

Table 1. Potential benefits to supply chain participants with cooperative core.

Participant	Benefit
Farmer/herdsman	Technical guidance and education on production and business; increased access to market information and credit, risk mitigation, reduced costs, improved revenues and profits.
Enterprise	Improved forecasting, reduced production costs, increased profits, better control over product quality.
Cooperative	Scale expansion, increased operating income, increased market influence.
Financial institution	Alleviate challenges of asymmetric information and high transaction costs, develop the rural financial market, fulfill social responsibility, enhance image.
Customer	Improved quality, quality and food safety assurance, reduced cost.
Government	Increased information, improved efficiency and equity in distributing subsidies, stimulate local economy, enhanced image.

2.1 Optimization of the marketing channel

After the development of the primary agricultural supply chain through integration and coordination, a cooperative can work to refine the system to capture further efficiencies and more effectively exploit market power. This second phase we call supply chain optimization. It usually includes one or more of the following: vertical extension, horizontal expansion and supply chain integration.

Vertical extension of the supply chain can include extension into the farm-supply sectors including financing, into post-production sectors including processing, transport, storage and marketing of agricultural products; and the addition of intermediate links. In addition to traditional operating and capital inputs in the upstream sector, cooperatives may develop research programs, form technical education programs, and develop and enforce quality control standards. In the downstream channel, cooperatives can establish agricultural processing plants and cold storage, or develop a contractual relationship with enterprises that supply these value-adding services. Whether the tie is achieved through integration or coordination, processing fresh agricultural products can have a very important effect on the quality of the resultant products and the market price received for such. While large cooperatives can vertically expand to include sorting, grading, cleaning, processing, packaging, and inspection, the investment required to develop a transportation infrastructure can be prohibitive. As such, in rural China this extension is often through coordination with a third-party logistics company.

Horizontal expansion of cooperative activities need not be limited to the addition of members and their agricultural products. Expansion can include an increase in the scale and technical level of value-adding processes (e.g. additional cold storage), but can also include activities such as eco-tourism, financing and insurance, and other secondary and tertiary industries, such as pick-your-own operations, eco-resorts, and farmhouse stays. In the process of supply chain integration, cooperatives will play a key role. They can act as intermediaries, providing services to their farmer members before, during and post production; act as the negotiating agent for purchasing farm inputs and selling agricultural products; and facilitate the development of value-adding processes.

3. Tonghui Agricultural Cooperative

Inner Mongolian TAC is in Dengkou County, Bayannur City. Dengkou County covers an area of about 1,038,000 acres including approximately 260,000 acres of arable land. The county contains four towns and one Süme[2]. It has a population of approximately 130,000, of which 40% are rural residents. The area includes a complex variety of land forms, including mountains, deserts, plains and rivers. In the northern part of the county is Mount Langshan, which covers a rocky mountain area of about 239,000 acres. In the western part, there is the vast Ulan Buh Dessert whose surface is covered with dunes and psammophytes. Ulan Buh Dessert covers an area of about 703,000 acres. In the eastern part, there is the vast alluvial plain of the Yellow River. The plain is flat and fertile and covers an area of about 76,000 acres. Crossing channels that run through the plain make irrigation convenient. The Yellow River crosses the southern part, covering an area of 11,530 acres.

The Yellow River brings rich water resources to the county. The environment is favorable for a variety of crop and livestock farming. The main grain crops are corn and wheat. Beef, sheep, and pigs are raised. Farming can be characterized as decentralized management by local farmers and herdsmen. Technology used and facilities are not standardized. There is little coordination in the supply chain. Each of these challenges has hindered the development of the region's agriculture.

Since the Law of Farmer Cooperatives was implemented in 2007, leaders in Dengkou County have worked to guide the development of farmer cooperatives. By the end of 2015, farmer cooperatives registered in the

[2] Süme refers to a community of minority people, generally larger than a village but smaller than a town.

county by the Bureau of Agriculture and Animal Husbandry reached 153, including those of crop and livestock farmers, and their supporting industries. Approximately 80% of farmer cooperatives in the county are crop or livestock cooperatives and are small scale, providing only single service. As such, as noted about many Chinese cooperatives in general by Hu *et al.* (2015), existing cooperatives have had little effect on farmers' incomes and development of the agriculture marketing channel. TAC was established to help overcome these noted challenges facing the farmers and herdsmen. The cooperative has quickly helped farmers organize and coordinate internally and with market channel partners, improving the income of farmers and herdsman as well as that of the local economy.

3.1 Organizational Structure

TAC was registered on March, 20, 2015 with registration capital of 10 million ¥ ($1,562,500) and inaugurated on May 20, 2015. The cooperative was initially organized by five individuals[3], each of whom provided a capital investment of 2 million ¥ ($312,500). By September 2016, the cooperative claimed 471 member-households[4]. The charter specifies the cooperative principles of voluntary membership, and equal and democratic membership.

Three bodies including the General meeting of members, Board of management and Board of supervisors are responsible for guiding the cooperative and oversight of management and decision making (Figure 2). There are four operating departments: production, marketing, finance and administration and eleven sub-departments.

Division of labor and cooperation between different departments has been important to success. Each member has one vote regardless of their capital contributions or transactions, which promotes democratic decision-making. TAC actively engages members in decision-making at all levels. All-member meetings are held quarterly. TAC also invites its members to participate in forums and training designed to improve member understanding of the role and functioning of cooperatives, improve their production efficiency and gain

[3] Ma Fei, Ren Guangyin, Wang Lu (Chairman of the Board of Management), Ma Shaoqi, and He Yongxiong (Chairman of the Board of Supervisors).
[4] Only one member of each household can be a member of the cooperative.

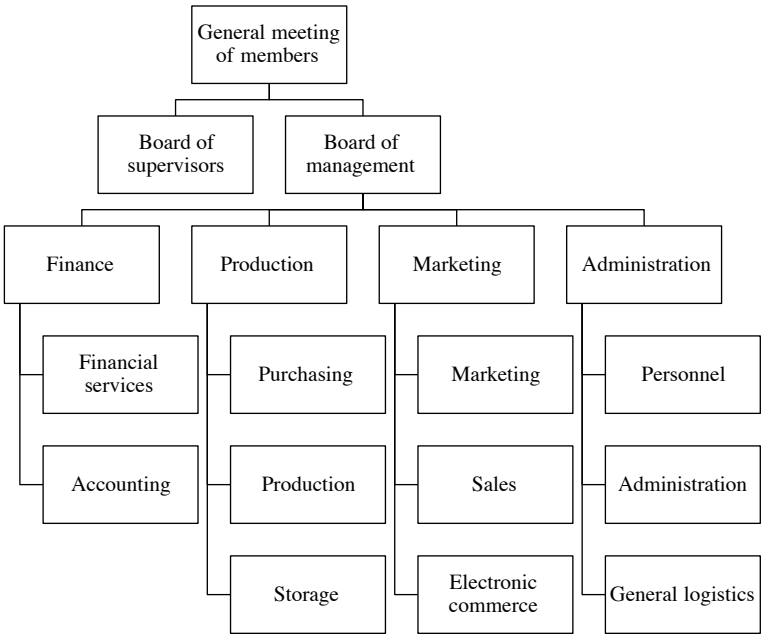

Figure 2. Organization structure of Tonghui Agricultural Cooperative.

their input on means to do the same, and protect their rights and interests. Some examples of cooperative-sponsored activities are shown (Table 2).

To organization farmers together in the steps of production, marketing and logistics to effectively provide a broad range of services, TAC set the county as the management center entity. Branches are in towns and liaison service stations can be found in villages. These branches allow the cooperative to take advantage of the informal system of rural acquaintances so important in China to reduce transaction costs and manage risk. At present, TAC has nine grassroots branches and 27 service stations, providing service for more than 3,000 rural households (Table 3). Grass-roots branches play an important role in assurance, development, organization and information transmitting. They are also responsible for keeping track of transitions between members and the cooperative. To best serve the members, the cooperative selects appropriate shops in villages to work as liaison service stations. In village shops, members can exchange and disseminate information, and make purchases. Members can often take advantage of an offered discount by the village shop and those nearby.

Membership requires an applicant have full capacity for civil conduct, be honest, have a good reputation, and be a farmer or herdsman with a demonstrated mastery of agricultural skills, all measured subjectively by the membership board. Members who are hardworking and honest are more likely to unite, improve production

Table 2. Participation of members of Tonghui Agricultural Cooperative.

Activity	Date	Content	Participating households
Establishment ceremony	May 2015	Ceremony, introduction to cooperatives	110
National forum on industrialization and cooperative economy	Dec. 2015	Agricultural policy, Internet, project docking contracts, site visits	400
Grassroots branch trainings			
Nalin	Jan. 2016	Purchasing, sales, credit cooperation	70
Xindi	March 2016	Operating and transferring land	30
Minxing	June 2016	Trinity of cooperation, operation of cooperatives	55
Experiment bureau	July 2016	Cooperation in pensions and collective management of land	67
Bianming	July 2016	Internet basics, Internet and traditional sales	70

Table 3. Grassroots branches of Tonghui Agricultural Cooperative.

Name	Have Tonghui warehouse	Member households
Bianming	Yes	35
Haigang	Yes	5
Nalin Lake	Yes	55
Minxing	Yes	75
Experiment Bureau	Yes	45
Xindi	No	50
Dongdi	No	30
Shajin Süme	No	101
Wulanbahe	Yes	75
Total		471

efficiency and create a better life under the guidance of the cooperative. Each member is required to pay 100 ¥ ($16) for qualification shares.

Wang Lu was voted as professional manager by members at the general meeting of members. He manages production and marketing. Staff were selected from among the membership to lead the departments of production, marketing, finance, and administration. There are currently 14 employees. All of them are between 25 and 50 years old and have at least a junior high school level education. Two hold graduate degrees and four hold certificates of completion from three-year vocational colleges.

3.2 Operation

TAC provides and coordinates services for members and distributes proceeds[5]. Benefits to members originate from three sources, consistent with the foundational principles of cooperatives. First, production costs are reduced through increased market power for procurement of inputs and production efficiencies resulting from education and training. Second, sales revenues increase and market risk declines because of marketing efficiencies from economies of size and from cooperative storage, logistics, and marketing activities. Third, the cooperative increases access to and reduces the cost of credit for members. The cooperative has successfully earned profits, which are distributed to members based on their transactions volume with the cooperative. The cooperative also distributes subsidies to members on behalf of the government.

- *Training and technical guidance*

TAC provides services, training and technical guidance for farmers and herdsmen to improve product quality and production efficiencies as well as to help members understand the production standards required for certifications in both crop and livestock production. Volunteer experts who understand and are experienced users of modern agricultural production techniques, including local experienced cooperative members, and active or retired government workers and professors, provide regular guidance and training for members and also work with farmers and herdsmen individually. For example, they will conduct farm soil testing and analysis to aid in the recommendation of seeds and fertilizers for individual fields.

The Cooperative facilitates availability and understanding of market information. A Chinese farmer may be hard working and have gained productive skills honed from many years of experience, yet continue to lose money because he does not have access to and is not skilled at using market information. Acting independently, farmers often make production and marketing decisions based on market and production success and failures from the previous year (e.g. if the price of a product in the previous year was strong, they will increase production of this product). External expertise and that provided directly by the cooperative can guide members to adjust production scale and structure according to current and expected market conditions.

- *Marketing cooperation*

Farmers who produce independently and in small scale are at a disadvantage in the market and lack negotiation capacity. TAC adds value for its members through reduced input costs, adding value to products internally through storage and processing, and increased prices and reduced risk by exploiting multiple marketing opportunities.

Reduced input costs: TAC negotiates upstream purchases on behalf of its members. Presentation of cost savings from two key inputs serves as an example of this value. During its first sixteen months in operation,

[5] An ideal contribution to this manuscript, as suggested by a reviewer, would be a quantified analysis of the value of the cooperative to individual farmer-members. Most farmers in the region are not well educated and for other reasons, their use of record-keeping, financial or otherwise, is minimal. In the absence of evidence about the financial impact for individual farmers we therefore provide some detail regarding revenue- and efficiency-enhancing and cost-reducing activities provided by the cooperative for membership groups. For example, cost-savings are estimated for a group of farmer-members purchasing their fertilizer and plastic sheeting through the cooperative.

taking advantage of negotiation power originating from size of purchase and exploiting multiple procurement venues, TAC reduced member cost of fertilizers and plastic film by more than 20,000¥ ($3,175) (Table 4). This may not seem like an important savings in the context of western agriculture, but it is important in China where the average farmer earned an annual net income of $1,175 in 2015 (Green Book on China's rural economy released by the Chinese Academy of Social Sciences and quoted in http://tinyurl.com/yb57yeqv).

Professional centralized storage: Recommend Cooperative organization also facilitates activities associated with increasing revenue. Fresh produce has a short shelf life and is difficult to preserve. Product loss due to spoilage is high for local farmers using self-storage because their facilities are primitive and improper storage techniques are widely employed. TAC built local warehouses for storage, including advanced preservation technology to extend the storage life for fresh produce, frozen meat, and other products. This has substantially reduced loss. The warehouses further facilitate cooperative growth through multiple functional usages. In the spring, agricultural inputs such as seed and fertilizer are stored in the warehouses. Warehouses are used to dry agricultural products in summer, and store them in the fall. Stored products can be used as collateral for bank loans throughout the winter season.

Marketing diversification: there are few options for local farmers and herdsmen selling their products independently. To help its members overcome this challenge and thereby increase revenues and decrease risk, TAC worked to develop a diversified marketing system. The cooperative sells over 160 products including both commodities (e.g. grains, sunflowers, fruits, vegetables, whole chickens, eggs) and the products of those commodities (e.g. wheat, sunflower seeds). Channels employed include an electronic commerce platform, mobile application store, and sales through wholesale markets and chain stores, directly to independent retail stores, and through a store front with a home delivery option.

China is the world's largest e-commerce market (http://tinyurl.com/yb26p9fr) and TAC has exploited the value of the internet, including building Taobao[6] and Wechat[7] stores for the mobile internet customer, and cooperating with electronic commerce platforms such as Tootoo Commune (Figure 3)[8]. As a means to communicate to consumers, including those purchasing online, the attributes of food products otherwise considered commodities, the cooperative registered the Tonghui brand. Fresh products (e.g. pork, chicken, lamb) are assembled from independent members. The Cooperative then examines, processes, transports, and sells these products under the Tonghui brand. Use of e-commerce has been an important venue to expand brand awareness and gain market share. The cooperative also provides fresh produce for supermarkets directly including two supermarkets in Wuhai City, a nearby city with a population of over 500,000.

[6] TaoBao (淘宝网; pinyin: Táobǎo Wǎng; literally interpreted as 'searching for treasure website') consists of a Consumer to Consumer Platform (Taobao Market place, similar to Ebay), Tmall.com (a business to consumer platform similar to Amazon), and eTao (an online shopping search engine). It was founded in 2003, has a gross income estimated to be more than 1 billion ¥ (approximately $156 million), and retains a majority market share in Mainland China (https://en.wikipedia.org/wiki/Taobao).

[7] Wechat (微信; pinyin: ēixin; literally interpreted as 'micro message'), originally introduced as Weixin, was first released in January 2011 and is a one-interface mobile service center. It serves as a social networking site (similar to Facebook) and also facilitates text messaging, broadcasting, video conferencing, and sharing of locations, photographs and videos. It includes an embedded translation service, supports payments and money transfer, and supports city services, which allows for such activities as making doctor appointments, paying city fees, and arranging transportation (e.g. booking a taxi). Wechat also serves its approximately 600,000 active users as an e-commerce site.

[8] TooToo Organic Farm (http://www.tootoo.cn/index-en-1.html) was established in 2008. The e-commerce site sells organic produce, fish and meat, and grain products; and a small selection of drinks, bakery items, and daily-use items such as paper towels.

Table 4. Materials purchased through Tonghui Agricultural Cooperative (TAC) (June 2015 to September 2016).

Year	Product	Quantity	Market price ($)	TAC price ($)	Reduced cost ($)	Farms
2015	Urea	100 kg	178	171	640	32
2016	Plastic film	266 sheet	17	16	346	30
	Diamine	94.4 kg	441	433	755	38
	Urea	239 kg	203	197	1,530	78

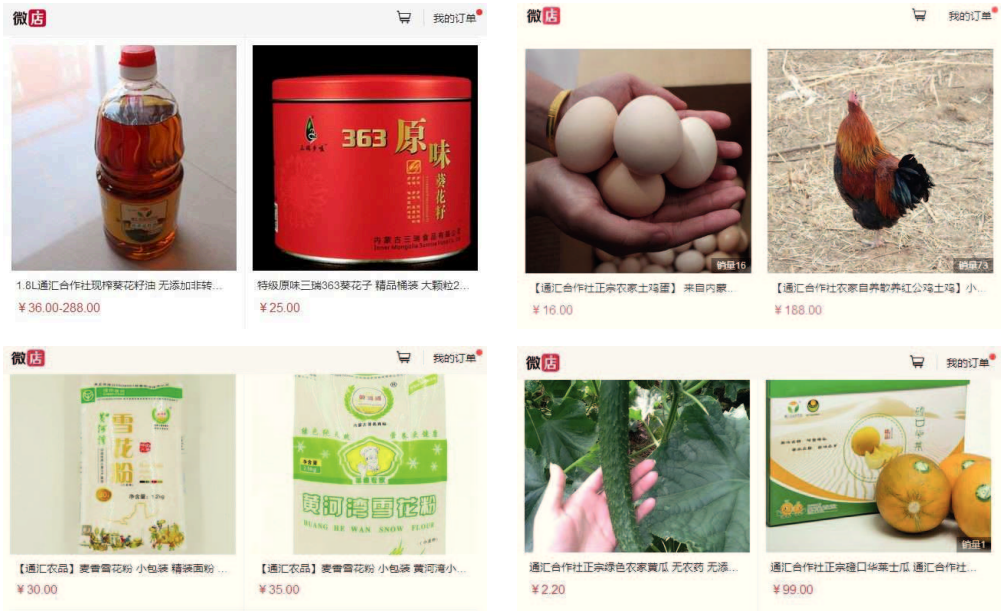

Figure 3. Examples of Wechat store products of Tonghui Agricultural Cooperative.

At the end of 2015, maintaining the principles of high quality, healthful products produced in an environmentally-sustaining manner, TAC entered the agricultural products sales market in Wuhai under their Home Life Company (HLC). HLC provides TAC with a business outlet as their traditional store front in a new agricultural products sales market. The outlet consists of 108 m^2 of floor space. It was renovated with the 'Tonghui Farm' theme (Supplementary Figure S1). Nineteen employees are responsible for its operation, store management, product promotion, technical maintenance, and financial management.

The cooperative uploads details about agricultural products for sale regularly onto its HLC consumer application. Consumers can select and purchase goods using this application. HLC collects and transfers the sales data to the cooperative weekly, and the staff screen, process and package the products. TAC continues to utilize third-party logistics. In this case, TAC partnered with the Wuhai Post Office. Every Friday, the cooperative sends food products to Wuhai outlets and, from there, the Wuhai Post Office sends the packaged foods directly to consumers.

Targeted couponing: to increase sales, TAC has worked to develop high-income consumer markets. More than 400,000 high-quality customers use the Wuhai Mobile Company's application. Many in this target market work in the government sector, at financial institutions, and at state-owned enterprises, have a higher net worth and/or income, and value product attributes including healthy foods and those produced using environmentally-sustainable methods. In March, 2016, TAC and Wuhai Mobile Company signed a business cooperation promotion agreement. Wuhai Mobile Company provides approximately 4,000 customers in TAC's target market the opportunity to earn points towards a Tonghui Farm Products cash coupon. This coupon can be used directly for purchases from the Wuhai HLC.

Pre-sales channels: the cooperative also carries out pre-sale business. Tonghui farm provides consumers in Wuhai with monthly, quarterly, half-year and full-year pre-sale services. Taking the full-year pre-sale services as an example, consumers sign a contract with Tonghui Farm to pay 3,000¥ ($476) annually, and receive products including rice, flour, and meat delivered to their home each Friday. The delivery volume specified in the contract is designed to feed a typical family for one week for 60¥ ($9.50) per week. This system provides some volume and price stability for the cooperative and helps promote the Tonghui brand.

■ *Production efficiencies*

Since establishment in March 2015 through the end of the year, TAC operated at a loss as they had significant cost investments and were not yet operating at a break-even level. Yet, because TAC provided benefits to and improved the income of its local farmer members from the beginning, the cooperative was granted subsidies. In December 2015, at its National Agricultural Industrialization and Cooperation Economic Summit Forum, TAC was granted subsidy funds in the amount of 100,000¥ ($15,873) from the Dengkou County Agricultural Animal Husbandry Bureau. In March, 2016, TAC implemented its experimental project to explore the Wallace melon rejuvenation and seed breeding, having obtained an additional subsidy from the same source; this one for 160,000¥ ($25,397). The government not only encourages and fosters an environment that facilitates entrepreneurial ventures, but provides funds; funds which are critical to accelerate the growth of the cooperative. Since the second quarter of 2016, TAC has become profitable (Figure 4).

4. Supply chain development

Dengkou County covers a vast geographic area. There is a diverse terrain, good soil, and clean air and water, bringing forward considerable potential to produce high quality agriculture products. At present, total farmed area approximates 128,500 acres and improved varieties are already used on most planted acres. Production agriculture has in fact been developing at a faster rate than the supply channel needed to successfully bring the products to market. Facilities used for agricultural production in 2013 had already grown to 1,450 acres. By this time, these facilities included 742 acres of solar greenhouses and 708 acres of plastic greenhouses, both of which support large scale off-season growth and availability of melons, vegetables and seedlings. Livestock farming has also been developing rapidly with inventories at 662,500 animals. And, many farmers have begun producing using methods that qualify the products as a Green Health Product which is analogous to an organic food certification in the U.S.

Despite progress in production, the location of Dengkou County is remote to cities and the local rural infrastructure is not well developed. Poor transportation and low-capacity, primitive agricultural storage facilities greatly impeded local agricultural development. In addition, the county continued to struggle with inadequate financial services. To overcome logistics and storage challenges, TAC worked to integrate resources in planning, procurement, production, and sales and distribution to fit local conditions, including building partnerships with upstream and downstream market participants. For this case study, we consider two distinct products, the Wallace Honeydew Melon and Dengkou mutton, to investigate how the cooperative worked to coordinate the marketing channel, facilitate member access to the resources needed to successfully

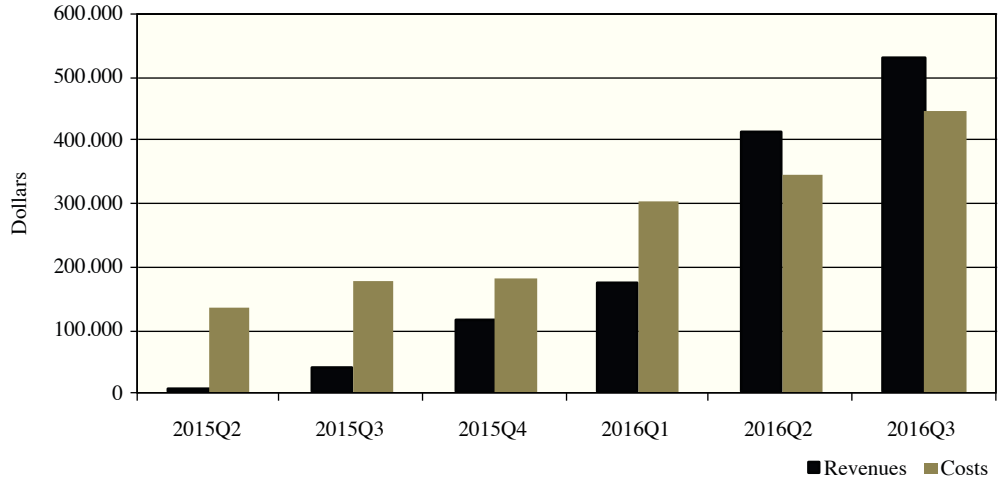

Figure 4. Revenues and expenditures of Tonghui Agricultural Cooperative.

serve potential markets, and increase member income. We focus consideration on these two products in the manuscript because, as was noted by Reardon and Barrett (2000), cooperative structure may be especially important for produce and meat because cooperatives can provide training and resources to help facilitate production to grading and contract standards, serve to sort products accordingly and ensure quality. Further, both are highly perishable and therefore coordinated storage and logistics can produce considerable benefits to farmer-members.

4.1 Wallace Melon

The production area of the Wallace honeydew melon[9] is adjacent to the Ulan Buh Desert on an alluvial plane of the Yellow River. The deep and fertile soil contains abundant organic minerals. The climate is characterized by over 3,000 hours of annual sunshine, dry air, and a high temperature difference between day and night. Despite little precipitation, irrigation from the Yellow River is convenient. This growth environment results in the unique features of the Wallace Melon that differentiates it from the traditional honeydew melon including a thin skin, thick flesh, sweet juice, moderate crispness, rich fragrance and a high level of nutrition.

Freshness of the Wallace Melon directly affects taste and it is generally not suitable for longer-term storage. As there was neither a mature preservation technology nor a well-developed logistics system in Dengkou, both the production and distribution activities were previously conducted by farmers independently. As there had been no efforts in market development, output was low. Most melons were sold within the county or offered as gifts to visiting friends and relatives.

■ *Recruiting producers*

Within months of its establishment, TAC began positioning the Wallace Melon as one of the most promising products in Dengkou County. Cooperative leadership worked to simultaneously build a market for and expand production of these melons. They developed a recruitment plan specifically aimed at farmers currently growing melons, especially those with experience growing Wallace Melons; and worked to reduce melon seed costs and simplify seed procurement for farmers by collectively purchasing seeds from the Local Agriculture and Animal Husbandry Bureau. Previously, farmers worked with the Bureau independently. The cooperative began to purchase seeds in bulk and subsequently sell them to farmers at the wholesale price. Planting area increased from 165 acres in 2013 to more than 824 acres in 2015.

■ *Improving and standardizing production (capability)*

The Cooperative hired professional melon planting experts to carry out field investigations, develop and put forward recommendations, and launch a school for melon farmers. Experts provided information and consulting on land selection, land preparation requirements, ridge preparation and fertilization, seed sowing, disease and insect control, topdressing, cultivating and weeding. As such they not only helped growers improve their production capacity and efficiency, but helped the cooperative standardize production management, improving the ability of members to meet qualifications such as those for Green Food Base, Good Agricultural Practices, and export registration base certifications.

Volume of production was further encouraged in February, 2016 when the Department of Agriculture and Animal Husbandry of Inner Mongolia Autonomous Region and Agriculture and Animal Husbandry Bureau of Dengkou County offered grants of 200,000 ¥ ($32,000) and 130,000 ¥ ($21,000), respectively, to build greenhouses. This support facilitated cooperative development of new varieties and promoted fertilization,

[9] Referred to as the 'Wallace Melon' in China, this is similar to the honeydew melon. It was bred to be slightly sweeter and has higher moisture content and a shorter shelf life. There are multiple historic accounts of the use of the term Wallace Melon Chinese: 华莱士; pinyin: Hualaishi), ranging from that commonly understood in Inner Mongolia, that Vice President Wallace visited the region and so enjoyed the melon that the people thereafter referred to it by his namesake, to the name originating from the donation by Mr. Wallace, who was also the founder of Pioneer Hybrid Seeds, of the melon seeds while visiting China in the 1940s.

disinfection, pest control, harvesting and other steps by helping the cooperative and its members adopt advanced technologies. New generation Wallace greenhouses were built, each covering about 2.5 mus (0.41 acres) with an expected output of 2,500 kilograms per mu.

■ *Shelf-life extending technology*

Cooperative leaders understood that adopting the technology required to extend the storage period of the melons was the key to the successful development of external markets. However, there were no domestic storage technologies available that could match the specific requirements of the Wallace Melon. That changed shortly after Mr. Wang became acquainted with Mr. Liao, Director of the Taiwan Farmers Association, at an economic development forum. They discussed a preservation technology used in Taiwan that applies ozone sterilization, preservative and coating treatments, and advanced refrigerated storage techniques steps in the storage and preservation process. This technology is well suited for Wallace melons produced in Dengkou, and cooperation with the Taiwan Farmers Association provided TAC with the solution required. The introduction of this advanced preservation technology extended the shelf life of the Wallace Melon from three days to fifteen (Table 5).

■ *Market development*

TAC simultaneously worked on market development. Beijing was identified as having considerable potential as the large city nearest to Dengkou. Distance is important as production and particularly logistics costs of Wallace Melons are high. Because of the high logistics costs, a higher income market was targeted.

Faculty at Peking and Renmin Universities in Beijing and several supporting industry partners helped to develop the market-entry strategy. The strategy identified the primary marketing channels for Wallace Melons to include an e-commerce platform and direct sales to supermarkets. In 2015, TAC signed an agreement with All-China Federation of Supply and Marketing Cooperatives (ACFSMC), enabling Wallace Melons to directly enter the e-commerce platform of the ACFSMC and be sold throughout China. This is an example of the willingness to work with other cooperatives identified as an International Cooperative Alliance principle (Ortmann and King, 2007). The admission to the e-commerce platform also represents the acquisition of the 'quality endorsement' from the ACFSMC, which provides further support to brand image.

Supermarkets place orders directly and the cooperative schedules deliveries from TAC warehouses. The products are loaded in the early afternoon and scheduled to arrive in Beijing by 2 a.m. so they can be placed on shelves in all physical supermarkets prior to 6 a.m. The cooperative uses a third-party logistics company, and engages the technology noted previously to help guarantee the quality of the product when it arrives in Beijing.

4.2 Dengkou Mutton

Livestock plays an important role in the economic development of Dengkou County. In 2013, the output value of animal husbandry reached $69 million, comprising nearly one-third of the total value of agricultural output. In recent years, the number of standardized, large-scale livestock farms has increased steadily. A

Table 5. Preservation technology and equipment cost of fresh agricultural products.

Product	Non-refrigerated shelf life	Cold storage shelf life	Refrigeration equipment type	Equipment cost ($)
Honeydew	5 days	3 months	OBBH3-45M	87,302
Wallace melon	3 days	15 days	OBBH3-45M	87,302
Dengkou mutton	5 days	1 year (frozen)	OBBL2-250L	103,175

majority of the livestock raised in this region are sheep[10]. Shepherds can provide a high-quality product at a relatively low cost, and Dengkou County had secured a place in the domestic fresh product market. However, over time, lack of organization, antiquated production facilities and processes, and lack of a brand contributed to the declining price for live sheep for local producers and, regardless of herd size, herdsmen have suffered losses. Because of these struggles and the regional importance of sheep, TAC selected the industry as a strategic priority. The cooperative employed methods to cut cost and improve market access like those developed for the Wallace Melon including recruiting additional producers, inviting experienced members and other professionals to offer training, consolidating procurement and marketing activities, and adoption of improved logistics and storage technologies. The most influential contribution was the role of the Tonghui warehouses.

In a similar strategy to that employed for the Wallace Melon, to attract sheep farmers to join the cooperative, TAC negotiated reduced prices for raw materials and invited experts to provide technical expertise and teach short courses. On the supply-side a different strategy would need to be employed. Approximately 70% of the meat produced in the county is exported. The cooperative needed to consider development of marketing channels for export and worked under the reality that the world market dictates price and increases substantially the risk faced by herdsmen. At this time, sales models such as contract farming, electronic business platforms, and directly arranged links between farmers and supermarkets were not mature and not used by local herdsmen. To extend the viable sales window to help mitigate risk associated with price volatility, the cooperative decided to establish additional town- and village-level warehouses and equip them with freezers to store meat. Although this strategy allowed member-herdsmen to reduce the effects of external market volatility, there was a need to do more. As sales of Dengkou mutton had declined in recent years, capacity use of small-scale local processing factories was relatively low, and some were nearly idle. Even the larger-scale facilities faced a sharp reduction in use. Cooperative leadership proposed that the warehouse enterprises be combined with existing local fresh-processing capability, and the idea gained support among the members. Tonghui Warehouse began its expansion in September 2015 with a focus on integrating the fresh-processing facilities. The cost of integrating existing facilities was far less than the establishment of new facilities. The warehouses provided the cooperative the flexibility to carry out secondary processing steps based on storage capacity and forecasted orders. Their use would also serve to bring additional jobs to the area. Tonghui quickly built or updated seven warehouses, each with a supply radius of about 25 miles. The largest one covers 32,290 square feet and the smallest is just 4,300 square feet. They upgraded existing processing equipment, and introduced meat roll and packaging equipment and quick-freezing warehouse technology, expanding their ability to offer both primary and processed mutton. The option to contract out the processing step to large-scale meat processing factories was retained.

■ *Brand development*

Currently, some domestic fresh mutton brands stand out among others, such as Xinliguole, Donglaishun, and Tianmashengtai. Foreign brands such as New Zealand Sheep have also become popular in recent years. In addition to managing processing and storage, the cooperative was faced with the challenge of creating a brand image that would stand out in a field that had become increasingly crowded with branded product. During their market analysis, the cooperative discovered that most mutton sold under existing brands came from large sheep farms rather than from individual households, the latter being the case in Dengkou County. The local way of raising sheep is through open-range grazing as it is a long-held local belief that sheep free to graze on open land result in a more natural and delicious product. The cooperative chose to build on their production practices rather than adapt them to the confined facilities used to support most other brands. They developed a 'free-ranging, naturally healthy' brand image.

[10] Hand-grabbing mutton is a rich tradition among the residents of Inner Mongolia. Local residents believe that the local grasslands grazed by sheep and cattle contain five herbs necessary for complete seasoning so that mutton can be cooked without seasoning. The mutton is simply cut into pieces and boiled in salt water.

Challenges for Tonghui Cooperative were small animal numbers, a lack of market power, and cultural and other differences between members within the cooperative that made it difficult to coordinate as required for brand establishment and development. Chairman Wang summed up the outcome of discussion among cooperative members in his statement, 'Our limited funds determine we cannot promote our brand by advertisement over a short period. We can only establish our own brand to be low-cost, and then improve our product step by step, accumulating brand influence over time. The market will embrace us as long as we have good products'. The cooperative registered the Tonghui Cooperative brand and started simply by upgrading the packing machines so every product delivered from cooperative facilities had the Tonghui Warehouse label. Overtime, the strategy has been relatively successful. The Tonghui brand has captured an increasing share of the market, having processed and marketed over half of locally-raised sheep by the end of 2016.

To take advantage of spillover effects associated with introducing the brand, the cooperative entered other surrounding markets including Baotou, the largest city in Inner Mongolia and home to more than 1.7 million residents. They also actively employed e-commerce channels including Taobao, Wechat and a supply and marketing business platform for cooperatives. Aided by e-commerce, the Tonghui brand has begun to gain recognition around the country. Through the establishment of Tonghui Warehouse, longitudinally extending the supply chain, brand development, and actively pursuing multiple additional marketing venues, TAC established a coordinated mutton supply chain extending from the herdsman through the storage, processing, and logistics and transportation steps, and concluding with high-potential marketing outlets.

5. Horizontal expansion through tourism

With the objectives of promoting their brand, taking advantage of additional place-dependent opportunities and enhancing economic development, the cooperative decided to explore development of a rural tourism industry. Dengkou has many prestigious human and natural landscapes, such as Sanshenggong scenic spots, Agui temple, Nalin Lake, and Hateng Taohai Nature Reserve. In December 2015, TAC invited the Beijing Tourism Association to examine Dengkou' tourism resources, help plan tourism routes, and establish specific strategies for individual farm households.

In China, the Mongolian are called 'the nation on horseback'. Now, the Han, China's ethnic majority, are the majority among Inner Mongolia residents, but the personality characteristics of the local people have persevered (honest, forthright and resilient). The literally-interpreted 'eating hunks of meat and drinking wine in big bowls' is a signature of the culture. To embrace this and to further the interest of outsiders in the life and culture of Inner Mongolia, TAC adopted a rural tourism slogan 'drink and eat as you like'. The hand-grabbing mutton, slow cooked over an open fire, would be an important part of the strategy. Distinctive ethnic characteristics and magnificent regional natural scenery are the natural advantages for the rural tourism at Dengkou County (Figure 5).

TAC divided the tourism product structure into three layers. The first layer product is experiencing the local customs. During the inspection period with the Vice President of the Beijing Tourism Association, Mr. Wei, and based on member input, the tourism route was designed. The main tourist attractions include the Sanshenggong, Demonstration picking Garden, Ten-kilometer Ecological Park, and sunflower and fruit farms. The second layer is a homestay at a 'Happy Farm House'. Guests will eat farm cuisine, sleep in the farm house, partake in farm work, enjoy the farm scenery, participate in activities such as riding horses, and purchase branded farm products. Participating member households need to renovate their houses, register with the Business Administration Department, and pass a home inspection. TAC is cooperating with the county government to carry out infrastructure maintenance around the scenic areas and ensure there are procedures to ensure that accommodation facilities are maintained and the food and environment are safe for guests. TAC will participate in organizing trips to show the local culture and will provide a variety of farm services. The third layer is the addition of tourism-specific activities. For example, TAC will use internal funds and sponsored fundraising efforts to rent a sightseeing helicopter. Visitors will be able to enjoy desert flight and deepen their understanding of the natural scenery, local conditions and customs of Inner Mongolia. Other

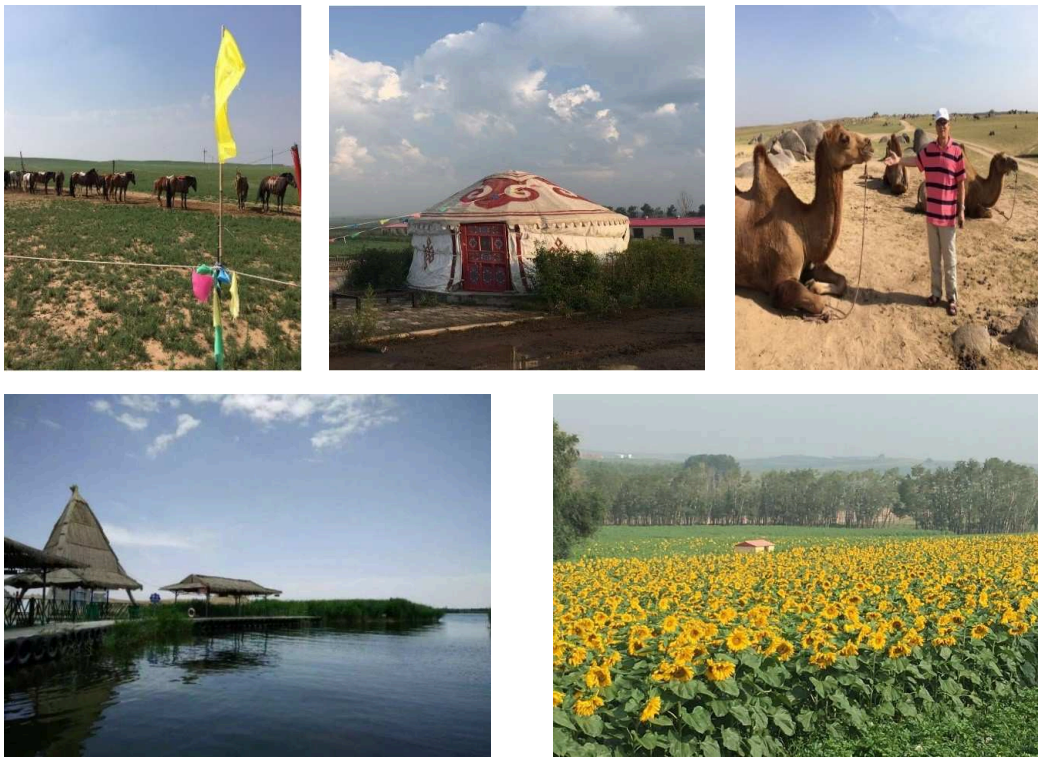

Figure 5. Examples of Tonghui Agricultural Cooperative rural tourism sights.

excursions will also be added based on additional market research, guest input and the existing activities and capabilities of participating member households (e.g. sand dune rides in the desert).

6. Supply chain finance

As elsewhere, agricultural production in Dengkou is dependent on weather and other external factors. And, there is considerable volatility in prices. Because of the risk, relatively low profitability, lack of liquidity, and high service costs, local farmers experience a considerable level of financial exclusion (i.e. demand for commercial financing far exceeds supply). To help cover the credit gap, and supported by new legislation, TAC introduced supply chain financing to their mix of member services. The cooperative was authorized to begin offering credit in April, 2015, and has successfully done so, providing members with improved credit access and reduced rates. The cooperative can provide loans for members with its own funds. It can also cooperate with financial institutions such as banks to facilitate loans to members with external funds. It does so by serving as a guarantor on behalf of its members.

6.1 The Jinfurong integrated management system

An important initial step in developing a credit system was information management. The cooperative worked with Peking (Beijing) Fumin Commune to introduce the Jinfurong Integrated Management System (JIMS). This system integrates member financial information such as family income and credit activities, property, and member non-financial information such as family members' status and reputation; membership details; cooperative service, financial, and procurement management; and cooperative credit activities.

Joining and departing members, records and accounting of purchases between the cooperative and members, daily expense reimbursement, and period (e.g. monthly) statements for the Cooperative are processed through the system. The system allows for standardized management of all member personal, financial and operation data. It allows the cooperative to establish and maintain financial criteria and greatly facilitates transparency

within the organization and with downstream, upstream and facilitating partners. Use of the system allows TAC to quantitatively assess member creditworthiness, provide fair lending quotas, and reduce credit risk for members and for the cooperative.

6.2 Use of cooperative funds to provide internal financing through trade credit

Agricultural production factors require financing, and local farmers generally require external credit to provide this financing. Lending from formal financial institutions not only has a complex procedure and approval process, but also generally carries a high interest rate. To overcome this challenge, the cooperative made use of investment contributions from members and founders to, according to individual credit assessments, issue loans to members by the form of joint guarantee of three households. The joint guarantee system is commonly employed in China. A joint guarantee group responsibility can greatly reduce risk associated with loan non-repayment.

Tonghui Cooperative's loan origination in practice is relatively flexible. It works on the assumption that credit needs vary from farmer to farmer. Loans usually consist of short-term funds and are used to provide capital for activities such as building or repairing a greenhouse or planting a crop. Within the Cooperative's supply chain, if members using contract marketing require funds to purchase capital equipment, the cooperative can provide a loan by trade credit.

Regardless of the amount or details of the loan, the Cooperative plays the role of fund circulator within in the supply chain. In their first year of operation, Tonghui Cooperative issued loans of approximately 200,000 ¥ (about $32,000) using internal funding. A typical loan is 20,000 to 30,000 ¥ ($3,200 to $4,800) at a rate approximating 9.7%, which is 2% lower than that members could obtain directly from formal financial institutions if they were successful in obtaining such a loan. Borrowing from the cooperative also reduces pressure on the member because payments are amortized rather than the balance being due at one time.

6.3 External financing function

Tonghui Cooperative is still in its early stages of development. Its financial credit strength therefore is limited. To better meet member needs during this time of initial growth, the cooperative explored other means to increase member access to credit. The result was establishment of relationships with local banks including the Bank of China, Agricultural Bank of China, Rural Credit Cooperatives and rural banks. The cooperative prepares the joint guarantee agreement and supervises the use of loans taken by its members from these financial institutions. Amortized loans are used to reduce risk for the bank.

From August to October 2015, Tonghui Cooperative cooperated with Mengyin Rural Bank issuing 2,300,000 ¥ ($36,500) in loan funds for use by 48 households. In February 2016, Tonghui Cooperative worked with the Bank of China and Agricultural Bank of China to offer loans to more 100 households. Under the agreement, Agricultural Bank of China and Mengyin Rural Bank offer policy-based lending with low interest rates of between 6.35 and 6.9%. Generally, the Bank of China and Rural Credit Cooperatives provide commercial lending, with annual interest rates of between 7.2 and 11%, which are higher than policy-based lending but still lower than the market average. Potential loan volume is large. Bank of China has approved issuance of 20 million ¥ ($3.17 million) in loan funds. The Bank of China and the Rural Credit Cooperative require a joint guarantee of three households and Mengyin of five households (Table 6). Loan terms are generally three to six months.

Tonghui Cooperative first investigates the credit worthiness of the potential borrower including consideration of their personal history, accounts, and operation and operational history, loan amount, and intended use of funds (Figure 6). After selecting suitable borrowers, the cooperative develops loan teams comprised of three (or five) borrowers placed in a joint guarantee on a voluntary basis. The information is packaged and sent to external financial institutions. The bank will approve loans quickly, issuing a Funong card for every

Table 6. Member loan details.

Lender	Rate	Amount ($)	Form	Nature
Bank of China	7.2%	3,175 to 4,762	Three household guarantee and cooperative recommendation	Commercial
Agricultural Bank of China	6.35%	7,937	Cooperative recommendation and guarantee	Government support loan
Mengyin Rural Bank	6.9%	3,175 to 4,762	Five household guarantee and cooperative recommendation	Commercial
Rural Credit Cooperative	11%	7,937	Three household guarantee and cooperative recommendation	Government support loan

farmer with a limit set to match the loan amount. The Funong card is similar to a debit card with the account defined at the level of the loan limit.

Approved farmers bring certificates and other evidence to complete the loan process, and receive their Funong card. 70% of the loan amount on the card cannot be directly withdrawn, but is transferred to the cooperative and is available to the farmer to purchase chemical fertilizer, seeds, and other operating items from the cooperative. 30% is provided for direct use by members for additional operating expenses and for resources that cannot be obtained through the cooperative or that farmers do not choose to obtain through the cooperative. Farmers pay off the loans in installments. If overdue, the other members of their joint household guarantee must shoulder the responsibility. A farmer's product storage in a Tonghui warehouse can also be used to pay off the debts

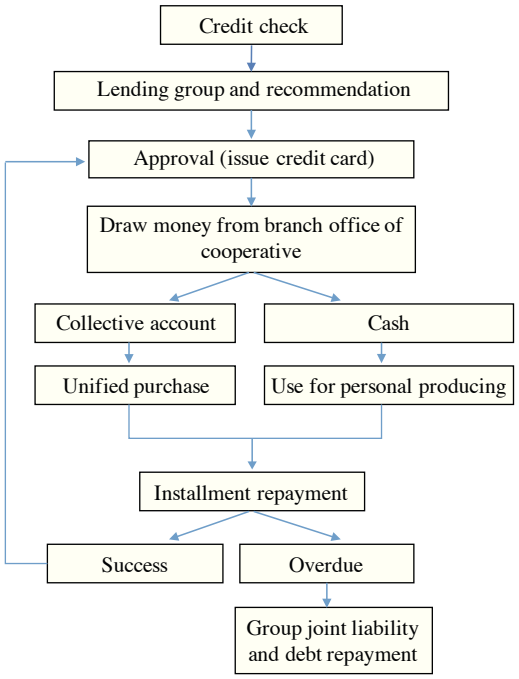

Figure 6. Loan operating process.

6.4 Look to the future of credit operations

In the future, TAC plans for JIMS and the Tonghui Warehouse to play more important roles. The JIMS will improve the quality and timeliness of information and make it more efficient and convenient for enterprises to obtain loans. The Tonghui Warehouse, as the logistics base for storage, will provide collateral on behalf of farmers as well as their upstream and downstream partners (Figure 7). When upstream enterprises provide production inputs (e.g. seed, machinery and equipment) to cooperative members, they also face cash flow requirements to cover their costs during production and after sale to the cooperative and to its members that they cannot meet internally. In the proposed system, this upstream partner can gain approval for their own external financing needs when supported by credit information available in the JIMS, and using as (partial) collateral, materials stored in Tonghui Warehouse. This collateral guarantee by the cooperative can make it easier and less expensive for the upstream partner to obtain external financing. Downstream enterprises will benefit from the same system. Furthermore, commitment by the downstream partner to purchase raw or processed commodities reduces risk for the external lender, further increasing the value of lending to cooperative members and marketing channel partners. The Jinfurong system is the facilitating mechanism. It provides information including inventories, values, and historic use of raw materials provided by upstream firms and the production plans of cooperative members interpreted in terms of intended purchase and sale orders.

A full understanding of the likelihood of success of the proposed system depends on the reader's understanding of the culture of agriculture and of business in China. It is not necessarily intuitive under the western culture of financing and business to business relationships. For example, an important value offered by the cooperative organization discussed at length in this case is that resulting from its market power on both ends of its marketing channel, procurement and sales. This remains important, but its value originates less from a new negotiating position and more from easing transactions between the users, independent farmers now represented as one entity, and solidifying relationships with upstream and downstream partners. To understand why the described system brings value, it is necessary to view the relationships between the cooperative and its marketing channel partners as true partnerships. For example, for the relationship with the cooperative to provide a guarantee that is of value to external financial institutions, the commitment by all parties must be made prior to production. Specifically, for an external financial institution to accept the cooperative as a financial guarantor for the input supplier, the supplier must have a commitment from the cooperative and

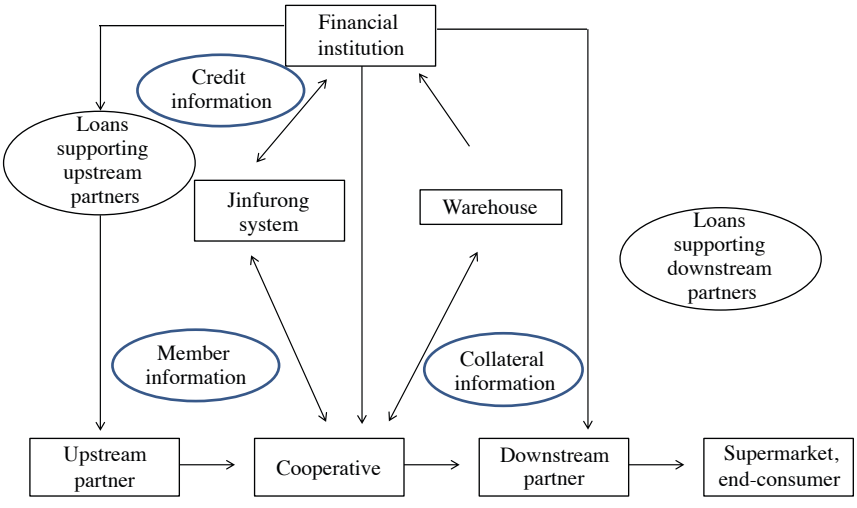

Figure 7. Future planning of finance in the cooperative supply chain.

its members to purchase its materials. The same is true for the relationship between the cooperative and downstream firms using the relationship to acquire financing to fund its cash flow requirements.

Tonghui Cooperative is well on its way to successfully building capacity for farmers and herdsman by continuing to develop financing coordination that combines the resources and needs of the Cooperative and its warehouses, upstream and downstream enterprises, financial institutions and farmers and herdsmen. This model not only is a breakthrough in solving challenges of resourcing financing needs for all parties, but also forms a close collaboration of risk- and benefit-sharing by guiding business cooperation among the cooperative, farmers, enterprises, and financial institutions.

7. Discussion and conclusions

TAC has quickly and successfully designed, and continues to improve, its agricultural supply chain by adding value to commodities, market expansion, increasing efficiency of logistics, and improving information and capital flow (Figure 8). The cooperative facilitates efficiency throughout the supply chain through unified purchase and sale and partnerships with buyers and suppliers. Increased access to information helps the cooperatives, its members, and its partners in the marketing channel to better plan and reduces transactions costs and risk. Use of the JIMS provides information about members and up- and down-stream partners to help the cooperative and external financiers assess credit worthiness, facilitates the provision of financial services, and allows the cooperative to assess the drivers of its financial performance.

Through the exploitation and coordination of resources, TAC has effectively developed a value-added marketing channel that provides income and mitigates risk for its producer members and its marketing channel partners. It has also promoted rural development in the county. We conclude the paper by revisiting the three questions posed early in the paper.

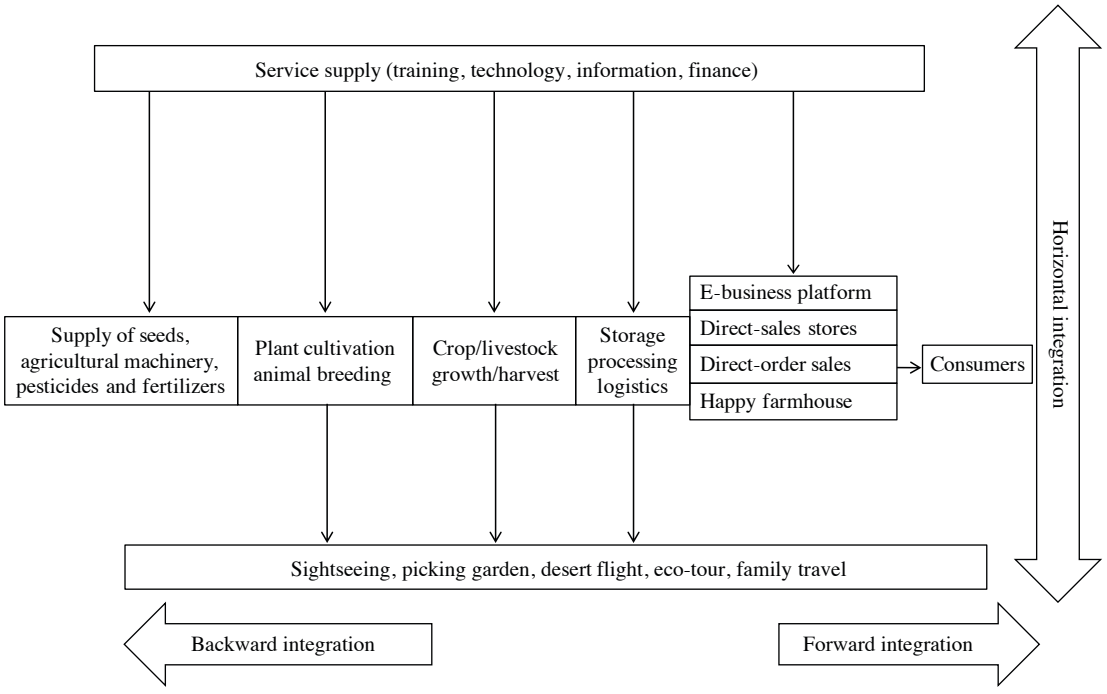

Figure 8. Optimized agricultural supply chain.

1. How does Tonghui Agricultural Cooperative use the flow of information and capital, and its logistics system to integrate and coordinate the supply channel from the purchase and use of inputs to the end consumer to improve the welfare and income of local farmers?

TAC is representative of a new generation of cooperatives in China. This type of cooperative introduces the principle of proportionality through the option of equity stock. These cooperatives remain true to the basic principles of cooperatives: member-owned, controlled and benefited. Members benefit through purchasing through the cooperative at favorable prices in large part due to negotiation power not available to them independently; lower rate, easier-to-access financing; education and technical services; and sale of individually-produced agricultural products at favorable prices with less risk. As the owners, members have the option to inject capital into the cooperative for additional earnings opportunities. Members receive these advantages without giving up their democratic right to participate in the decision-making process. Through the cooperative members of the General Assembly, members democratically elect the Board of Management and the Board of Supervisors to guide strategic and tactical development. Professional leadership and full-time management in sales, production, finance and administration provide the business astuteness required to maintain and grow the cooperative in the evolving production and marketing environments. Cooperative earnings are returned to the members in proportion to the volume of trade through patronage.

2. Given that the development of many farmers' cooperatives in China have failed, what is different about the organization and strategic and tactical behavior of Tonghui Agricultural Cooperative that has led to success?

The necessary but not sufficient keys to the success of TAC are leadership and entrepreneurship. Mr. Wang Lu, President of Tonghui Cooperative, and the other initial cooperative investors played a key role in the initial establishment and subsequent development of the cooperative, the formation and optimization of the agricultural supply chain, and the formal inclusion of marketing channel and supporting industry partnerships. They have continued to grow the cooperative in breadth and depth through their ambitious pursuit of alternatives for members to grow their operations, income, and technical expertise and their ability to effectively communicate with and include in decision-making, not only the farmer and herdsman members, but partners throughout the marketing channel and in supporting industries and the government sector. The leadership has also been proactive in consulting with university and business experts on plans and in adapting for use supporting development tools such as the JIMS. For example, the TAC President used his personal connections to overcome an important challenge facing the cooperative, transporting less-than-full-truckload shipments of produce and other products over long distances. Produce, for example, is both bulky and heavy. And, because it is perishable and rather fragile, it is important that the product be moved as soon as possible out of the field. The challenge facing TAC was that third-party logistics firms usually require transport vehicles to reach near full capacity before shipment, a standard TAC does not yet regularly reach. Mr. Wang negotiated with the logistics company China Post for flexible, partial load transportation. The management team also worked with an entrepreneur from Taiwan to adopt a storage technology that extended the shelf life of TAC products allowing for additional time to make fuller-capacity loads. For his leadership, Wang Lu, elected by the cooperative members and by the Inner Mongolia Autonomous Region, won the 2016 'National Youth Agriculture Rich Leader Award'.

Earlier, we identified cooperative characteristics or behaviors with potential to support successful and sustained performance in a developing cooperative in addition to strong leadership to include: member understanding of and participation in cooperative governance; an efficient democratic process for decision-making; a large base of members with medium and/or small-sized farms; a willingness to coordinate the marketing channel by integration, partnerships, agreements, or other coordinating activities; and the support of government in that an environment exists that supports entrepreneurial activities and cooperatives. And, finally, that a cooperative must be both prepared and flexible as it faces new challenges and opportunities, including growth. The evolution of TAC has benefited from these defining characteristics and strategies.

TAC has made an important part of its mission the education of its members. This includes, but it not limited to, the technical aspects of production and the business of procurement, sales and credit. They also educate their members, formally through all-member and branch seminars and informally during day to day interactions, about the role of the cooperative and cooperative governance. Through the General Membership Body, which elects the Board of Management and the Board of Supervisors, each member has a vote in the decision-making process. The system works because it allows for members to have a voice but allows for the efficiency in decision-making and flexibility in management that is so important as TAC faces new challenges and opportunities, including growth. While less formal evidence, it is worth noting that the President is from the region and the management team and staff are members, ensuring that members have ready access to their leadership. As such, and because regional farms are generally small, individual family operations, there is little concern about members with larger operations dominating the decision-making. For at least the intermediate term, relative homogeneity in farm size and wealth, or lack thereof, is equaling among the members and potential members.

Where the cooperative really excels is the criteria of a willingness to coordinate the marketing channel by integration, partnerships, agreements, or other coordinating activities. The case study is filled with examples of the efforts by TAC to exploit opportunities for marketing channel development. This is important because the primary motivation for membership in TAC is to benefit from services and opportunities it offers. To date, the cooperative has extended its partnerships and coordination to every link of the marketing channel, and the supporting industries. TAC developed and is multiplying the cooperative brand. It has diversified the marketing channel and the production opportunities for its members. For example, members raising farm products have begun the process of renovating for home-stay tourism; others have become involved in further processing of their agricultural products and those of their peer members. Increasing the breadth of production of individual member families and of cooperative offerings has allowed TAC to combine the advantages of specialized economies of scale and multi-scope economies.

Finally, the cooperative is blessed with strong support by government both nationally and locally. They have received financial support to add process infrastructure and local support to facilitate development of the tourism industry. Cooperative management worked to obtain the support of local government entities, both financial and through partnerships, to develop value such as through the development of tourism sites and establishment of the rules accompanying home-stay visits.

3. What is the impact of Tonghui Agricultural Cooperative organization and growth on the rural economy?

Well-run cooperatives will show growing positive externalities as they evolve. Based on our global understanding of cooperatives as demonstrated through the literature and confirmed in our case analysis of TAC, cooperatives in general provide the most value in peasant industries with perishable products sold in a commodity market, and with particular logistics requirements; products with relatively large investment requirements for production and processing technology; and in communities where farmers and herdsmen have relatively low levels of market power, education, or literacy. A close-knit community based on cooperation and acceptance like that found in Dengkou County and other Inner Mongolian regions guided by strong leaders will find an easier road to success.

Although many cooperatives were originally a combination of vulnerable individuals, the growth of cooperatives and their well-functioning societies as is the case with TAC can provide strong externalities. TAC has more than 160 agricultural products with quality certifications, has established a product tracking system working with the government that not only provides brand value but mitigates the chance of food safety instances and, if they occur, will help mitigate their breadth and impact.

By way of partnerships with procurement and marketing vendors, the cooperative can reduce the steps associated with moving products from the farm to the end consumer and help stabilize regional prices. Their internal credit and development and use of the JIMS provides information that reduces transactions costs and risks for financial institutions, both increasing availability and reducing risk of financing for all parties.

Offering regular education and training activities on the cooperative business structure and operation, production, and new technology, among other topics, and providing timely and readily available information to members, the cooperative can work to gradually cultivate its farmer-members into more efficient operators with market astuteness and the capacity to grow and accept additional risk. Farmers can diversify their operations through production, vertical expansion (e.g. processing), or horizontal expansion (e.g. home stays).

The cooperative itself employs staff, increasing the job base and providing employment that allows new college graduates the opportunity to return to their home region. Further, the series of production and marketing activities added in the marketing channel such as the expansion of warehouses creates jobs. And, the cooperative provides a platform for discussion and exchange among scattered farmers through the regular meetings of members of grass-roots bureaus, which arouses the enthusiasm of farmers and improves the organization and cohesion of rural and farmers, thus enhancing rural harmony and stability.

7.1 Opportunities and challenges ahead

TAC provides comprehensive services for members, brings benefits to members and distributes proceeds to members. Benefits to members originate from three sources. First, production costs are reduced through increased market power for procurement of inputs and production efficiencies resulting from education and training. Second, sales revenues increase and market risk declines because of marketing efficiencies from economies of size and from cooperative storage, logistics, and marketing activities. Third, the cooperative increases access to and reduces the cost of credit for members. The cooperative also has successfully earned profits, which are distributed to members based on their transactions volume with the cooperative.

Less than two years after establishment, TAC has been able to engineer a supply chain that successfully joins the products of farmer and herdsmen members with external partners throughout the marketing channel. It extends the theoretical value of cooperative organization to include the cultural realities of interactions between marketing channel participants in China. The variety of fresh and processed products offered by the cooperative continues to grow. Sound connections with industry and academic partners, a creative spirit, hard work, and drive have facilitated growth of the size and breadth of activities of the cooperative. Carefully engineered marketing channels have been established for many products. Tonghui Cooperative coordinates upstream and downstream enterprises and carries out quasi-integrated management throughout the marketing channel. It provides comprehensive services including facilitating cooperation in production, procurement and marketing and credit; improving member welfare. TAC is ready for the next steps. One opportunity is participating in the public information platform planned for Dengkou County to help in brand-building efforts. The platform will allow for the recording and public availability of detailed information about production and subsequent logistics, thus establishing complete product traceability. To protect the interests of consumers, the information platform is being developed by the government per the legislated standards. The continuing challenge for TAC in the coming years will be to identify additional opportunities and work to solve challenges that arise.

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Supplementary material

Supplementary material can be found online at https://doi.org/10.22434/IFAMR2016.0095.

Figure S1. Direct-sale store of Tonghui Agricultural Cooperative.

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Supply chain re-engineering: a case study of the Tonghui Agricultural Cooperative in Inner Mongolia

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Figure S1. Direct-sale store of Tonghui Agricultural Cooperative.