

Article

# Rethinking the Role of Grain Banks in China's Agriculture

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**Abstract:** Grain banks are an organizational innovation and unique phenomenon in China that help reduce food losses and food security costs. It collects scattered food from the farming community into centralized storage and circulates it, thereby realizing asset mobilization and appreciation. This article first elaborates on the definition, function, and evolution of China's grain banks through a literature review. Then, we used survey data of face-to-face interviews and field visits to a grain bank company in Hubei Province to analyze the economic rationale of grain bank development, including micro and macro conditions of grain bank development and its operating mechanisms. In addition, from the perspective of key stakeholders such as farmers, grain bank companies, and the government, we also studied the challenges of grain banks. We found that, in addition to providing many economic and social benefits in the form of food security and improved farmer income, grain banks still face many challenges in the new era. These include the ambiguity of property rights, lack of institutional structure, low efficiency of state-owned grain banks, and exploitation of loopholes by grain dealers. We propose to implement the supply-side reforms, clarify property rights, improve the supervision and management of grain banks, promote the privatization of grain banks, and take advantage of rural finance to realize the industrialization of the whole sector.

**Keywords:** grain banks; food banks; food security; economic effects; economic reforms; China



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## 1. Introduction

The ongoing COVID-19 pandemic has caused the world economy to go in the wrong direction. While hitting the world economy, it also exposed the long-standing food crisis. In addition, the worst locust disaster in the past 20 years is affecting Africa and Asia [1], and global food security is facing huge challenges. So far, India, Vietnam, Russia, Pakistan, and many other countries have announced a ban on grain exports. From 2003 to 2018, China's total grain production has increased from 431 million tons to 658 million tons with an average annual growth rate of 3.5% [2]. At present, the continuous growth of China's grain production for more than a decade is solving the difficulties related to the loss of agricultural land, a water shortage, and climate change [3,4]. However, due to population growth and the improvement of the grain consumption trend of the Chinese population, the demand and consumption of grain also increased significantly [5]. In addition, the country's agriculture sector still suffers from severe post-harvest grain losses. The annual post-harvest grain loss estimated in China is about 80 million tons, or about 15% of the annual total national grain production, which can feed 200 million people for one year [6,7]. This huge post-harvest production loss is not only destabilizing and reducing the grain supply but also leads to economic losses in terms of labor, arable land, water, and fertilizer used in grain production. In this case, reducing post-harvest grain losses and maintaining quality are essential for food security and sustainable economic development.

Since 1980, the Chinese government has established and maintained a grain bank institution to solve food security issues by reducing post-harvest grain losses. At present, there are large grain banks in Shandong, Henan, Heilongjiang, and other major grain-producing

areas. Since the 1980s, various studies have been conducted on the theory and practice of grain banks from various perspectives. Therefore, theoretical evolution on the issue has gradually established a modern grain bank system. For instance, Zhang [8] took Guangrao County grain bank as a case study to initially define the basic concept of the grain bank. Edakkandi [9] pointed out, without a well-thought-out strategy, to reduce postharvest losses, all the efforts to increase production and ensure self-sufficiency are impractical if there are no well-thought-out strategies to reduce post-harvest losses. The promotion of grain banks has been proposed as one of the strategies to limit post-harvest losses. Ruchira [10] mentioned that NGOs and the Indian government have made grain banks as part of their tribal food security strategy.

Various Chinese scholars have studied the phenomenon of grain banks from different perspectives. For instance, Xu [11] revealed the problems of grain banks in the new economic environment. In addition, Zheng [12] studied the supply-and-demand aspects and disclosed that the grain banks have problems with financing functions and risk supervision. He also proposed a financing and transportation mechanism to improve the operations of grain banks. Furthermore, Li [13] suggested that the development direction of the grain banks should be to establish professional institutions that can maintain, increase, and resist risks in grain circulation through multiple operations. Understandably, these studies have contributed to the development of the theory and practice of grain bank institutions.

However, with the continuous changes in economic environment and recent policy developments, the main focus of China's grain banks has shifted from grain storage to grain processing, energy production, and many other activities. In this context, previous research has ignored the justification for the sustainable development of grain banks with constantly changing organizational and environmental aspects. Given these concerns, this research aims to analyze the evolution of China's grain banks and the economic and social benefits of various stakeholders in the current economic environment. The previous studies have only focused on a single aspect of grain banks and did not utilize a systematic approach to analyze the results. Unlike previous research, we use an exploratory case study design and systematically analyze the results to study different aspects of grain banks. Furthermore, we also study the operational mechanism of grain storage in grain banks, as well as the challenges faced by industries in the new era. The specific objectives of this study are to: (1) understand the conditions of grain bank development, (2) study the operational mechanism and operational modes of grain banks, and (3) assess the economic benefits of grain banks to the farmers and society. In general, this study sheds light on the grain bank development history, thereby providing a clear understanding of contemporary grain banks in China. In addition, the results of this research can be used by stakeholders to promote the sustainable development of grain banks and agricultural enterprises.

### *1.1. The Concept and Development of China's Grain Banks*

#### *1.1.1. The Definition of Grain Bank*

As the name suggests, banks are financial institutions that accept public deposits and create credit. Borrowing activities can be done directly or indirectly through the capital market. Therefore, by name, a grain bank can be defined as an institution that accepts public grain deposits. According to the functions of most Chinese grain banks, the producer-owned grain is temporarily held by the grain bank, used in the preparation of feed, and returned to the producer as a feed or whole grain on demand. Watuleke [14] defines a food bank or grain bank as "a centralized warehouse or clearinghouse registered as a non-profit organization for collecting, storing, and distributing food (donated/shared), free of charge, to front line agencies, which provide supplemental food and meals to the hungry." This definition mainly emphasizes the concept of surplus grain in the grain production and retail system, which indicates that grain banks are trying to utilize the grain that will be wasted otherwise. In developed countries like Singapore, grain banks can be defined as a place where people come to deposit unused or unwanted food, which will then be distributed to those in need through voluntary welfare organizations (VWO),

charities, and soup kitchens. There is evidence that, in developed countries, participants associate food banks with poor food quality, shame, stigma, embarrassment, and limited food choices [15]. In addition, such food banks in developed countries do not seem to reduce food insecurity [16]. Nicholas-Casebort and Morris [17] generalized the definition of a food bank as a community-centric warehouse that collects, stores, and distributes food from local producers, retail food sources, federal community distribution plans, and the food industry. This definition is more closely related to food banks in China.

The food banks have a different connotation and economic impacts in China. For instance, Zhou and Yang [18] argue that the grain bank is an organizational innovation of the grain circulation system in China. It takes warehousing companies as the main body, absorbing rural cooperatives, food processing companies, and the state financial sector to participate in joint operations in some form. By developing food credit to increase the efficiency of food circulation, it may become a part of the food circulation system with Chinese characteristics. Since 2000, with the pilot project of China's grain circulation system reform and rural revitalization, the grain banking business has been continuously developing with the increased degree of informatization, thereby, changing its original connotation. Zhang [8] and Liu [19] argue that the essence of grain banks is a new institutional innovation in the transformation and development of grain banks under the new economic environment. The grain bank is an institutional innovation of the agricultural industrialization model, which integrates rural resources to a certain extent through the integrated management of trade, industry, and agriculture. It also integrates agricultural resources to a certain degree and is an innovation in the rural management system under the new economic environment in the country. China's grain banks, which developed from the grain sector in the late 1970s, have now expanded their business scope, and introduced a financial bank management model.

#### 1.1.2. The Historical Evolution of the Grain Banks

At the end of the 1970s, the development of the household contract responsibility system in China solved the problem of hunger for most people [20]. In 1983, the People's Commune was dissolved, and, two years later, the national grain purchasing and unification system was phased out (Jiang, 2014). Since then, China's grain production has grown steadily. By 1990, the average annual growth rate of grain production was 3.5%, reaching the highest level in 41 years since the liberation [2]. The National Grain Reserve Bureau was also established this year. With the continuous expansion of grain storage in the state-owned grain sector, storage costs and potential market risks had become challenges that grain banks must face. In response, the grain department of the Guangrao County Government of Shandong Province first introduced the operating mechanism of the new grain bank in 1989 [21], which became the most typical development model of this period.

At that time, when the traditional planned economic system was constantly being affected by market economic factors, state-owned grain enterprises had to face an increasingly hostile and competitive environment. The grain bank of Guangrao County was the product of deepening the reform of the grain circulation system [8]. It did not charge grain storage fees, but generated income through the operation and management of grain itself, mainly relying on grain processing enterprises. In order to establish a credit mechanism, they established rules following commercial banks: maintaining 50% of grain reserves, 35% of reserve funds, 10% of bad debt reserves, and 5% of central management fees [21]. At the same time, more attention was paid to institutional construction in the process of operation and management, and a unified food management system, turnover system, and risk compensation system were established to form a relatively complete management standard. By the end of 1993, there were 25,000 grain storage households in the county, accounting for a quarter of the county's total rural households, and 42,000 tons of grain were used for substitution [22]. By 2006, the stable depositors of the grain bank rose to 80%, accumulating 520,000 tons of storage for farmers [23].

Since the 21st century, with the reform of China's grain circulation system and the transformation and upgrading of its grain circulation enterprises, grain banks have developed rapidly. Based on this background, the Jiangsu Taicang Grain Banks was formally established in 2006. It imitated the business philosophy of commercial banks and used advanced management software, thus, becoming the first grain bank officially launched in China. In general, the grain banks cover a wide range of models, from the initial development model of Taicang Grain Bank in Jiangsu and the Guangrao Grain Bank in Shandong to the grain banks in Henan, Shanxi, Hubei, Sichuan, Ningxia, and other provinces. The expansion of the grain banks' scale is reflected in the transformation from small savings companies to large grain processing companies. The transition from a simple rations bank to a comprehensive modern enterprise reflects significant performance improvements.

### 1.1.3. The Functions of a Grain Bank

All commodities need circulation to create value, just like money. The currency banking system of the financial sector is already a very mature asset management system with clear operating procedures, profit models, and accountability systems. It assumes intermediary credit responsibilities through business deposits, loans, and exchanges. There are many similarities between food assets and monetary assets. Food assets can be used as the general equivalent of monetary assets because the mobilization and appreciation of food assets can be realized through market circulation.

Today's grain banks have many functions. First of all, the grain bank solved the problem of farmers' grain storage [24]. Due to the wide variety and large quantity of foods, its susceptibility to insects, rat bites and molds, and lack of equivalent protection technology, the quality of food stored by farmers under poor storage conditions may be greatly reduced. Centralized storage and advanced storage as well as processing technology in grain banks can reduce losses, beautify farmers' home environment, and improve the quality of life. Second, the grain banks solved the problem of raw material procurement and helped to enhance the sales for processing companies. Through grain banks, most of the stored grains can enter and circulate in the market as assets [25]. Through the effective operation of the grain banks, grain processing enterprises can obtain sufficient grain resources and ease the financial pressure on raw material procurement. At the same time, the payment in the form of processed products to depositors has broadened the sales channels of products. However, one risk of food circulation is that depositors heavily rely on the bank. Since the profitability of depositors depends on the bank's turnover rate, stability of returns cannot be guaranteed in the current system. The balance between the two depends on reasonable regulation. Third, the grain bank is an important supplement to China's grain reserve system [26]. It was established in the Spring and Autumn period and the Warring States period, prevailed in the Western Han Dynasty, and reached a relatively advanced level during the Tang Dynasty [27]. The current reserve and accounting management system have enabled many processing enterprises to be included in the national grain reserve system. The grain allocation and government subsidies of grain banks at all levels are based on the national grain reserve index. The grain bank itself is a mechanism that turns idle food into centralized storage and circulates it. The decentralized food storage of the past has now become centralized storage, and the previously stationary food is now in circulation. Guangrao County in Shandong Province is an interesting case in point. As of 2008, the county has stored 530,000 tons of grain for farmers, with an average annual reserve of 32,000 tons and a maximum reserve of more than 50,000 tons [22]. This people-oriented food organization is conducive to establishing a three-tier grain reserve system, thereby, reducing the cost of ensuring food security and saving state funds.

However, food has its particularity as a necessary condition for human existence. It not only has huge differences in quality and circulation costs, but it also has vital strategic importance. Therefore, the grain bank is still not like a commercial bank. It does not have functions such as payment systems, credit intermediaries, and financial loans, which not only limits the development speed of the industry but also limits its policy goals of serving

rural farmers and agriculture and ensuring food security. Therefore, in the current grain purchase and storage policy, the grain bank can only play a supporting role, and not a substitute.

## 2. Materials and Methods

### 2.1. The Choice of the Research Method

This is a qualitative research that uses a case study method to achieve the objectives. We used this method because it has many strengths including the ability to accommodate various research methods [28], the ability to establish rapport with research subjects [29] to obtain rich data that can be applied to similar situations [30] and, finally, a deep insight into the phenomenon under study. Furthermore, the case study method was deemed appropriate for our research because of its defining feature of focusing on ‘how’ and ‘why’ questions [31]. Another possible research strategy was a survey design. However, the dearth of previous literature on the economic perspectives of grain banks in China would make it difficult to use survey design because we had limited information to construct a questionnaire that may elicit the information required to answer the research questions. Using survey design could be more useful for the second research phase in this area. Following on from the consideration of several methodological approaches for this research, an exploratory single case study design was adopted.

### Units of Analysis

In the case study design, the unit of analysis (UoA) is the basis of each case [32]. The UoA may be an individual such as a person who has had an experience of interest to the study, an event such as a decision, a social process, an implementation process, an organization, or part thereof [31]. Since our research mainly focused on understanding the conditions of grain bank development, the operational mechanism and operational modes of grain banks, and the economic benefits of grain banks to the farmers and society. Therefore, we used a combination of grain banks, the grain bank managers, employees, and customers (farmers) as units of analysis in this study.

### 2.2. Selection of Cases and Study Area

With managers, employees, and customers (farmers) as the units of analysis, access to at least one grain bank was an important consideration for this study. Using purposive sampling, the specific case chosen for this research was a grain bank company, namely Sanjie Group Grain Bank (SGP) in Zaoyang city of Hubei province. This specific case was chosen for several reasons. First, in interpretive research, the number of participants is relatively small. The relevance to the research questions rather than representativeness should be the criterion for the selection of cases [33], and the “random selection of cases is neither necessary, not even preferable” [34]. Second, an overall goal within qualitative research is to collect the richest possible data [35], i.e., collection of wide and varied information, from multiple perspectives pertinent to topics/cases under investigation [35,36]. Therefore, the use of snowball sampling or purposive sampling is justified [37]. Third, within the case study design, contacts in industry, academia, and friendship can be helpful to establish a list from which cases can be selected [38]. Lastly, the trust between the researchers and research participants in case studies is important for truthful sharing [32]. The researchers had personal networks and word-of-mouth referrals in the study area, which made them select this grain bank company as the case study. Another reason for the choice of this grain was its large size and integrated business model that could potentially offer rich data for the research.

Established in 2002, the Sanjie Group Grain Bank (SGP) is a fully functional grain bank company in the Hubei province. It mainly stores and processes wheat, rice, and sweet potatoes. Furthermore, the company produces bioenergy using straw and chaff, biofertilizers, and molten steel covering agents. The annual processing capacity of the company is 180,000 tons of wheat, 80,000 tons of dried noodles, and 60,000 tons of rice.

The company has a storage capacity of over 125,000 tons and generates 14.4 million kilowatt-hours of electricity from the husk. As the largest noodle product manufacturer in Hubei province, the Sanjie Group became the only company in the province that made it to the list of China's top 50 wheat flour processing enterprises in 2016.

Hubei Province has always been China's main grain-producing area, while the rural population accounts for the majority. The annual grain output in the province has exceeded 25 million tons for seven consecutive years, reaching 27.25 million tons in 2019. In the same year, Hubei contributed a share of 64% and 14% of national rice and wheat production, respectively, with a total output value exceeding US \$30 billion [2]. However, due to the uncoordinated agricultural structure, the reduction of cultivated land, and weaker technological innovation, food security still faces huge challenges in the province [39]. Studies have pointed out that there will be a gap of 11 to 13 million tons of food demand by 2025 [40,41].

### 2.2.1. Data Collection

The use of multiple sources of data and multiple participants is preferred in the case study designs to gain in-depth insight and triangulate data. Therefore, we employed a variety of data sources in this research that included primary and secondary sources of data. The primary data sources included direct observation and interviews, while secondary data was collected from documentary sources and literature surveys.

The primary data was collected in two phases. From 11–16 January 2017, the researchers visited several sites of Sanjie Group Grain Bank (SGP) including its Agricultural Industrialization Technology Park, Gaozhuang Village Distribution Center, and Zaoyang Agricultural Farmland Base. During these visits, we conducted in-depth face-to-face interviews with the manager and other executives of SGP, its 10 employees that belonged to different departments mentioned above, and 10 local farmers who were depositors (customers) of SGP. We opted for semi-structured interviews to keep interviews focused and to provide room to explore new and relevant issues that emerge during the interview [32,33]. Knowing that today's grain banks are more processing plants than the grain banks themselves, the interviews were focused on gaining retrospective information only. The interview guide was designed by researchers before conducting interviews, which focused on capturing the respondents' background information, context, processes, functions, and operating mechanism of the grain bank, and its economic benefits to the farmers. The interview with the SGP manager lasted for three hours, while other interviews lasted for more than half an hour. All interviews were conducted face-to-face to build trust, establish rapport, and identify any non-verbal cues, which warranted further questions. The language used to conduct interviews was Mandarin Chinese. The purpose of interviews was explicitly described to all respondents before the start of interviews. While farmers were ensured that their identity and responses will be kept confidential, the SGP was pleased to allow us to use their identity in our research reports/articles.

The researchers visited the SGP headquarters again from 16–18 May 2018, and conducted further in-depth interviews with the SGP manager. The purpose of this visit was to supplement the previously gathered information and gain further understanding of the grain bank functions. During this visit, the researchers also stayed for a few days in a nearby village and conducted in-depth interviews with seven local farmers who were customers (depositors) of SGP. This second interview phase also provided the basis for cross-comparison of farmers' responses in the first phase.

The secondary sources of data mainly included government reports, news articles, and literature surveys. These sources served as the basis of constant comparison for the data gathered in the field visits.

### 2.2.2. Data Analysis and Interpretation

While analyzing data in qualitative research, the researcher tries to make sense and interpret the phenomenon by placing meaning to the participants' responses [42]. To this

end, a variety of data analysis methods can be used, such as content analysis, constant comparisons, and pattern matching. However, for sound qualitative research, the process of data collection and analysis should be as explicit as possible [32]. Therefore, we used Cope's [43] four level of analysis (level 1–4) with an additional level, namely "Level 0" that considers the process of data collection and recording itself as the first level of analysis. The details of these steps are given below.

#### Level 0: Conducting Interviews

As described earlier, the interviews were conducted face-to-face to enhance the quality of data collection and direct observation. The interviews with the SGP manager and staff were conducted in their place of work, while farmers were interviewed at the grain bank distribution/collection center (first phase), and the village (second phase). All interviews were recorded with the permission of respondents. The face-to-face interviews allowed the researchers to consider the impact of social and physical settings in which the interviews took place.

#### Level 1: Transcribing and Capturing of Notes

The analysis in Level 1 concerns with transcribing and taking additional notes as soon as possible after the interviews. This is done to highlight any significant issues and experiences during face-to-face interviews [32,37]. Therefore, we reviewed all our notes and recordings after we came back to university. The interviews were transcribed in the same order as they were conducted. The additional notes were added to the data. This process makes it easier for the researcher to get familiar with the data and to begin the process of organizing and structuring the data. Subsequently, it can increase the researcher's awareness of themes, categories, and patterns in the data [32,44]. In our case, it also helped us to ask relevant questions in the second phase of interviews.

#### Level 2: Writing up the Case-Study Narratives

In this level of analysis, we wrote up the rich descriptions of the narratives in a thematic and coherent way in order to allow subsequent cross-analysis. Since some questions were also related to the history of grain banks, the chronological order was followed in the writing process. The resulting summary of the interview was also discussed with the grain bank manager in the second visit to confirm if there were any inaccuracies or misunderstandings in the initial narratives.

#### Level 3: Determining Findings through Cross-Case Analysis

We used qualitative content analysis for cross-case analysis. It involves identifying coherent and important themes and patterns in the data. The researcher looks for "quotations or observations that go together, that are examples of the same underlying idea, issue, or concept" [45]. We used a mixture of emergent approach and a priori directed approach to analyze the collected data and establish our findings.

#### Level 4: Interpreting and Enfolding Findings in Literature

In order to develop a deeper understanding of the data collected, Level 3 analysis involves the "clustering" together of findings [32] without the use of any relevant theoretical literature. In Level 4, the findings are discussed in the context of extant literature, which is a process that Eisenhardt [34] calls enfolding literature, and the outcome of this level of analysis is the interpretation of the findings. In this level of analysis, we compared our findings with the existing literature on grain banks. Especially, the findings related to the functions of grain banks and the operational mechanism/modes of grain banks were compared with the extant literature on grain banks in China.

### 3. Results

The survey results are presented and discussed in the following paragraphs.

### 3.1. The Conditions for the Establishment of Grain Bank

The results of our survey showed that China's grain banks have a history of more than 30 years. However, the prevalence of these banks is not very high, as it is not common to find grain banks in many other grain-producing provinces. The survey results indicate that bank's existence and operating model must have some necessary conditions.

#### 3.1.1. Micro-Conditions for Establishing a Grain Bank

The grain bank is the product of a small-scale peasant economy. Our results indicate that, only when small farmers have poor storage conditions and value these losses, will there be a demand for food reserves. The impetus to participate in grain banks is higher when small farmers also lack non-agricultural employment opportunities. In the current system, grain banks must be integrated with grain processing businesses to accumulate resources, but there is a risk that it will lead to monopolistic behavior by processing companies, thereby depriving opportunities to small farmers [46]. Second, the grain banks must be closer to the community. For instance, Sanjie Group Grain Bank has 10 member companies, which are all located in agricultural-oriented towns and villages to actually perform the functions of convenience stores and bartering. Third, according to the SGP manager, there should be a balance between the profit of the grain bank and the farmers. If more favorable conditions are provided for depositors, the operation and management risks of grain banks will be higher, which will force the grain bank to participate in market speculation. Similarly, if the market price of grain fluctuates very little, the profit margin of grain banks will be very small, and it will bring even fewer favorable conditions to farmers.

Finally, to overcome the existing challenges of grain banks, it is also important to establish a credit management system for grain banks. Zhou and Yang [18] proposed the concept of grain credit. It applies to farmers or other grain managers and consumers. Under the premise of owning food, certain types of grains that are easy to standardize and temporarily idle are stored in the grain bank. The right to use these grains will be delivered to the food credit department on a regular or current basis. The grain bank obtains the benefits of grain turnover through grain financing or direct trade circulation. In return, it gives farmers individual interest in the form of grain or currency. All participating farmers can become carriers of food credit. Farmers are the main grain storage households in rural China. However, their behavior is very volatile because they have a lower preference toward contract arrangements, especially when the risk of default is relatively high. Therefore, the trust between the depositors and the grain bank is the key to continued cooperation. The cooperation may be at risk if farmers speculate that the grain bank manipulated food prices during procurement, deliberately reduced grain procurement quotas, or even run away.

#### 3.1.2. Macro Conditions for Establishing a Grain Bank

The results of our interviews and literature survey indicate that there are several macro-level conditions that must be fulfilled for the existence and continued operation of a grain bank. First, the practice of grain storage and processing on behalf of farmers began during the economic reform and opening-up period of the early 1980s. During this period, there was a severe shortage of corporate funds and high inflation (food prices rose and fluctuated greatly). These reforms were also termed as "Socialism with Chinese characteristics." In rural areas, these "Chinese characteristics" are reflected in the entrepreneurial skills of Chinese farmer entrepreneurs, who can "collect" and use the huge and fragmented value of storage losses and fulfill their cash needs. Second, the government's support for the grain bank is crucial, especially during the financial crisis [47,48]. In the current system, one of the main responsibilities of the grain bank is to promote food security, so the sustainability of grain bank's operations depends on government support. Almost all grain banks rely on government subsidies to recover the losses. The support of the government is particularly important in difficult times when the operation of the grain bank encounters difficulties. During this period, the grain bank must rely on the government's economic power and



expect the government to rescue the market. Finally, in the current grain bank model, market risks are controlled. Price fluctuations in the food market may bring potential risks in operations. Grain banks usually forecast food prices. If they expect the price to fall, they usually sell a portion of the stock, and vice versa. However, the actual market conditions may be inconsistent with the grain bank's price forecasts, which affects the company's sustainable management and may even lead to bankruptcy. Therefore, the grain bank must establish a risk prevention mechanism [40], such as improving market forecasting capabilities, using food price fluctuations and seasonal differences to their advantage, and making accurate business decisions.

### 3.2. The Operation Mechanism of the Grain Bank

The grain depositors (farmers) treat grains as rations or commodities, and either keep them for personal use or deposit them in grain banks. The grain bank uses price differences and value addition to generate income. For example, the average retail price of wheat in 2016 was 188.60 US\$/ton, while the SGP food bank purchased it at 156.67 US\$/ton. The price rose by 31.9 US\$ per ton in just 60 days. In the meantime, the whole grain industry had plenty of room to add value through processing. Therefore, the revenue of depositors and grain banks depend on market conditions. The grain prices are lower when prices are concentrated in the market and supply exceeds demand. When supply and demand balance each other, prices are also balanced. In addition, prices rise when there is lower grain circulation in the market. Using these market conditions to their advantage, grain banks make it possible for farmers to sell products at any time of the year to maximize income through unified procurement, dry storage, easy access, and value-added operations.

In addition to storing grains, the main business of the grain bank is its role as a processing company that uses farmers' grain as raw materials. After grain storage, the focus of the grain bank is to reduce the financial cost of storage and speed up capital turnover. They use several strategies to achieve this goal. For instance, in the autumn and the winter, farmers usually prepare to plant crops. At this time of the year, processing companies have many idle funds available for use. Therefore, they lend some of these funds to farmers to plant seeds. After harvesting, the farmers deposit their grains to the grain bank, which uses it to make products to be sold in the market.

Farmers in rural China have dual identities, working as farmers and laborers in an agricultural processing sector. They usually do 10 months of migrant work each year. The main concern for farmers is the inability to repay the grain bank loans obtained for planting. However, grain banks and processing companies play an important role in the development of the entire agricultural industry, including farmers' income. For example, the SGP has opened a grain bank in each town in the city and expanded its storage capacity to 5000 tons. Their integrated business of planting, storage, processing, and repossessing of rice/wheat provides depositors with high yields through high-quality, disease-resistant seeds and a series of production technologies, thereby, increasing employment opportunities and economic benefits in the rural areas (Figure 1).

### 3.3. The Operating Modes of Grain Banks

In terms of the practice of grain banks, Table 1 shows a typical operating model of Zaoyang SGP grain bank. However, different regions of China have adopted unique models based on their local conditions. For example, Guangrao County, Shandong Province has adopted a "grain bank + processing company" operating model [8,49]. In the late 1980s, the county's grain department took the lead in cooperating with larger grain processing companies, using bank loans to borrow grain from farmers and issuing grain storage certificates to farmers. This certificate allowed farmers to obtain food or finished products in various food stores in the county. The county's agriculture department even used 30%–40% of the grain for trading to generate income for grain banks. Through these innovations, it became the first unregistered grain bank in China.

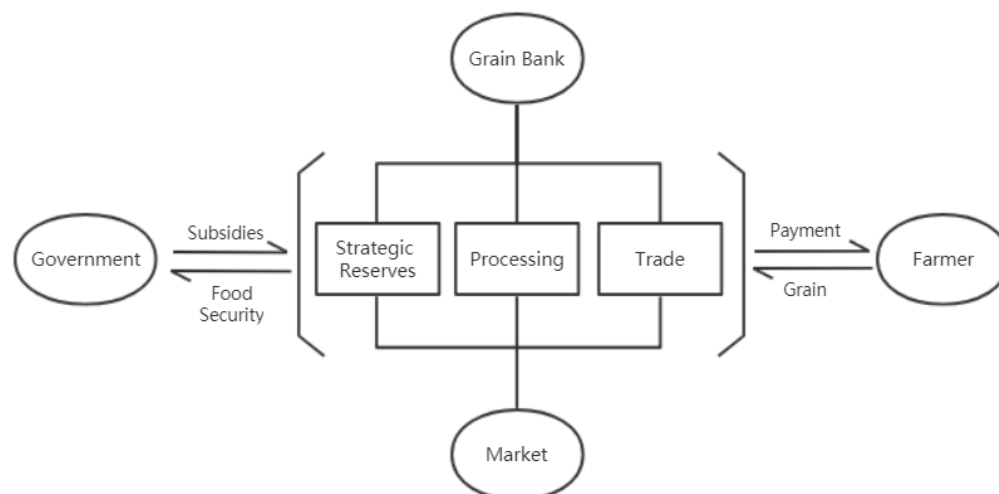


Figure 1. The operation mechanism of the Zaoyang Grain Bank.

Table 1. The operating modes of different grain banks in China.

| Grain Bank Location                | Main Business                          | Features                                      | Operating Mode                                  |
|------------------------------------|----------------------------------------|-----------------------------------------------|-------------------------------------------------|
| Guangrao County, Shandong Province | Grain storage                          | The first grain bank in China, unregistered   | Grain bank + processing company                 |
| Heilongjiang Reclamation Area      | Grain storage and trading              | Introduced information management system      | Grain bank + logistics enterprise               |
| Taicang County, Jiangsu Province   | Grain storage, processing, and trading | The first officially registered grain bank    | Food bank + Grain bank + Land transfer fee bank |
| Zaoyang County, Hubei Province     | Grain storage, processing, and trading | Technical, innovative, informational features | Comprehensive business                          |

In Heilongjiang Reclamation Area, Beidahuang Commercial Group has cooperated with Minsheng Bank to establish a “grain bank + logistics enterprise” model using 13 storage and logistics bases [50]. Under this model, farmers can sell grain through on-spot trading services. They can also use the electronic trading platforms established by the grain bank. A different grain bank operating model exists in Taicang County of Jiangsu Province, which uses grass-roots grain purchasing and marketing companies as the carrier to actively develop network management software and use information technology to establish service outlets throughout the city. Through the exchange of deposits and withdrawals, a unique combination of “food bank + grain bank + land transfer banks” has been developed, known as the “Taicang model”.

In addition, from the perspective of operation and management, grain banks can be divided into traditional, storage, and risk-sharing types [51]. The distinction in these banks is mainly reflected in the scope of business and the interests of farmers. Although the grain bank can have a variety of operating modes, its basic operating mechanism is still unified. All of these banks are based on the currency deposit and loan principles of commercial banks. They exchange commodities with farmers by using network management to “preserve and share currency,” balance the supply-demand gap in the grain market, increase the circulation of grain assets, and keep an eye on the market conditions to help farmers avoid the risk of grain price fluctuations.

#### 3.4. The Economic Impacts of Grain Banks

The business model of the grain bank has improved the stability of the grain market and the efficiency of grain circulation. It also fulfills farmers’ food storage needs and stabilizes their agricultural incomes. In addition, it promotes the organic integration of the

government's food security targets, corporate profit goals, and farmers' income growth targets. These benefits are discussed in the following paragraphs.

#### 3.4.1. Helping the Government Maintain Food Security

First, the minimum reserves required by the government for grain banks makes the source and amount of grain available in the national food register. However, we found that the minimum reserve requirements are more stringent and need to be reviewed and relaxed by local government agencies. For example, Hubei province stipulates that the minimum standard inventory levels for operating grain banks should be above 25,000 tons. For Anhui province, the threshold is 30,000 tons [52]. Since government subsidies are tied to the scale of grain banks, the government can effectively control grain stocks and flows based on the centralized data. Second, the grain banks promote centralized management of grain retail. It is because grain banks have achieved centralized grain storage and centralized sales, which helps the government to formulate grain price policies and maintain market stability. Third, grain banks provide a mechanism to control food prices. Each grain bank is required to maintain a specific grain reserve ratio to ensure food security. Just like the reserve ratio of commercial banks, grain banks also have a threshold that stipulates that about 50% of grain must be stored [53]. By flexibly adjusting the reserve ratio, the government can adjust food prices. However, the effectiveness of the grain reserve ratio in ensuring food security also depends on follow-up actions, especially monitoring mechanisms.

#### 3.4.2. Contribution to Sustainable Business Development

As a grain bank, the company establishes a close and stable relationship with farmers, which is conducive to realizing sustained economic and social benefits in two ways. First, the grain bank generates income by saving working capital, interest, trading, and financing based on seasonal and regional price differentials. Large grain banks can also achieve economies of scale through their large-scale rapid processing and sales. These features of grain banks provide several redistribution benefits. Second, the grain banks attempt to minimize operational costs. The main costs of a grain bank are transportation and logistics costs, human resource training costs, operational risk costs, and bad debts. However, these costs are inherent in processing companies. The operation of the grain bank allows us to share this cost among several players. In reality, like the SGP grain bank, most grain banks simply calculate gross profit based on the original deposit balance (the difference between raw materials and finished products) rather than actual revenue minus costs. It is worth mentioning that the fundamental purpose of grain banks is to serve farmers, not just to engage in buying and selling. They can realize additional benefits only when they provide services to the farmers.

#### 3.4.3. Contribution to Farmers' Economic Benefits

Food depositing families usually think from two perspectives. First, the survival perspective: Chinese people have a strong sense of self-sufficiency. Food security is very important, especially among the older generations that suffered from famines. There is a famous Chinese saying: "Holding food in the hand, there is no panic in the heart," which reflects a special food-oriented rural culture and cultivates the habit of farmers to store grains. Second, the economic perspective: food loss, fluctuations in food prices, labor opportunity costs, and the high proportion of farm income in farmers' total income all contribute to this view. Under a mutually beneficial arrangement, farmers produce and store grains to maintain their livelihoods while grain banks bear the storage costs. Without grain banks, grain storage losses can be as high as 8%–10%, which reduce to 1%–2% when grains are stored in centralized storage [14,22]. In addition, grain banks allow farmers to use seasonal price differences to their advantage to obtain higher incomes by selling grains. Farmers still have the credit risk of storing grain, but the risk of a more developed market economy is lower.

### 3.5. The Main Challenges of Grain Banks

Currently, the development of grain banks in China is uneven, and the country's food industry has not yet found a better path to innovation and sustainable development. In the new economic environment, the grain banks face new difficulties and challenges. First, the property rights relationships in the grain bank business are not clear, and the industrial structure needs to be adjusted. The ownership, contractual rights, and management rights of the grain bank were initially divided between three entities. The ownership belongs to the government, the contractual rights belong to the farmers, but the management right is arbitrary. Due to this reason, the independent status and independent operation of the grain bank cannot remain stable. It is vulnerable to direct or indirect government intervention and cannot guarantee independent market economic behavior. It is even more difficult for grain banks to assume social responsibility. Second, the current regulatory environment has led to inappropriate practices. Inferior storage technology in grain banks can cause grain rot and infestation. Besides, some grain banks do not process grain only to receive annual grain storage subsidies. Under the current regulatory system, stored grains are more beneficial to grain banks than processed grains. Since state subsidies can be used to accommodate storage fees, labor costs, grain losses, and other expenses, the grain banks are eager to obtain the required grain storage indicators. Their enthusiasm for adding value and acquiring grain processing technology is not high. Third, the operational efficiency of state-owned food banks is low. Affected by historical issues and economic policies, the state-owned grain banks have a less-versatile business model, lack technological innovation, and relatively weak competitiveness. Due to national food security considerations, the government's innovation and reform policies cannot adapt to the fierce competition environment of the multi-player market. The market mechanism can more effectively promote the optimized development of grain depots. Fourth, private grain dealers use loopholes in the grain bank model to gain economic benefits. Due to the irregularities and loopholes in the grain market, small grain sellers deposit low-quality grains collected from farmers in grain banks and then exchange processed products (such as high-quality noodle flour) for sale on the open market. Sales of these types of food compete for plenty of market share.

## 4. Conclusions, Recommendations, and Limitations of the Study

### 4.1. Conclusions

This study was designed to understand the history, functions, preconditions, operational mechanism, economic and social benefits, and challenges of China's grain banks. A variety of methods and data sources were used to gather and analyze the data to obtain results. Using an exploratory case study design, the Sanjie Group Grain Bank (SGP) company in Hubei province was chosen as the case study to gain comprehensive insight into different aspects of grain banks. The results show that the institution of grain banks in China has a history of more than 30 years and has gradually evolved to be more like a commercial bank. For instance, starting from the traditional grain storage roles, the SGP grain bank has gradually improved its operating model into an income-generating enterprise. The same applies to many other grain banks in China. Our results also indicate that there are several micro and macro conditions for the existence of grain banks, which is why these grain banks only exist in certain areas. Although the grain bank has a variety of operating modes in different regions, their basic operating mechanism is still unified. All these banks are based on the currency deposit and loan principles of commercial banks. As for economic impacts, the grain banks provide many economic and social benefits to the farmers, government, and the grain bank company themselves. The innovation of the grain bank model is of great significance for overcoming the difficulties of grain sales and storage caused by farmers' scattered operations under the new economic environment. However, enterprises engaged in the grain banking business must adapt to the new situation and national policies, explore new development paths, and provide farmers with better services and higher profits. Only in this way can they truly realize the goal of agricultural modernization. At present, it is generally believed that the purpose of grain banks is to

support farmers. Government support is necessary for the sustained operation of grain banks. However, the activities of the grain bank should not be limited to its traditional role. In addition, we found that grain banks alone cannot effectively eliminate food insecurity. They need to be integrated into other agricultural enterprises, such as the food processing industry. Some Chinese scholars believe that grain banks are social tools and should not be evaluated based on their economic performance. However, in the SGP case, we found that the grain bank benefited from the integration with the processing industry. In addition, the current relationship between grain banks and farmers is like any commercial bank and depositor, seller, and buyer, and producer and consumer. However, it is also important for the grain bank to establish a new socially stable relationship with farmers so that they can fully understand the exact role of the grain bank. Otherwise, the low management efficiency of the grain bank will lead to the failure of the grain bank. The development model of the SGP grain bank is unique to some extent. Like many other grain banks in China, it has a long history of development. The future development of grain banks should strive to achieve financial independence through more integration with the private sector.

#### 4.2. Policy Recommendations

##### 4.2.1. Clarify the Property Rights of Grain Banks and Advance the Supply-Side Structural Reform in the Food Industry

Unclear property rights of the grain banks can create problems such as escaping and transferring social and economic responsibilities. Unless property rights are clearly defined, grain bank companies cannot truly assume social responsibility. It is necessary to clearly define the ownership, contractual and operating rights of the grain banks, with particular emphasis on the independent legal status of the enterprise. It can ensure that the grain bank enterprises can achieve self-financing of business management and promote the free flow of food assets under the promotion of market forces. Since the elasticity of demand for food is low, a simple approach of increasing demand will not work. The efforts to promote supply-side structural reforms in the context of a supply-dependent economy should be made by optimizing the key elements of the grain bank operations, eliminate the use of outdated storage capacity, and reduce tax burdens and subsidies. All participants in the grain banking business can benefit from adjusting and optimizing the structure of the food industry to stabilize grain purchases, accelerate technological innovation, and promote value addition.

##### 4.2.2. Improve the Institutional Structure and Optimize the Management System of the Grain Banks

The chaos driven by the interests of the food market highlights that China's grain banks are still in a fragmented and disorderly management stage, and there is an urgent need to establish and improve its institutional and management system. A unique and independent association or organization should be established to define specific storage standards, capital requirements, and to verify the company's reputation and risk response capabilities. At the same time, the government should actively guide the grain banks to achieve management optimization. The scientific management of the grain bank enterprises, sound technological capabilities, and high-quality services can increase the enthusiasm and trust of farmers.

##### 4.2.3. Expand the Private Grain Storage Systems and Promote the Privatization of Grain Banks

Grain banks have a strong vitality as a new model to assist the country's grain purchasing and storage policies. However, private enterprises can play a better and decisive role in the efficient allocation of resources in the market due to several reasons. First, private grain banks have more advanced technology and stronger innovation power than state-owned enterprises. Therefore, the government should expand the preferential loan capabilities of private enterprises. Many heads of private grain companies stated that their loaning capabilities are far lower than similar state-owned companies. If the same conditions are relaxed, they can save about half of the financial costs of state-owned enterprises. Second,

the grain bank connects farmers and consumers, not only to ensure food security but also to ensure food safety, so that it can quickly and accurately understand market conditions. Therefore, qualified and creditworthy private food bank enterprises should have a say in setting the minimum grain purchase prices in national policies. Private grain storage systems and trading systems should be liberalized and integrated with national systems.

#### 4.2.4. Using Rural Finance to Achieve Full Industrialization of Agriculture

The agricultural challenges are facing the entire industrial chain from the field to the family table, including the early stages of seed selection to harvest and the later stages from processing to sales [48]. As an overall economic model with various business functions (including storage, exchange, logistics, and interest), the grain bank connects the entire agricultural industry chain, so each participant forms a community of stakeholders and produces a specific-scale agglomeration. If banks in the financial market can be further opened, grain banks will work with commercial banks and other financial enterprises to actively explore innovative food hedging, asset management, and stock trading. Through bank financing, a complete chain of “risk and benefit-sharing” will be formed, the deep integration of the two will be realized, and a new development path will be opened for the grain banks’ development.

#### 4.3. Limitations of the Study and Future Research

There are some limitations to the study. First, due to the dearth of literature on grain banks and the unique characteristics of each grain bank, it was not possible to develop a structured questionnaire. There, we could not use a survey approach. However, the results and insights can be improved by following a survey design for future studies. Our study provides a starting point for future studies in this direction. Second, building upon the survey designs, empirical methods can be used to analyze the data of more grain banks in the country. Especially, more farmers should be included in the analysis so that heterogeneous characteristics can be considered in the analysis. Third, future studies can also consider interviewing relevant officials charged with the policies toward grain banks and national food security.

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