

## Article

# How Agricultural Farmers Respond to Risks during the COVID-19 Pandemic: An Exploration through the Dual Social Capitals Approach

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**Abstract:** The degree of risk to which agricultural farmers are exposed during the COVID-19 pandemic and how they tackle those difficulties is a critical topic. Although the topic has been paid considerable attention by worldwide scholars, this study intends to compensate for it via conducting a ground-breaking analysis based on sample survey data. Integrating theoretical perspectives of individual- and collective-level social capitals rooted in sociology, and using NPRM (Nested Poisson Regression Model) to analyze a sample survey data collected in rural China in August 2020, we generated the following findings. (1) The overall risks and damages to agricultural production and management are relatively minimal. Thus, farmers are highly confident in conquering the pandemic and recovering their business. (2) Compared with micro- and macro-level influencing factors, social capital at both levels could greatly help agricultural farmers obtain informal and formal supporting resources (such as encouragement and financial supports), thus helping them to cope with the pandemic shock. (3) Specifically, the acquisition of informal supporting resources is mainly affected by the size of farmers' ordinary networks (Spring Festival Visiting Network) and the frequency of public activities held in a village; gaining access to formal supporting resources is also influenced by the frequency of public activities, but the state of farmers' personal connections with official departments plays a crucial role in determining the amount of such resources can be obtained. According to these empirical findings, suggestions on how to suppress the negative effects and lift the positive effects of dual social capitals in the process of responding to risks are proposed.



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**Keywords:** agricultural farmers; risk response; individual-level social capital; collective-level social capital; supporting resources

## 1. Introduction

Farmers engaging in agricultural business often have to face unexpected strikes and risks. Due to insufficient resource endowment in rural areas (especially in poor rural areas), in addition to the seasonality, vulnerability, and natural dependence of agricultural production, this “weak business” is vulnerable to external shocks and risks, including nature-related risks (such as risks caused by earthquake, hurricane, and drought) and market-related risks (production risk, price risk, financing risk, etc.) [1–7]. The outbreak of the COVID-19 pandemic has generated a big shock to the economy and society. This condition provides a concrete window for us to investigate the degree of risk agricultural farmers are facing and how they handle those difficulties.

At the beginning of the year 2020, a pandemic caused by COVID-19 rapidly spread across China and the whole world, giving rise to enormous obstacles to the exchange and circulation of labor, material, financial, and other resources. One study used daily transaction data in 214 cities of China and found that the offline consumption decreased by over 1.22 trillion RMB, or 1.2 percent of China's 2019 GDP, in the 3-month post-outbreak period (from January to April in 2020) [8]. Another typical research uses the Dynamic CGE Model to predict that the pandemic's impact on China's food security indicators

will continue for 3–5 years [9]. Other studies around the world have also shown that the adverse effects of the pandemic are widespread and even dramatic. For example, a special issue on COVID-19 and the Canadian agriculture and food sectors has manifested that “keeping social distance”, “quarantining at home”, border containment, and other relevant policies caused by the pandemic have exacerbated labor shortage, disturbed traffic and transportation, and even destroyed supply chains, which have brought a great impact on Canada’s agricultural production [10]. Similar plights have broken out in the United States [11,12], South Africa [13,14], India [15,16], Iran [17], and other countries and regions [18–20]. Thus, based on the IMF World Economic Outlook release (2020), worldwide real GDP growth is forecast at −3%, making 2020 the worst recession since the Great Depression [21]. In addition, the International Food Policy Research Institute (IFPRI) has projected that 316 million people may fall below the international extreme poverty line of \$1.90 per day [16,22].

Although the impact of the pandemic has decreased dramatically over time, it is not over yet, for we have been living in a “post-pandemic era”, which is still full of uncertainties [23,24]. First, the pandemic may resurge and even get more powerful occasionally, leading to control and even lockdown on certain parts of the economic and social system. Second, all countries of the world are connected and linked together today, so the pandemic situation in one country may influence other countries’ domestic economic production and social environment sooner or later. Third, although the pandemic and “lockdown policy” will be eliminated one day, the fear, awareness, and behavior mode shaped and formed by relevant policies and macro-environments will remain for a long time, continuing to affect people’s actions, work, and lives. Last but not least, what we do not want to see, but have to be alert to, is that one day a similar threat (such as pandemic, or other accidents) may re-emerge and hit the whole world once again.

Considering the entire situation, the degree of risk and loss to which agricultural farmers have been exposed and how they cope with these difficulties is worth exploring. As mentioned above, numerous scholars around the world have been watching and investigating the impacts and shocks from the pandemic [9–20], and most researchers have built their evidence on the macro-level (such as the nationwide statistical data), the micro-level (such as tens of surveys in case studies), or by relying on mathematical methods (such as getting the specific values of a model’s parameters according to experts’ estimation). These efforts will positively help us explain and understand this issue from different standpoints, but there is still work needing to be done. For example, Lin et al. uses mathematical models and combines the reports from National Health Commission of China and the working time schedule of employees in city to calculate that the supply of labor force will decrease by 2.26% because of the pandemic shock [9]. However, the working time of farmers in rural villages is much different from that of employees in city, so the estimation may be correct for urban laborers, but is likely to be largely mismatched with the situation in rural areas. Therefore, to conduct further analysis from the quantitative perspective (especially based on sample survey datasets collected directly from agricultural farmers) will compensate for this issue, which will not only enrich our knowledge on what is happening in rural China but also supply salutary references for how to understand and tackle this issue in other countries.

Moreover, whether we can handle this challenge successfully or not will achieve particular significance for Chinese agriculture. Since 2015, the Chinese government led by President Xi Jinping has begun to implement a nationwide strategy called the “Targeted Poverty Alleviation”. This strategy focuses on mobilizing resources all over the country to solve the poverty problem by 2020. According to the National Big Data Platform of Poverty Alleviation and Economic Development, more than 88% of poor rural households have been empowered to eliminate poverty during this period, relying primarily on the development of agricultural business and the tourism industry. After this great victory in conquering absolute poverty, China moves forward with a new national strategy, namely, the “Rural Revitalization”. This strategy aims at achieving the goal of “rich farmers, strong

agricultures and beautiful villages” by 2050. One key point for realizing this goal is to achieve a further step in the development of agricultural business [25,26]. Therefore, to examine and find out whether agricultural farmers could survive and recover from this pandemic shock is critical.

Against this background, this article focuses on agricultural farmers in rural China, particularly farmers engaging in the business of farming, forestry, animal husbandry, side-line production, and fishery as a major source of income. Integrating dual social capital perspectives arising from sociology, we adopt survey data collected by authors in 2020 to explore how agricultural farmers faced the shocks and utilized different kinds of social capitals to acquire various supporting resources in response to the pandemic. More specifically, we (1) clarify the core meaning of risk, agricultural risk, and the conceptual differences between dual social capitals, (2) elucidate the situation of risks and damages to agricultural business on the ground, and (3) estimate and compare the specific effects of dual social capitals on agricultural farmers accessing different types of supporting resources.

## 2. Literature Review and Theoretical Framework

### 2.1. Agricultural Risk and Risk Responses

Risk is often understood as uncertainty that can cause cost and loss [27]. Agricultural risk refers to the uncertainties and instabilities that may occur in the process of agricultural production and management [1,28]. In pioneering studies, agricultural risk was often theoretically divided into two types based on how it was generated: nature risk and market risk [1]. As research in this field has grown constantly, agricultural risk has developed into a multidimensional concept, as shown in the studies on Chinese agriculture, involving production, price, currency, institution, finance, law, operation, strategy, and other types of risks during the concrete production and management process [3,29].

According to existing studies, the ways farmers respond to various agricultural risks can be classified into self-insurance and risk sharing. Self-insurance way refers to farmers coping with risks by relying on their own resources (financial savings and asset accumulation, etc.). Farmers are often forced to sell assets, work outside, or reduce daily consumption to respond to agricultural risks and difficulties [30,31]. In the way of risk sharing, farmers seek external resources to help them share and handle the loss and cost resulting from risks. Risk sharing is categorized into formal and informal sharing mechanisms [32]. In the formal mechanism, governments and official agents tend to adopt policies and provide financial assistance, including loans and agricultural insurance, to help farmers in need deal with risks. In the informal mechanism, resources and supports from farmers’ relational networks (such as relatives and friends) are often utilized to help them overcome the risks and difficulties.

As to farmers coping with the risks from the COVID-19 pandemic, research around the world has been mostly focusing on the formal risk-sharing mechanism which is largely dependent on the help and support from official channels. Among them, one typical case is from the Canadian government. According to Ker [5], the federal government firstly announced support to Farm Credit Canada (FCC) for an additional \$5 billion in lending capacity to farmers, processors, and other agribusinesses to tackle the pandemic risks. The second additional measure intended to provide liquidity to the farm sector by giving eligible farmers who had an outstanding APP loan a Stay of Default, allowing them an additional 6 months to repay the loan. The third additional measure was to provide \$50 million in support to farmers for bringing in temporary foreign workers during the COVID-19 crisis. Specifically, employers were eligible for \$1500 per foreign worker to help cover the costs of complying with a mandatory 2-week quarantine upon their arrival in Canada [5]. Furthermore, several provincial governments and relevant departments even provided portable toilets at rest stops and weigh stations and increased the maximum hours of service for truck drivers [33]. In other countries, such as in South Africa, Tanzania, India, etc., governments have been providing plenty of supports to help farmers in this pandemic [13,15,34].

By comparison, the formal risk-sharing mechanism in China remains underdeveloped, moreover, few studies have focused on how Chinese agricultural farmers dealing with the pandemic risk. Therefore, this formal mechanism is rarely mentioned in the existing research [9,35]. On the one hand, the Chinese government mainly focuses on the risk prevention stage, ignoring its role in risk resolution. For example, the government pays much attention to innovating ways for alliance and cooperation among farmers, building platforms for exchanging agricultural products information, and improving farmers' ability to make scientific decisions. On the other hand, the products and services provided by financial departments are fraught with defects, such as insufficient choices, the limited capacity of allowance, and ineffective implementation. Meanwhile, most Chinese farmers lack financial literacy and have low awareness to buy formal insurance products properly. As a result, financial and other relevant departments often fail to help farmers address risks [36]. In this context, informal risk-sharing mechanisms based on personal networks and social capital has gained extreme importance.

## *2.2. Social Capital and Farmers' Responses to Risk: A Review of Existing Studies*

Social capital is an essential concept in new economic sociology to explain and understand economic and social phenomena. It emerged in the 1970s in American sociology. Unlike economic capital embedded in materials and human capital embedded in actors, social capital emphasizes the efficacy and power of resources embedded in social networks and social structures [37–42]. At the core of this concept is the idea that various social capitals exist in a society, such as personal networks constituted by relatives and friends, general trust in ordinary people and institutions, and reciprocity norms among individuals. These social capitals can provide financial support, necessary information, favor influence, and informal constraints to help individual actors and organizations deal with difficulties (such as resources shortage, asymmetric information, and high transaction costs). Therefore, social capital can serve to promote the growth and development of individuals, enterprises, the economy, and the entire society [23,42–47].

Regarding social capital and its role in helping farmers tackle external risk, scholars mainly from Europe and America have pioneered insightful research. Most previous studies on social capital and its role in helping farmers have focused on developing countries where formal social safety nets or institutions are either imperfect or non-existent [27]. This leads to the condition that agricultural smallholders often face difficulty in gaining access to loans, insurance, and other financial products from official departments. Therefore, the connection with relatives, friends, and community members has become the key factor for the survival and recovery of agricultural business [2,48].

Social capital based on relational networks and social structure has been found to help farmers cope with risks through two main channels. First, in terms of risk prevention, social capital encourages farmers to obtain the latest market information, adopt new varieties and technologies, and take the appropriate methods through knowledge spillover, information dissemination, and learning from neighbors; this approach helps reduce the probability of exposure to risky events and improve farmers' ability to avoid shocks and losses [49,50]. Second, regarding handling risk, after the outbreak of an accident (such as threats from an earthquake or a pandemic), various forms of social capital can provide sufficient useful resources (such as information, funds, and encouragement) to help farmers manage and treat damages and costs; this approach could accelerate post-disaster reconstruction and reduce losses in agricultural business [2,51].

Compared with these studies in other countries, research on Chinese farmers' social capital and its role in response to risk is scarce and insufficient. Relevant studies mainly focus on two fields. The first field is interested in how urban enterprises tackle risks with social capital. Certain scholars exploring this topic emphasize the effect of social capital on risk prevention [52]. For example, entrepreneurs and executives can obtain abundant information, resources, and external assistance through their personal ties, which could help them improve the quality of their decision-making and thus reduce the occurrence of

a risk event [53,54]. Other scholars focus on the effect of social capital on handling risk. For instance, an enterprise's CEO would mobilize his/her relational networks and resources to limit the scope and degree of loss caused by an unexpected risk [55].

In the second field, scholars have paid much attention to ordinary farmers in dealing with risks and shocks in daily life. Social capital represented by relational networks, mutual trust, and social participation can significantly reduce farmers' fear of risk in daily lives triggered by events such as natural disasters and serious diseases [56,57]. Furthermore, families with rich social capital have a strong ability to obtain informal insurance to realize risk sharing, and are more likely to seek help to deal with uncertainty and flow constraints [58]. Moreover, social capital could also help farmers deal with challenges via a mediating way, for example, the enhancement of farmers' social capital can firstly improve farmers' awareness and ability to utilize formal financial instruments and services, and those factors further help farmers address income troubles [59]. Finally, certain studies point out that the mechanism and function of social capital are not independent but collaborate with human, material, financial, and other types of capital to raise farmers' capacity to manage risk as well as reduce their poverty vulnerability [60].

To sum up, existing studies on Chinese society mostly concentrate on urban enterprises in response to risk, or take agricultural and non-agricultural farmers together as ordinary farmers in analysis, focusing on the risks and shocks in their daily lives. Nonetheless, compared with agricultural farmers, non-agricultural farmers live in rural areas but do not manage an agricultural business, that is, they rely on themselves or family members working in non-agricultural industries (such as working as a part-time building worker outside their hometown) to get their main source of income. According to the National Bureau of Statistics of China, approximately 70% of rural laborers (above 14 years old) have been working part-time or full-time outside their hometown in 2020. Therefore, ordinary farmers in reality should be divided into agricultural farmers and non-agricultural farmers. This situation implies that existing studies are insufficient in investigating agricultural farmers and their businesses. Particularly, no research has been conducted to systematically examine the specific situation of various social capitals and their effects on helping agricultural farmers obtain supporting resources to respond to risks from the pandemic.

### 2.3. *Synthetical Theoretical Framework Based on Dual Social Capitals*

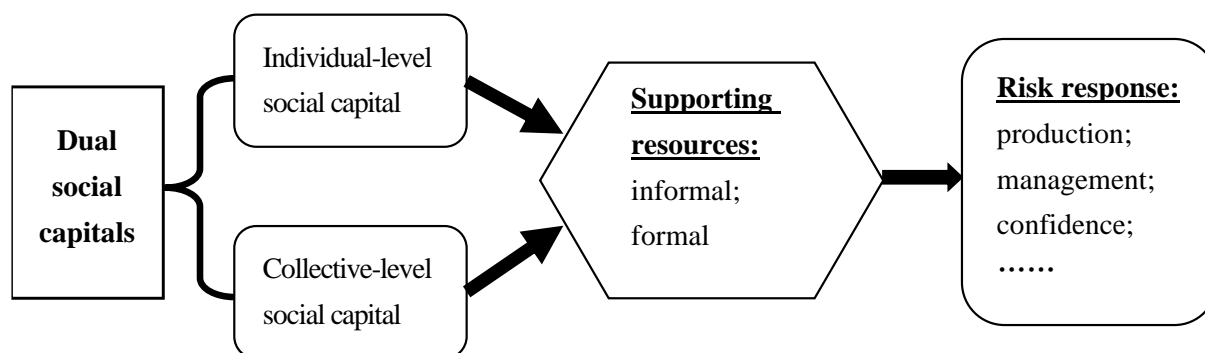
This study will expand the theoretical perspective of social capital into two dimensions to inspect agricultural farmers' responses to risks and shocks. The first dimension of social capital refers to social resources nested in emotional connections and interpersonal networks between individuals, such as the support from an actor's relatives and friends [61–64]. Therefore, this dimension can be regarded as the individual-level social capital, which mainly originates from the sociological theoretical research of Granovetter [65,66] and Lin et al. [47]. The second dimension refers to social capital based on group or membership identity, such as mutual help among rural villagers in one village, general trust between urban residents in a community, and cooperation among members in an interest group [2,62,63]. Therefore, this dimension can be seen as social capital at the collective level, which is widespread in Western societies and deeply rooted in the discussion from Coleman [39] and Putnam [65,66].

Integrating the two dimensions of social capital could raise this study to a greater extent to contribute to the theoretical framework of risk response. Taking the Chinese society as an example, field observations and empirical studies show that individual relationships and personal networks based on Confucian relationalism culture and "ordered diversity pattern" (*chaxu geju*) are very common in Chinese society, particularly in rural areas [52,67]. This condition constitutes the "fertile soil" for social capital at the individual level to build and grow. Meanwhile, each villager or farmer also lives in a specific organization (i.e., village community), which is built on group identity and formal norms, such as giving neighbors a hand whenever it is needed [68–70]. This situation lays the "wider foundation" for the development of social capital at the collective level. With the



characteristics of privateness, exclusiveness, and closeness, individual-level social capital is mostly beneficial for specific actors, such as the members having strong ties with the network owner. In contrast, collective-level social capital is often helpful to all members due to its equal, normative, and public attributes. Nonetheless, in practice, these two types of social capital often coexist and correlate with each other, and more importantly, they work together. Therefore, combining two dimensions of social capital in analysis will help us develop a more comprehensive theoretical framework for exploring the universal issue of risk response.

How do dual social capitals help farmers responding to risks caused by the pandemic? This study proposes that the most important and frequently used mechanism is the path “dual social capitals → supporting resources → risk response.” Theoretically, supporting resources can be divided into two categories: informal and formal supporting resources. Informal supporting resources mainly involve financial support, technical help, and spiritual encouragement from relatives, friends, and neighbors. As the old saying goes in China, “A fence needs three stakes, and a hero needs three partners,” and “A neighbor nearby is more valuable than a relative far away.” When difficulties and disasters occur, these informal supporting resources can be activated and mobilized immediately, providing timely help and assistance to farmers in trouble. Therefore, informal supporting resources play a crucial role in helping agricultural farmers at key moments. Formal supporting resources mainly refer to support and help from formal institutions and organizations, such as loans from banks and financial subsidies from governments. Compared with informal supporting resources, formal supporting resources could be stronger, broader, and more powerful on the whole. In practice, these two categories of supporting resources often overlap, complement, and work together to reduce and even eliminate losses and costs, improving farmers’ ability and confidence to deal with unexpected risks and shocks. Figure 1 illustrates this comprehensive theoretical framework.



**Figure 1.** Comprehensive theoretical framework based on dual social capitals.

### 3. Data, Variables, and Methods

#### 3.1. Data Collection Process

Data were collected from Southern Shaanxi Province in August 2020. The administrative management system in rural China is divided into five levels: province, city, county, town, and village. Considering this situation and the feasibility of the survey in the context of the COVID-19 pandemic, Shaanxi Province as the nearest to our workplace became the optimal choice. First, we randomly selected two cities (Ankang and Shangluo) from the three cities located in the southern part of Shaanxi Province. Then, one county was randomly selected from each city: Pingli County and Shangnan County from Ankang and Shangluo, respectively. Being closer to the center of a county indicates that the town’s business and economy tend to be more developed. Accordingly, we stratified all towns into two types (stratums). Specifically, in Pingli County, the nearby type included 5 towns, and the distant one contained 6 towns; in Shangnan County, the nearby type included 4 towns, and the distant one contained 6 towns. Then, two towns were selected randomly from each stratum. Lastly, two villages were randomly selected from each town (the total number of

villages in the four selected towns in Pingli County are 15, 10, 10, 11; in Shangnan County are 16, 12, 11, 12).

In order to increase the representativeness, 20 farmers in charge of different types (including planting, breeding, etc.) and scales (small, medium, and large) of agricultural business were selected from each village. Considering that the risks and shocks to different kinds of agricultural business may be heterogeneous, so covering all kinds of agricultural business was a key measure to lift and ensure the representativeness of the sample. Furthermore, farmers selected as survey respondents had to meet four inclusion criteria: (1) their birth in a rural area was recorded and can be evidenced by rural registration (*nongcun hukou*); (2) they are in charge of an agricultural business, such as an orchard, a pig farm, or a tea sales company; (3) such a business started in or before 2019; and (4) the main body of the business (such as the land, farm, and plant) is located in the county at the time of the survey. As mentioned above, approximately 70% of the laborers (above 14 years old) in rural China have been working part-time or full-time outside their hometown, which led to the fact that most farmers living in rural areas were non-agricultural farmers. Consequently, during the field survey the committee in many villages told us that it was difficult to find out 20 or more farmers met the four inclusion criteria. These situations altogether gave us the confidence that 20 samples could catch most attributes of all agricultural farmers in a village.

Along with 12 students majoring in social science, the authors visited each village. Then one or two students used paper questionnaires (in the Chinese language) to conduct a face-to-face interview with respondent. Two team members (usually a master student and a teacher) checked the finished questionnaires daily to ensure the quality of the answers. Specifically, all team members were trained before conducting the interview, including how to introduce themselves, the purpose of the survey, and the basic principles (including ethical norms) during the survey process. As to health guidelines, the project team/manager provided necessary insurance, materials, and equipment to all team members, such as disinfectant and surgical face masks; during the interview process, we strictly obeyed the regulations and policies from local governments, and fortunately that the pandemic was under control at the time of the survey and no inflection happened after the survey. After completing all interviews, the data were digitalized via a double-entry mode (i.e., one questionnaire was recorded into a computer by two persons). Thus, the recorded answers could be double-checked. If an inconsistency between two records was noted, we would review the original paper questionnaire or contact the respondent again to fix the errors. As a result, the number of effective samples totaled 324.

### 3.2. Variables Design

According to above risk theories and Chinese agricultural status in reality, this study focuses on production risks, management risks, and farmers' confidence to recover their business. Production risks are measured by the degree to which production, transportation and sale of products, and employee recruitment are affected by the pandemic. Management risks are measured by the degree to which the pandemic has influenced the fund withdrawal and upscaling of business. The answers regarding the degree of impact are divided into four categories, from "0 = no impact" to "3 = very strong." Moreover, agricultural farmers' confidence level to settle the pandemic risk and recover their business is investigated and measured from "1 = not confident at all" to "5 = very confident."

The dependent variables are the two types of supporting resources that farmers have obtained during the pandemic. The first type is informal supporting resources, which include spiritual consolation and encouragement, information (related to staff recruitment, market channels, etc.), material resources (such as land and plant), financial support, and other supports from informal channels (such as from relatives and friends). Adding these five kinds of supporting resources together, we could obtain the overall informal supporting resources. The larger this value, the more resources and the greater support farmers have obtained informally. The second type refers to formal supporting resources, which are

measured as whether farmers have received support and assistance from the government on skills training, employee recruitment, tax, financial subsidies, loans, land renting, plant construction, and other aspects. These eight kinds of resources are added together to represent the overall status of formal support. Similarly, the larger the value, the greater the help and support farmers have acquired from governmental agencies.

The independent variables are dual social capitals. Social capital at the individual level is measured in two dimensions: scale and structure. The scale dimension is reflected through the “Spring Festival Visiting Network (SFVN)”. The SFVN is developed based on the “position generator method” and Chinese traditional culture, which is regarded as an effective tool in measuring the stock and storage of Chinese people’s personal social capital [47,61]. Specifically, the SFVN is measured by the total number of relatives, friends, and acquaintances the respondents visited and communicated with each other during the Chinese Spring Festival in 2020. The higher the number of network members, the richer the resources contained and the more those resources can be activated and mobilized at a critical moment. Regarding the structure dimension, an actor’s network members could be classified into market- and hierarchy-oriented relations, providing different types of resources to the actor. Market-oriented relations refer to the number of the respondents’ family members, relatives, and friends who engaged in the same or related agricultural business by the end of 2019. This number reflects the correlation with the production market and its potential strength. Hierarchy-oriented relations refer to the number of the respondents’ family members, relatives, and friends working in government or financial departments by the end of 2019. This number mainly reflects the connection and linkage with the hierarchical system and its potential power.

Regarding collective-level social capital, it is measured through both subjective and objective dimensions. The respondents were tasked to evaluate the degree of mutual familiarity, mutual trust, and willingness to help each other among the villagers. Specifically, mutual familiarity refers to the extent to which residents in the village know each other; mutual trust aims at measuring the concrete level that local residents trust each other in the village; the last aspect intends to capture whether villagers would give a hand to any other ones in trouble. The answers ranged from “1 = very low” to “5 = very strong”. Adding up the three aspects, we obtained the actual value of the subjective dimension of collective-level social capital in the village community. Consequently, the higher the value, the more familiar, trustworthy, and willing are the residents in the village to help each other. The objective dimension is measured by the total frequency of cultural/sports/entertainment activities, public welfare/volunteer activities, and policy introducing activities held in the village in 2019. The answers ranged from “1 = seldom or never” to “4 = often”. Adding up the answers of the three categorical activities, we get the total frequencies of public activities held in the village, and a higher value indicates more collective-level social capital for villagers.

The last type is control variables. Based on the survey data and the existing literature, three categorical variables have to be controlled in the following regression models. The first category is the respondents’ characteristics and family background status, including gender, age, age squared item, marital status, political status, education level, family member size, and family economic status. The second category is the business attributes, such as business type and duration time. The third category locates at the macro-level of social environment. One aspect is the quality of the macro-environment, which is based on the respondents’ assessment of the degree of fairness in a competitive situation, the degree of justice in policy support, normative degree of government administration, and the degree of local villagers’ friendliness to the business. The four answers are added together, ranging from 4 to 20. The higher the value, the better the quality of the macro-environment for farmers to manage and develop the business. In addition, another aspect of the macro-social environment is the region (i.e., the county) where the farmer’s business is located.



### 3.3. Methods and Models

The main task of the subsequent statistical analysis is to examine and compare the specific effects of independent variables (i.e., dual social capitals) on farmers' access to supporting resources. Furthermore, the dependent variables both range from 0 to 5, each of which should be treated as a discrete type of counting variable. Thus, the Nested Poisson Regression Model (NPRM) is appropriate for performing the estimation [71]. First, the base/benchmark model (Equation (1)) is run to estimate the effects of control variables on accessing supporting resources. Second, the full model (Equation (2)) is run by adding the independent variables into the base model. Then, we can confirm whether the effects of dual social capitals exist or not via the "Wald chi2 test" on the change in LL (Log Likelihood) between the basic and full model, and get the specific effects of dual social capitals according to the coefficients in full model.

$$\ln(\text{Res}) = \beta_0 + \beta_1 \times \text{Con\_vars} + \varepsilon \quad (1)$$

$$\ln(\text{Res}) = \beta_0 + \beta_1 \times \text{Con\_vars} + \beta_2 \times \text{Ind\_sc} + \beta_3 \times \text{Col\_sc} + \varepsilon \quad (2)$$

In Equations (1) and (2) above, *Res* represents the dependent variable of supporting resources; *Con\_vars* represents the control variables; *Ind\_sc* and *Col\_sc* denote the individual- and collective-level social capitals; and  $\beta$  and  $\varepsilon$  refer to the concrete effect of social capitals and the random error term of the equation, respectively. In addition, considering that the variance of dependent variable was greater than its mean value, so the Negative Binomial Regression Model (NBRM) was also used to run the same model for fulfilling the robustness check. The trends of the results of NBRM were almost the same as NPRM, and the "Likelihood-ratio test of alpha" was insignificant in all NBRM models, all of which implied that the results of NPRM were robust and should be accepted as a matter of priority.

## 4. Results

### 4.1. Descriptive Analysis

Table 1 represents the descriptive statistical results. The sociodemographic characteristics of all the samples are as follows: nearly three-quarters of the farmers in charge of the business are male, with an average age of 50.74 years; the married farmers account for 90.43%; Chinese Communist Party (CCP) members constitute 17.90%; those with a high school education degree or above occupy only 19.44%, with a junior high school education level accounting for 37.04%, and people with a primary school education degree or below take the largest proportion (43.52%). Regarding the status of family background, the mean value of family members is 4.75; farmers belonging to the middle class are 49.23%, whereas only 16.72% belonging to the upper-middle class; it is noteworthy that 26.23% of the farmers still live in "poverty family" (*pinkun hu*) by the end of 2019.

In terms of business attributes, the planting and breeding types are almost equally divided, with an average duration of 8.54 years. With respect to the macro-viewpoint, the mean value of social environment quality is up to 14.84 scores, indicating that most business owners consider the environment good for local business development and growth, and all agricultural farmers are evenly distributed between the two counties. On the whole, the distributions of basic indices (such as age and education level) are significantly consistent with the findings from the national representative survey data (such as CHFS2013) [72]. Additionally, most descriptive statistical results are in line with our field observations and experiences. Thus, we have confidence in the representativeness and reliability of this survey data.

The last seven rows of Table 1 are the descriptive statistical results of key variables. First, the mean value of informal supporting resources is 0.96, whereas formal supporting resources have a mean value of 0.59, indicating that agricultural farmers have received more kinds of informal supporting resources during the pandemic. Second, in terms of individual-level social capital, the average size of SFVN is 32.81, whereas it is only 13.47 and 3.07 for market- and hierarchy-oriented relations. These findings match with

our observations and experiences in Chinese society. Finally, in terms of collective-level social capital, the mean value of the subjective dimension is 12.03, whereas that of the objective dimension is 7.71, manifesting that rural villages are rich in both dimensions of collective-level social capital.

**Table 1.** Results of descriptive statistical analysis.

Variables		Percent	Mean	S.D.	Min.	Max.
Gender	Female	25.62				
	Male	74.38				
Age			50.74	9.38	24	74
Age square			2661.95	939.42	576	5476
Marital status	Married	90.43				
	Others (unmarried, widowed, etc.)	9.57				
CCP member	No	82.10				
	Yes	17.90				
Education level	Primary and below	43.52				
	Junior high	37.04				
	Senior high and above	19.44				
Number of family members			4.75	1.79	1	11
Family economic status	Lower class	11.76				
	Lower-middle class	22.29				
	Middle class	49.23				
	Upper-middle class	16.72				
Poverty family by 2019	Yes	26.23				
	No	73.77				
Business type	Planting	48.15				
	Breeding	44.44				
	Others	7.41				
Duration year of the business			8.66	8.08	1	41
Macro-environment quality			14.85	2.99	4	20
Region	Shangnan County	50.62				
	Pingli County	49.38				
Informal supporting resources			0.96	1.09	0	5
Formal supporting resources			0.59	0.95	0	5
Size of SFVN			32.81	45.59	0	360
Size of market-oriented relations			13.55	25.23	0	200
Size of hierarchy-oriented relations			3.68	11.25	0	150
Subjective dimension			12.03	2.00	6	15
Objective dimension			7.71	2.65	3	12

#### 4.2. Overall Situation of Risks to Agriculture and Farmers' Confidence

The upper five rows of Table 2 show the extent to which agricultural business is affected by the pandemic in terms of production and management. When asked about the negative impact of the pandemic on the production, transportation, and sale of their products, 32.41% of the farmers stated that they were not influenced by the pandemic, whereas the percentage of the degree of impact from small to very strong ranged from 19.14% to 27.78%. Therefore, the risks and damages to business production are relatively high. This result is consistent with our findings in the field work that isolation and virus control policies have generated obstacles for pig breeding farmers, such as in purchasing fodder and transporting hogs. This kind of dilemma also exists in other countries, for many studies have found that the supply chain of agricultural production has been disturbed or destroyed by the pandemic [17,18,73].

**Table 2.** Descriptive statistical results of risks to agriculture and confidence of farmers.

	No Impact	Fairly Small	Relatively Strong	Very Strong	Not Applicable
Producing/processing/ transporting/selling	32.41%	19.14%	16.98%	27.78%	3.70%
Recruiting employees	29.01%	6.48%	9.26%	6.17%	49.07%
Funds withdrawal	33.02%	12.04%	13.89%	12.65%	28.40%
Scale expansion	31.79%	10.80%	13.27%	7.72%	36.42%
Confidence in recovering	Not at all 0.62%	Fairly Small 4.04%	Middle Level 9.63%	Fairly Strong 39.44%	Very Strong 46.27%

Regarding the negative impact on employee recruitment, 29.01% of the farmers mentioned no impact, and the proportions of those who viewed the impact as fairly small, relatively strong, or very strong were also very low. In addition, 49.07% of the farmers selected the answer “not applicable” because they just relied on themselves to run the business and did not need to recruit other employees. These findings imply that agricultural business in rural China mainly depends on owners’ family members and relatives rather than external labor forces. The limited demand for human resources can be met through the local labor market (even in the village), leading to a very strong ability to resist unexpected risks and shocks. This trend is also found in other countries, where the labor force mainly coming from the domestic market is less impacted than the labor force relying heavily on international market [13,74].

As to the management risks of funds withdrawal, 33.02% of the farmers were found to be not influenced at all, and the degree of impact varied from fairly small to very strong, ranging from 12% to 14%. Farmers who selected the answer “not applicable” were 28.40%, mainly due to real-time trading ways without using credit. These findings indicate that the financial chains between different agricultural businesses are located in a local economic system and are relatively short, thus making the financial system healthy and stable when facing external risks and strikes. This is also supported by the findings from other societies, which have demonstrated that the long (financial) supply chains are more vulnerable than the short ones [11,75]. With respect to the risk and damage to business expansion, 31.79% of the farmers held that they were not affected during the pandemic, and the percentages of fairly small, relatively strong, and very strong were 10.80%, 13.27%, and 7.72%, respectively. Moreover, 36.42% of the farmers responded “not applicable,” indicating that they had no plans to expand their business at the time of the survey. Overall, scale expansion was also minimally affected by the pandemic.

The last two rows of Table 2 show that most farmers have relatively strong or very strong confidence (39.44% and 46.27%, respectively) in dealing with the pandemic and recovering their business. The results further support the above findings and indicate that agricultural businesses in rural China operate locally and do not rely much on external circumstances, thus possessing a strong ability to bear unexpected risks and shocks. These findings are consistent with the judgement that the rural agricultural system has been acting as a “reservoir” and “stabilizer” for the entire Chinese society when facing external risks and shocks [76]. Accordingly, a typical and powerful case supporting these findings was found in our fieldwork: In the early stage of the pandemic, certain official departments in some cities checked imported aquatic products (such as lobsters) and found them to be contaminated by COVID-19. As a result, Chinese consumers opted not to buy imported lobsters and other aquatic products as before. Under this situation, many consumers turned to domestic aquatic products (such as crayfish), which in turn increased the sales and profits of relevant local agricultural businesses.

#### 4.3. Effects of Dual Social Capitals on Obtaining Supporting Resources

The results of the NPRM are shown in Table 3. The specific effects of all variables on accessing informal supporting resources are estimated in the basic model 1–1 and full model 1–2. According to the basic model 1–1, we could obtain an inverted “U” relationship between the farmers’ ages and the acquisition of informal supporting resources. Specifically, the 44-year-old farmers are the group who can obtain the most informal supporting resources. Regarding family economic situations, farmers in non-poverty households are able to obtain more informal supporting resources than those in poverty households (the coefficient is 0.44 and significant at the 0.01 level). In terms of the macro-level, farmers who live in areas with a better social environment for agricultural business development can receive more informal supporting resources (the coefficient is 0.046 and significant at the 0.05 level). Moreover, farmers in Shangnan County have obtained more informal supporting resources than those living in Pingli County (the coefficient is 0.40 and significant at the 0.01 level).

**Table 3.** NPRM results of dual social capitals on acquiring supporting resources.

	Informal Resources		Formal Resources	
	(1–1)	(1–2)	(2–1)	(2–2)
Gender (reference group: Female)				
Male	0.00070	−0.073	0.29	0.22
Age	0.15 *	0.12 !	−0.026	−0.032
Age square/100	−0.17 **	−0.14 *	0.0041	0.015
Marital status (reference group: Others)				
Married	0.43	0.46	0.53	0.57
CCP members (reference group: No)				
Yes	0.23	0.12	0.22	0.028
Education level (reference group: Primary and below)				
Junior high	0.018	0.077	−0.090	0.0024
Senior high and above	0.24	0.23	0.44 !	0.24
Number of family members	0.042	0.036	−0.025	−0.017
Family economic status (reference group: Lower class)				
Lower-middle class	0.41	0.36	0.32	0.31
Middle class	0.49 !	0.39	0.31	0.37
Upper-middle class	0.41	0.18	0.65 !	0.51
Poverty family by 2019 (reference group: Yes)				
No	0.44 **	0.32 !	−0.33 !	−0.40 *
Business type (reference group: Planting)				
Breeding	0.10	0.057	0.30 !	0.27
Others	0.38 !	0.27	0.58 *	0.48!
Duration year of the business	0.010	0.013 !	−0.0066	−0.012
Macro-environment quality	0.046 *	0.011	0.074 *	0.039
Region (reference group: Pingli County)				
Shangnan County	0.40 **	0.39 **	0.38 *	0.37 *
Size of SFVN		0.0027 **		0.0026 !
Size of market-oriented relations		−0.0032		−0.0055
Size of hierarchy-oriented relations		0.00017		0.013 ***
Subjective dimension		0.064 !		−0.028
Objective dimension		0.065 *		0.12 ***
Constant	−5.60 ***	−5.67 ***	−1.66	−1.74
Pseudo R <sup>2</sup>	0.085	0.11	0.10	0.14
Number of obs.		303		303
Change in LL		9.77		14.01
Wald chi2 test of change in LL		<i>p</i> = 0.0013		<i>p</i> = 0.000

Notes: !, \*, \*\*, and \*\*\* denote significance at the 0.1, 0.05, 0.01, and 0.001 levels, respectively.

The five variables for measuring dual social capitals are added to obtain the full model 1–2, raising Pseudo  $R^2$  from 0.085 to 0.11 and resulting in the change in LL to 9.77. This change is significant at the 0.01 level according to the Wald chi2 test, indicating that dual social capitals have independent influences on farmers gaining access to informal supporting resources. As to individual-level social capital, the larger the scale of the SFVN, the more informal supporting resources farmers could obtain (the coefficient is 0.0027 and significant at the 0.05 level); the size of market- or hierarchy-oriented relations is uncorrelated with the acquisition of informal supporting resources. As to collective-level social capital, only the objective dimension has a positive and significant impact on the acquisition of informal supporting resources (the coefficient is 0.065 and significant at the 0.05 level), implying that farmers could acquire more informal supporting resources if living in a village with more public activities. Moreover, the effects of age, family economic status, and macro-environment quality have decreased a lot compared with the results in the basic model 1–1, manifesting that these control variables largely depend on dual social capitals to affect how farmers seek and obtain informal supporting resources.

The specific effects of all variables on accessing formal supporting resources are estimated in the basic model 2–1 and full model 2–2. From the basic model 2–1, farmers with an education level of senior high and above could gain more formal supporting resources than those with an education level of primary and below (the coefficient is 0.44 and significant at the 0.1 level). Farmers in the upper-middle class households can acquire more formal supporting resources than those in lower class households (the coefficient is 0.65 and significant at the 0.1 level). However, farmers in non-poverty households have obtained less formal supporting resources than those in poverty households (the coefficient is  $-0.33$  and significant at the 0.1 level). In terms of the macro-factors, farmers living in an area with a better social environment for agricultural business development can get more access to formal supporting resources (the coefficient is 0.074 and significant at the 0.05 level). Furthermore, farmers in Shangnan County have a higher probability of obtaining formal supporting resources than those living in Pingli County (the coefficient is 0.38 and significant at the 0.05 level).

To compare the full model 2–2 with the basic model 2–1, Pseudo  $R^2$  has increased from 0.10 to 0.14; meanwhile, the change in LL is 14.01 and significant at the 0.001 level according to the Wald chi2 test. These results demonstrate that dual social capitals have independent effects on farmers' access to formal supporting resources. With respect to individual-level social capital, the larger the size of hierarchy-oriented relations, the more formal supporting resources farmers are likely to obtain (the coefficient is 0.013, significant at the 0.001 level). In terms of collective-level social capital, only the objective dimension has a positive and significant influence on the acquisition of formal supporting resources (the coefficient is 0.12 and significant at the 0.001 level). Furthermore, the effects of education level, family economic status, and macro-environment quality turn to become insignificant, indicating that these control variables rely largely on dual social capitals to affect the degree to which farmers search for formal supporting resources.

## 5. Conclusions and Discussion

This study focuses on the degree of production and management risks to which agricultural farmers have been exposed and how they cope with these difficulties during the COVID-19 pandemic. On the one hand, existing research have mostly explored this topic via building the evidence on macro-statistical data, micro-case studies, or mathematical models [9–20]. Unlike these efforts, this article presents a ground-breaking way to conduct a quantitative analysis based on the sample survey data collected by authors directly from agricultural farmers in a Chinese province, which will not only enrich our knowledge on what has been happening in rural China but also supply salutary references for how to understand and tackle this topic in other societies. On the other hand, in response to risks, the formal risk-sharing mechanism (such as resources and help from government) has been playing a crucial role in developed countries [5,32–34], while in developing countries such



as China, the informal risk-sharing mechanism based on social capitals (such as supports and help from personal relations) are very critical [2,27,36,48]. Nevertheless, no research has been conducted to systematically investigate the specific situation of different kinds of social capitals and their effects on helping agricultural farmers respond to risks from the pandemic. In view of this, we pioneer a way to integrate individual- and collective-level social capitals theoretically and take them as the core perspective to explore this topic.

According to the empirical findings, three main conclusions are drawn out. First, the risks and damages to Chinese agriculture are relatively minimal. Among them, the risks in the process of production (i.e., producing/processing/transporting/selling) are relatively high, while the risks in three other aspects (including recruiting employees, funds withdrawal, and scale expansion) are light, and as a consequence, farmers have strong confidence in fighting the pandemic and recovering their business. These results indicate that agricultural businesses and systems in rural China possess a strong ability to bear risk and maintain stability, therefore, they can cushion the shock for the entire society. This sort of attribute has also been found in other countries, where the agricultural labor force, mainly coming from the local or domestic market, is less impacted than the labor force relying heavily on the international market [13,74]. This is also supported by the findings from other societies that the long (financial) supply chains are more vulnerable than the short ones [11,75].

Second, compared with influencing factors at micro- and macro-levels, dual social capitals could greatly help farmers acquiring two kinds of supporting resources during the process of fighting the pandemic risks. This finding demonstrates that social capitals have been acting as a key component of the social safety nets for agricultural farmers, especially for farmers in developing countries where formal safety nets based on support from governments and official agents are underdeveloped [2,27,36,48]. Meanwhile, this finding tells us that when facing and coping with risks and difficulties caused by the pandemic now and in the future, we should not only focus on the resources and power from official departments [5,13,15,34], but also not neglect the supports and help from different kinds of social capitals.

Third, the acquisition of informal supporting resources depends mostly on the overall situation of farmers' ordinary networks (the size of SFVN) and the public activities held in the village community. Meanwhile, gaining access to formal supporting resources is also affected by the public activities, but the state of farmers' personal relations with official departments plays a crucial role in determining the amount of such resources that can be obtained. On the one hand, this finding implies that the collective-level social capital based on group identity and association engagement is getting very important in China today, which is similar to what has happened in many developed countries [46,62,63,66]. On the other hand, this finding shows that the relational networks based on traditional Confucian culture are still playing a crucial role in Chinese society today, which is a very particular and interesting phenomenon that deserves further investigation.

Three suggestions on how to suppress the negative influences and lift the positive influences of dual social capitals are put forward. First, farmers in all societies (especially in developing countries) must pay attention to building widespread personal networks and zealously taking part in public activities, all of which could benefit the formation and accumulation of dual social capitals, thus promoting farmers' ability to deal with unexpected risks and shocks. Second, governments and relevant departments must evaluate and adjust their policies, particularly those regarding how to allocate formal supporting resources to farmers, to ensure fair results. One of the most important points is to guarantee that the distribution of formal supporting resources is in line with the magnitude of risks and damages to farmers' businesses rather than the state of the hierarchy-oriented relations farmers possess, as shown in this study. Only in this way could these supporting resources help the farmers authentically in trouble. Third, governments, relevant departments, and local communities should make their best endeavors to create more platforms and opportunities for local residents to interact with each other, constituting widespread personal

networks, and taking part in public activities. These efforts will enhance the two levels of social capital and strengthen the social safety nets for agricultural farmers when being exposed to unexpected risks and shocks.

How agricultural farmers respond to risks and shocks (the COVID-19 pandemic, natural hazards, accidents, etc.) is a universal and important issue. Future studies could consider extending this issue via three perspectives. First, given the huge variations between different regions in China, whether the findings and conclusions from one province could be effectively extrapolated to other regions must be treated prudently. Thus, more investigation and examination based on sample survey data should be conducted to check the heterogeneity of dual social capitals' effects under different regions and other conditions. Second, with respect to agricultural farmers responding to unexpected risks, the power of dual social capitals has not been paid enough attention in existing research; even in this study, the direct effects of dual social networks (such as the effects on the change in products, incomes, and profits of the business) are not sufficiently investigated and discussed, so it deserves more concern and study (especially through quantitative analysis based on sample survey data) in different societies. Last, to deal with unexpected risks and shocks in reality, agricultural farmers around the world tend to utilize a wide variety of channels and methods to gain support and help. Therefore, despite dual social capitals, other contributing factors and functioning mechanisms are worthy of exploration as well. These findings will enrich our understanding and help us build a more comprehensive theoretical framework for this issue.

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