Pol. J. Environ. Stud. Vol. 33, No. 2 (2024), 1091-1100
DOI: *10.15244/pjoes/173444* ONLINE PUBLICATION DATE: 2023-11-25

Original Research

Perceptions of Social Responsibility, Resource Integration Ability and Sustainable Development of Family Grain Farms – Evidence from China

Wei Duan[1, 2], Guangqiang Luo[1]*

[1]Economic College, Hunan Agricultural University, Changsha, China
[2]Finance Office, Hunan College of Information, Changsha, China

Received: 20 June 2023
Accepted: 6 October 2023

Abstract

The purpose of this paper is to analyze the influencing factors of sustainable development of family grain farms in China. According to related investigation, there is a real problem of lack of social responsibility of grain family farms in China, which restricts their sustainable development. Therefore, based on a sample of 301 family grain farms in China, this paper used multi-classification ordered logit model and mediation effect model to investigate the relationship between perceptions of social responsibility, resource integration ability, and sustainable development of family grain farms. Various studies show that stronger perceptions of social responsibility related to more sustainable development; greater resource integration ability related to more sustainable development; and resource integration ability mediated the relationships between perceptions of social responsibility and sustainable development. Conclusions suggest that improving perceptions of social responsibility, increasing support for improving resource integration ability and giving full play to the mediating role of resource integration ability is needed to bolster the sustainable development of family grain farms.

Keywords: family grain farm, perceptions of social responsibility, resource integration ability, sustainable development

Introduction

Food security is an important issue for world peace and development [1]. Food security is also an important foundation for building communities with a shared future for humankind [2]. China has always been an active force in safeguarding global food security [3]. Family farms in China play an important role in ensuring food security [4]. These farms represent a new form of agricultural management wherein family members are the main labor force [5] that engages in large-scale, intensive commercial agricultural production and management. A series of policies in China established long-term mechanisms for sustainable development of family farms. In 2013, the Chinese government decided to support the development of family farms. China now gives priority to the development of family farms. In 2022, China further prioritized support for family farms to plant more and better grain. The implementation of these policies led to a boom

*e-mail: 347879923@qq.com

in the development of family farms. These farms played a key role in rural industry development [6], land use [7], as well as promoting an implementation process for rural revitalization [8].

However, it is difficult for these farms to have a driving role in developing modern agriculture and increasing income with price ceilings and cost floors of grain production [9]. This is not conducive to the enhancement of neighborhood relationships, integration into local culture [10], and intergenerational transmission [11]. Adhering to the concept of "Lucian waters and lush mountains are invaluable assets" [12], China has adhered to the path of sustainable development and consistently supported environmental protection for agricultural resources and ecological construction [13]. China has made considerable progress in sustainable agricultural development and in protecting cultivated land. China comprehensively promoted the protection of the quantity, quality, and ecology of cultivated land, implemented a master plan for land use nationwide, and strictly adhered to the line of 297 million acres of arable land [14]. Therefore, it is of great practical significance to explore the sustainable development of family grain farms from the perspective of a social function.

The existing research focuses on the meaning of social responsibility to family farms. For example, Li J. believed that family farms should adhere to certain social responsibilities. Specifically, their production and operation should ensure food safety, protect the natural environment, and maintain biodiversity [15]. Zhou M. speculated that different from agricultural enterprises, family farms are not only economic entities pursuing maximum profits but also are responsible for maintaining village life and cooperating with rural governance [16]. Cao Y.Z. believed that family farms are engaged in large-scale, specialized, and commercial production. Their purpose is to sell, so they have legal and social responsibilities to ensure product safety [17]. Others focused on existing problems on family farms and proposed solutions. For example, Wang J.H. and Li Q. discussed the development power and actual operation of family farms in China including access recognition, supportive management, cooperation and incentive, socialized services, and professional farmer cultivation [18]. Liu J.N. examined the operation of family farms in terms of new "agriculture, rural areas, and farmers" [19]. Yuan M., Yi X.Y., Chen Y.J., Zhao K., Wu X.J., Yang X., Liu L., Wang Q.Q. studied the development status and problems of Chinese family farms and put forward training suggestions based on a large sample from a survey conducted by the Ministry of Agriculture [20].

In summary, the existing research explains the basic connotation of social responsibility for family farms, the current situation, existing problems, and potential solutions. This provides a foundation for subsequent research on extending the concept of social responsibility for family grain farms. However, there is a lack of systematic discussion about the social functions of these farms. In a critical period of rural revitalization, this work has important theoretical implications and practical significance that allows for the exploration of issues around sustainable development. This paper uses cognitive learning theory [21] to define social responsibility for family grain farmers and explores sustainable development from the perspective of social functions.

Material and Methods

Cognitive Learning Theory

Cognitive learning theory research began in the 1960s and 1970s [22]. The theory focuses on learning processes related to mental activities. This theory holds that consciousness is the intermediary between stimulus and response and focuses on the learning processes associated with cognition [23].

Based on cognitive learning theory, this research examines the internal logic of perceptions of social responsibility, resource integration ability, and sustainable development. External conditions create an effective stimulus to family grain farmers so that after continuous learning and thinking, farmers form a more systematic and scientific perception structure of social responsibility. This establishes a focus on the importance of social functions to improve the ability to integrate resources and promote sustainable development. Based on upholding the concept of "harmonious coexistence between man and nature" and "man and nature are living communities" [24], market access systems consolidate the foundation of sustainable development to effectively explore the challenges of sustainable development in the future.

Research Hypothesis

The social responsibility in this paper refers to perceptions of social responsibility of family grain farms to help farmers increase income, inspire farmers to engage in entrepreneurship [25], inherit local culture, and facilitate the intergenerational transmission of farms. Engaging in these activities can help farmers improve their ability to quickly transform the resources on hand into raw materials, labor, and technology [26]; improve their ability to optimize resource distribution in line with new national agricultural policies and changes in the market environment; improve their ability to integrate cultural resources; and strengthen the cultural definition of agricultural products. Thus, to some extent, the farm provides villagers employment, increases other farmer's income, stimulates entrepreneurial enthusiasm, demonstrates the effects of entrepreneurial efforts, works in harmony with local customs, adheres to local culture, improve the farm's reputation, resolves conflicts [27], strengthens relationships between generations, and

increase infrastructure investment. This work proposes the following research hypotheses:

H_1: Perceptions of social responsibility positively influence the sustainable development of family grain farms.

H_2: Resource integration ability has a positive impact on the sustainable development of family grain farms.

H_3: Resource integration ability mediates the relationship between perceptions of social responsibility and sustainable development.

Data and Sample Information

In 2022, the online questionnaire survey and offline interview were combined to carry out field research. On the basis of discussions with the heads of township and town, village cadres and representatives of farmers, the electronic questionnaire was released to the wechat group of villagers in each village through the heads of township and town and village cadres. Each household was required to be filled by one person, and the answering time and place were controlled. A total of 320 questionnaires were collected, among which 301 were valid, with an effective rate of 94.06%. The survey samples were mainly distributed in 13 major grain-producing areas in China, namely Heilongjiang, Henan, Shandong, Sichuan, Jiangsu, Hebei, Jilin, Anhui, Hunan, Hubei, Inner Mongolia, Jiangxi and Liaoning.

The participants completed 301 valid questionnaires. Sample Characteristics are detailed in Table 1. 51.2% of the respondents were between 26 and 40 years old, followed by those aged between 41 and 55 years old, and those aged above 56. Few respondents were 25 years old or younger. Regarding education, 34.6% had either technical secondary school education or a high school education, 27.2% attended at least some college, and 24.3% had a junior middle school education. Most farmers (77.4%) completed agricultural technology training. Most (59.5%) worked in the agricultural planting industry for 3 and 7 years. In addition, 72.1%

Table 1. Sample Characteristics.

Variables	Options	n	%
Age	25 or younger	14	4.7
	26–40	154	51.2
	41–55	108	35.9
	56–70	25	8.3
Education	No education	8	2.7
	Elementary school	34	11.3
	Jr. high school	73	24.3
	Technical secondary school or high school	104	34.6
	College or higher	82	27.2
Agricultural technology training	Yes	233	77.4
	No	68	22.6
Number of years of industry experience in farming	< 3 years	53	17.6
	3–9 years	179	59.5
	10+	69	22.9
Off-farm work experience	Yes	217	72.1
	No	84	27.9
Risk appetite	Risk-averse	150	49.8
	Risk appetite	99	32.9
	Risk-neutral	52	17.3
Operation scale	< 8 acres	78	25.9
	8–16 acres	119	39.5
	16–32 acres	59	19.6
	32–50 acres	32	10.6
	50+ acres	13	4.3

Table 1. Continued.

Whether family grain farms transferred land	No	88	29.2
	Yes	213	70.8
Transferring land area of family grain farm	Not selected	88	29.2
	< 1.65 acres	29	9.6
	1.65–3.29 acres	73	24.3
	3.29–4.94 acres	55	18.3
	4.94+ acres	56	18.6
Frequent business ownership disputes during land transfer	Not selected	88	29.2
	No	75	24.9
	Yes	138	45.8
Production and operational inputs of improved varieties, pesticides, fertilizers, and machinery	=<50,000 yuan	55	18.3
	50,000–100,000	124	41.2
	100,000–150,000	75	24.9
	150,000+ yuan	47	15.6
Amount of mechanized operations applied	1 to 3	116	38.5
	4 to 6	153	50.8
	6 to 8	32	10.6

of the surveyed farmers have non-agricultural work experience. The farmers tended to be conservative with those that were risk-averse accounting for nearly 50%. Those that were risk-neutral or preferred risk made up 17.3% and 32.9%, respectively. Farmers (41.2%) reported improved varieties, pesticides, fertilizers, and machinery were more than 50,000 to 100,000 yuan with 24.9% reporting 100,000 to 150,000 yuan production. Roughly 50% of mechanized operations were devoted to sowing, watering, fertilizing, pest control, harvesting, drying, storage, processing, and other links of grain.

Research Methods

Multi-Classification Ordered Logit Model

Considering the sustainable development of family grain farms as a multi-classification ordered variable [28], a multi-classification ordered logit model analyzed perceptions of social responsibility, resource integration ability, and sustainable development. The basic formula of the model is as Formula (1) [29].

$$P(\mathrm{y}=j/x_i)=\frac{1}{1+\exp(-(\alpha+\beta x_i))} \quad (1)$$

In Formula (1), y represents the sustainable development of family grain farms; j = 0~5, and they are "not at all", "very weak", "weak", "general", "strong", "very strong", x_i indicates factors affecting the sustainable development; (i = 1, 2, ..., m), and m is the number of influencing factors. The cumulative model is established as shown in Formula (2).

$$Logit(P_j)=\ln[\frac{P(y\le j)}{P(y\ge i+1)}]=\alpha_j+\beta X \quad (2)$$

In Formula (2), P_j refers to the probability of sustainable development at a certain level; $P_j = P_j(y = j)$, j = 0, 1, 2, 4, 5 (X_1, X_2, ..., X_i)T represents a set of independent variables; α_j is the intercept; β is a set of regression coefficients corresponding to X. Based on parameter estimation of α_j and β, the occurrence probability of ($y = j$) is obtained, as shown in Formula (3).

$$P(y\le j/x)=\frac{\exp(-(\alpha_j+\beta x_i))}{1+\exp(-(\alpha_j+\beta x))} \quad (3)$$

Mediated Effect Model

Drawing on existing research [30], this study used the following mediated effect model:

$$Y_1=\alpha_1+cX+g_1\beta+\varepsilon_1 \quad (4)$$

$$M=\alpha_2+aX+g_2\beta+\varepsilon_2 \quad (5)$$

$$Y_2=\alpha_3+c'X+b\beta+\varepsilon_3 \quad (6)$$

In the above model, Y_i X, M, and β are sustainable development, perceptions of social responsibility,

resource integration ability, and control variables respectively. α_i is the intercept, ε_i is the random perturbation term; g_i, a, b, c, and c' are the coefficient to be estimated. If the unstandardized coefficients a, b, and c from Models 2, 3, and 4 are all significant and the symbols a, b, and c' are the same, it indicates the existence of a mediated effect.

Variable Selection Description

This paper takes the sustainable development of family grain farms as the dependent variable. Based on questionnaire design, the dependent variable is the composite of five items [31] focused on sustainable development. Item scores are one for positive answers and zero for negative answers. Sample items include "Do you think family grain farms help other farmers increase their income?" Scores range from 0 to 5. In the analysis of factors affecting the sustainable development of family grain farms, the dependent variable, namely the sustainable development of family grain farms, is denoted as Y (when Y = 0, there is no sustainable development ability at all; When Y = 1, sustainable development ability is very weak; When Y = 2, the sustainable development ability is weak; When Y = 3, in general; When Y = 4, the sustainable development ability is strong; When Y = 5, sustainable development ability is very strong).

The paper takes perceptions of social responsibility and resource integration ability as core variables. Based on questionnaire design, perceptions of social responsibility included four items [32] such as "Do you think family grain farms bear the social responsibility to help other farmers increase their income?" Resource integration ability included three items [33] such as "Can your family grain farm quickly adjust and optimize the existing resource distribution pattern according to the adjustment of national agricultural policy and the change of market environment?" Each measurement item is a binary category item, and item scores are one for positive answers and zero for negative answers. Perceptions of social responsibility scores range from 0 to 4. Resource integration ability scores range from 0 to 3.

In this paper, personal characteristics and farm characteristics are selected as control variables. Personal characteristics included gender, age, education level, whether the farmer has participated in agricultural technical training, years of experience in the agricultural planting industry, whether the farmer has non-agricultural work experience, and risk preference. Farm characteristics addressed whether family grain farms transferred land, production and operational inputs, and the number of mechanized operations. Variable description and descriptive statistics are detailed in Table 2.

Table 2. Variable description and descriptive statistics.

Types of variables	Variable name	Range	Mean	Standard deviation
Dependent Variable	Sustainable development	The total value range is 0 to 5	4.27	1.25
Core Variables	Perceptions of social responsibility	The total value range of 0 to 4	3.38	1.12
	Resource integration ability	The total value range of 0 to 3	2.55	0.84
Personal Characteristics	Gender	Male = 1; Female = 2	1.30	0.46
	Age	< 25 = 1; 26–40 = 2; 41–55 = 3; 56–70 = 4; 71 or older =5	2.48	0.71
	Level of education	0 years = 1; 1 to 6 years = 2; 7 to 9 years = 3; 10 to 12 years = 4; >12 years = 5	3.72	1.07
	Attended agricultural technology training	No = 0; Yes = 1	0.77	0.42
	Years farming experience	< 3 years = 1; 3–9 years = 2; 10 or more years = 3	2.05	0.64
	Off-farm work experience	No = 0; Yes = 1	0.72	0.45
	Risk appetite	Risk aversion = 1; Risk neutral = 2; Risk appetite = 3	1.83	0.90
Basic Farm Characteristics	Operation scale	< 8 acres = 1; 8–16 acres, = 2; 16–32 acres = 3; 32–50 acres = 4; 50+ acres = 5	2.28	1.09
	Transferred land	No = 0; Yes =1	0.71	0.46
	Production and operational inputs	< 50,000 yuan = 1; 50,000–99,999 yuan = 2; 100,000–149,999 yuan = 3; 150,000 + yuan = 4	2.38	0.96
	Amount of mechanized operations applied	1–3 = 1; 4–6 = 2; 6–8 = 3	1.72	0.64

Results and Discussion

Logistic Regression Analysis

Before conducting analyses, the researcher addressed assumptions. VIF values were all less than 3 [34], indicating no issues with multicollinearity. As shown in Table 3, perceptions of social responsibility are significantly related to sustainable development. The relationship was positive (B = 0.693), indicating that greater perceptions of social responsibility related to more sustainable development. This means that the stronger perceptions of social responsibility of family grain farms are in terms of helping farmers increase their income, inspiring farmers to participate in entrepreneurship, inheriting local culture, and facilitating smooth intergenerational transfer of farms, the better the farm's good social image can be established, and the stronger its sustainable development ability will be. Resource integration ability also showed a significant and positive relationship with sustainable development (B = 1.135), stronger resource integration abilities related to more sustainable development. It shows that the stronger the farm's abilities in resource mining, resource transformation and resource allocation are, the more correct market response behavior can be made to achieve sustainable development.

Turning to control variables, gender was related to (B = −0.810) sustainable development such that male farmers more actively participation in sustainable development efforts. Education also showed a significant and positive relationship (B = 0.406), indicating that more education related to more active participation in the sustainable development.

Test and Analysis of Intermediary Effect

Both perceptions of social responsibility and resource integration related to sustainable development of family grain farms. The next set of analyses examined whether resource integration ability mediates the relationship between perceptions of social responsibility and sustainable development. As shown in Table 4, for Model 2 which only included perceptions

Table 3. Model estimation results.

Type of variable	Variable name	Coefficient	Standard error	Wald	df	Sig.	95% confidence interval	
							Lower Bound	Upper Bound
Core variables	Perception of social responsibility	0.693	0.141	24.168	1	<.001	0.417	0.969
	Resource integration ability	1.135	0.179	40.408	1	<.001	0.785	1.486
Personal Characteristics	Gender	−0.810	0.295	7.526	1	0.006	−1.389	−0.231
	Age	0.057	0.211	0.073	1	0.787	−0.357	0.471
	Level of education	0.406	0.135	8.959	1	0.003	0.140	0.671
	Have you attended agricultural technical training	0.374	0.341	1.202	1	0.273	−0.295	1.044
	Years of industry experience in agricultural planting	0.269	0.243	1.224	1	0.269	−0.207	0.745
	Off-farm work experience	−0.048	0.337	0.021	1	0.886	−0.708	0.612
	Risk appetite	−0.119	0.156	0.580	1	0.446	−0.426	0.187
Basic Farm Characteristics	The operation scale of family grain farm	−0.084	0.156	0.290	1	0.590	−0.390	0.222
	Whether family grain farms transferred land	−0.214	0.323	0.436	1	0.509	−0.848	0.420
	Production and operational inputs	0.021	0.184	0.013	1	0.908	−0.340	0.383
	Amount of mechanized operations applied	0.029	0.233	0.016	1	0.900	−0.428	0.487
	Logarithmic likelihood value	675.449						
	Wald test	505.836 * *						
	Cox and Snell	0.431						
	Nagelkerke	0.482						
	McFadden	0.251						

Note: The values in brackets are T statistics, * P<0.1, ** P <0.05, *** P <0.01.

Table 4. Intermediary effect test.

	Model 1 (OLS)			Model 2 (OLS)			Model 3 (OLS)		
	Coefficient	t	p	Coefficient	t	p	Coefficient	t	p
Constant	1.144	3.6225	0.0003	1.813	4.019	<0.001	1.1032	2.6504	0.0085
Social responsibility	0.4005	9.9984	0.000	0.597	10.429	<0.001	0.3483	5.8116	<0.001
Resource integration ability							0.6205	8.1696	<0.001
Gender	−0.0847	−0.9485	0.3437	−0.320	−2.508	0.013	−0.2674	−2.3189	0.0211
Age	0.0292	0.4593	0.6464	0.070	0.772	0.441	0.052	0.6346	0.5262
Education	0.0003	0.0084	0.9933	0.134	2.281	0.023	0.134	2.5244	0.0121
Technical training	0.0984	0.893	0.3726	0.272	1.730	0.085	0.2111	1.4851	0.1386
Experience in agricultural planting	0.0354	0.4896	0.6248	0.091	0.881	0.379	0.069	0.7408	0.4594
Off-farm work experience	0.0318	0.3143	0.7535	0.032	0.221	0.825	0.0122	0.0936	0.9255
Risk appetite	−0.1404	−3.0864	0.0022	−0.143	−2.206	0.028	−0.0562	−0.9431	0.3464
Operation scale	0.0012	0.0254	0.9798	−0.026	−0.398	0.691	−0.0272	−0.4537	0.6504
Transferred land	0.0108	0.1151	0.9084	0.005	0.039	0.969	−0.0015	−0.0127	0.9899
Production and operational inputs	0.0852	1.5672	0.1182	0.042	0.538	0.591	−0.0111	−0.1579	0.8746
Amount of mechanized operations applied	−0.0227	−0.3183	0.7505	−0.010	−0.099	0.921	0.004	0.043	0.9657

Table 5. Table of mediating effect coefficients.

	Effect	SE	LLCI	ULCI
Total effect	0.5969	0.0572	0.000	0.4842
Direct effect	0.3488	0.0599	0.000	0.2304
Indirect effect	0.2486	0.050	0.1528	0.3499

of social responsibility and control variables, there was a significant relationship wherein greater perceptions of social responsibility (B = 0.597) related to more sustainable development of family grain farms. Model 3 added resource integration ability and found that social responsibility perception remained a significant predictor (B = 0.348) In Model 3, the regression coefficients for c' (social responsibility) and b (resource integration ability) were both significant, indicating that resource integration ability mediated the relationship between perceptions of social responsibility and sustainable development. Since the three regression coefficients a, b, and c are all significant, and a, b, and c' are the same sign, this indicates that the mediating effect of resource integration ability exists. Because the c' path remained statistically significant, this finding represents partial mediation. From Table 5 ,the percentage of the mediating effect for resource integration ability is (0.2486/0.597) = 41.65%. This indicates that resource integration ability mediates 41.65% of the effect of perceptions of social responsibility on sustainable development. This indicates that farms have the perception of social responsibility, such as helping farmers increase their income, stimulating their entrepreneurship, inheriting local culture and facilitating the intergenerational transmission of farms, which will enable them to adjust and optimize their own resources to a certain extent, so as to realize their sustainable development.

Robustness Test Analysis

Logistic and OLS analyses tested the robustness of the results [35]. As shown in Table 6, the direction of coefficients for all variables did not change, and the results remained significant across approaches. This shows that the estimation results were robust.

Conclusions

Based on data drawn from 301 family grain farmers in China, this paper studied the impact of perceptions

Table 6. Robustness test.

Variable	Logistic		OLS	
	Coefficient	Standard deviation	Coefficient	Standard deviation
Perceptions of social responsibility	0.693 ***	0.141	0.3483 ***	0.0599
Resource integration ability	1.135 ***	0.179	0.6205 ***	0.076
Gender	0.81 **	0.295	0.2674 **	0.1153
Age	0.057	0.211	0.052	0.082
Level of education	0.406 **	0.135	0.134 **	0.0531
Agricultural technology training	0.374	0.341	0.2111	0.1422
Years of industry experience	0.269	0.243	0.069	0.0932
Off-farm work experience	0.048	0.337	0.0122	0.1305
Risk appetite	0.119	0.156	0.0562	0.0596
Size of operation	0.084	0.156	0.0272	0.06
Transferred?	0.214	0.323	0.0015	0.1205
Production operational input	0.021	0.184	0.0111	0.0704
Amount of mechanized operations	0.029	0.233	0.004	0.092
Logarithmic likelihood value	675.449			
Wald test	505.836 **			
Cox and Snell	.431			
Nagelkerke	.482			
McFadden	.251			

Note: The values in brackets are T statistics, * P<0.1, ** P<0.05, *** P <0.01

of social responsibility and resource integration ability on the sustainable development of family grain farms. Greater perceptions of social responsibility and more resource integration abilities significantly related to more sustainable development.

The stronger perceptions of social responsibility family farms have to increase the income of other farmers, inspire other farmers to devote themselves to entrepreneurship, inherit local culture and allow for intergenerational transmission of farms, the more positive the sustainable development efforts. The greater resource integration abilities family farms have to quickly transform the resources on hand into raw materials, labor, technology, and other production factors, adjust and optimize existing resource distribution patterns in line with national agricultural policy and the changes in the market environment, and integrate the intangible cultural resources and other local cultural resources, the more positive the sustainable development efforts.

Additionally, perceptions of social responsibility partially affect the sustainable development of family grain farms by influencing resource integration abilities. Resource integration ability partially mediates the relationship between social responsibility and sustainable development.

Therefore, Chinese governments need to employ multiple measures to improve perceptions of social responsibility among family grain farmers to achieve sustainable development of farms. Firstly, relevant government departments should formulate scientifically based social responsibility systems and policies and provide rewards and punishments to guide and motivate social responsibility and as well as deter unresponsible behaviors. For example, the governments can develop special policies and regulations to give preferential taxation treatment for fulfilling social responsibility behaviors to maintain the long-term and stable development of family farms. Secondly, radio, propaganda, television, and training should be used more fully to publicize social responsibility for family farms to provide clear expectations for social responsibility. Big data, biological experiments, videos, and other approaches may help farmers understand the damage caused by unsustainable production methods on the environment.

Increasing support for improving resource integration abilities of family farms is also essential for sustainable development of farms. These efforts can include financial subsidies for improving resource integration abilities, encouraging and guiding efforts to strengthen technical innovations, expanding the external markets

by integrating advantageous resources, and enhancing market competitiveness. Another promising approach is arranging special funds to give awards and subsidies (grain subsidies, in particular) for the development of special planting and breeding industries, agricultural industrialization, agricultural standardization, land transfer, and agricultural machinery purchases. Additionally, supporting family farms' ability to integrate both hard and soft resources will support improvement of the quality of agricultural products, as well as aid in the development of agricultural products brand and culture. Focusing on the history of family farms will enhance the role of such farms in Chinese culture.

The intermediary role of resource integration ability between perceptions of social responsibility and sustainable development should be given full play. First of all, the specific content of perceptions of social responsibility is detailed, and the specific goals of sustainable development at the farm social level are also clarified, so as to reasonably determine the direction of resource integration. Secondly, strengthen perceptions of social responsibility, comprehensively identify and accurately evaluate the internal and external resources of the farm, independently develop detailed resource integration plans according to changes in the market environment, such as crop planting plans, agricultural technology selection plans, market risk response plans, etc., to enhance the endogenous development ability of the farm. Finally, actively seek to establish cooperative relationships with other farms, cooperatives, government departments and research institutions to carry out resource sharing best practices and achieve sustainable development.

Acknowledgments

The authors gratefully acknowledge the financial support from Hunan philosophy and social science project "Multifunctional study of family grain farms in major grain producing areas" (21YBQ124).

Conflict of Interest

The authors declare no conflict of interest.

References

1. THOU Z. Achieving food security in China: past three decades and beyond. CHINA Agricultural Economic Review. **2** (3), 251, **2010**.
2. DALLAS J.A., RAVAL S., GAITAN J.P.A., SAYDAM S., DEMPSTER A.G. Mining beyond earth for sustainable development: Will humanity benefit from resource extraction in outer space? Acta Astronautica. **167**, 181, **2020**.
3. SAVARY S., WADDINGTON S., AKTER S., ALMEKINDERS C.J.M., HARRIS J., KORSTEN L., ROETTER R.P., VAN DEN BROECK G. Revisiting food security in 2021: an overview of the past year. Food Security. **14** (1), 1, **2022**.
4. MARCUTA L., IONITA N., TUDOR V., MARCUTA A., TITA V. Covid Crisis and the Need to Ensure Food Security and Safety in the EU. Romanian Agricultural Research. **38**, 441, **2021**.
5. TOPILIN A.V. Russia's Labor Potential: Demographic and Socio-Economic Problems of Formation and Utilization. Herald of the Russian Academy of Sciences. **89** (4), 418, **2019**.
6. WU X., MA T., ZHANG J., SHI B. The role of construction industry and construction policy on sustainable rural development in China. Environmental Science and Pollution Research. **2022**.
7. LIU Y., JIAO L., LIU Y. Analyzing the effects of scale and land use pattern metrics on land use database generalization indices. International Journal of Applied Earth Observation and Geoinformation. **13** (3), 346, **2011**.
8. WU X. Research on Coupling Mechanism and Coordinated Development Model of Rural Rejuvenation-Rural Tourism System. Fresenius Environmental Bulletin. **29** (10), 9345, **2020**.
9. XU H., MA B., GAO Q. Assessing the Environmental Efficiency of Grain Production and Their Spatial Effects: Case Study of Major Grain Production Areas in China. Frontiers in Environmental Science. **9**, **2021**.
10. SHIH Y.-H. Designing Culturally Responsive Education Strategies to Cultivate Young Children's Cultural Identities: A Case Study of the Development of a Preschool Local Culture Curriculum. CHILDREN-BASEL. **9** (12), **2022**.
11. BRANJE S., GEERAERTS S., ZEEUW E.L.D., OERLEMANS A.M., KOOPMAN-VERHOEFF M.E., SCHULZ S., NELEMANS S., MEEUS W., HARTMAN C.A., HILLEGERS M.H.J., OLDEHINKEL A.J., BOOMSMA D.I. Intergenerational transmission: Theoretical and methodological issues and an introduction to four Dutch cohorts. Developmental Cognitive Neuroscience. **45**, **2020**.
12. CAI L., GUO L. Environmental Decentralization, Environmental Regulation and Environmental Pollution: Evidence from China. Polish Journal of Environmental Studies. **32** (3), 2053, **2023**.
13. MA B., PENG Z., GAO J. Driving system of ecological construction. Range Management and Agroforestry. **33** (1), 8, **2012**.
14. YANG S., LI D., LIAO H., ZHU L., ZHOU M., CAI Z. Analysis of the Balance between Supply and Demand of Arable Land in China Based on Food Security. Sustainability. **15** (7), **2023**.
15. LI J. Research on the moderate scale of Grain-producing family Farms. Anhui University, **2016**.
16. ZHOU X.Z. Research on the level measurement, Economic Performance and Influencing Factors of the extension of the industrial chain of Family Farms in Hebei Province. Hebei Agricultural University, **2020**.
17. CAO Y.Z. A Study on the effect of formal financial credit on Family Farms in Henan Province. Northwest A&F University, **2018**.
18. WANG J.L., LI Q. Motivation and Dilemma of family farm development in China and construction of sustainable development mechanism. Agricultural Modernization Research. **34** (05), 552, **2013**.
19. LIU J.N. Research on Family Farm Management Model under the new "Three rural" Background. Tiangong University, **2016**.

20. YUAN M., YI X.Y., CHEN Y.J., ZHAO K., WU X.J., YANG X., LIU L., WANG Q.Q. Development status, problems and cultivation suggestions of family farms in China – based on 343,000 sample data from a special survey conducted by the Ministry of Agriculture. Chinese Agricultural Resources and Regionalization. **38** (06), 184, **2017**.
21. XU W., GUO D., MI J., QIAN Y., ZHENG K., DING W. Two-Way Concept-Cognitive Learning via Concept Movement Viewpoint. Ieee Transactions on Neural Networks and Learning Systems. **2023**.
22. XIE X., XU W., LI J. A novel concept-cognitive learning method: A perspective from competences. Knowledge-Based Systems. **265**, **2023**.
23. DOVE G. Language is a Source of Grounding and a Mode of Action. Topics in cognitive science. **2023**.
24. ABDUL AZIZ N.A., ARIFFIN N.F.M., ISMAIL N.A., ALIAS A. Community Participation in the Importance of Living Heritage Conservation and Its Relationships with the Community-Based Education Model towards Creating a Sustainable Community in Melaka UNESCO World Heritage Site. Sustainability. **15** (3), **2023**.
25. SANTOS C.S.M.D., FREITAS M.A.V., DA SILVA N.F., DE DEUS L.A.B., PRODANOFF J.H.A. The role of rural credit policies in agricultural income generation in family farms in Pernambuco State, northeastern Brazil-spatial trend and future scenarios. Ciencia Rural. **53** (10), **2023**.
26. HUANG Z., WANG T., LI N. Reciprocal and Symbiotic: Family Farms' Operational Performance and Long-Term Cooperation of Entities in the Agricultural Industrial Chain-From the Evidence of Xinjiang in China. Sustainability. **15** (1), **2023**.
27. RIBEIRO NEPOMOCENO T.A., CARNIATTO I. Correlations between climate resilience in family farming and sustainable rural development. Ambio. **52** (7), 1233, **2023**.
28. BLESS A., DAVILA F., PLANT R. A genealogy of sustainable agriculture narratives: implications for the transformative potential of regenerative agriculture. Agriculture and Human Values. **2023**.
29. PFAMMATTER P., JONGERDEN J. Beyond farming women: queering gender, work and family farms. Agriculture and Human Values. **2023**.
30. CHEN X., PETERSON M. N., HULL V., LU C., HONG D. How Perceived Exposure to Environmental Harm Influences Environmental Behavior in Urban China. Ambio. **42** (1), 52, **2013**.
31. BHATTACHARJEE S., PANJA A., PANDA M., DUTTA S., DUTTA S., KUMAR R., KUMAR D., YADAV M.R., MINKINA T., KALINITCHENKO V. P., SINGH R.K., RAJPUT V.D. How Did Research on Conservation Agriculture Evolve over the Years? A Bibliometric Analysis. Sustainability. **15** (3), **2023**.
32. GERMANOVA S., KONDRASHEV S., LAZAREVA Y. Minimizing the adverse effects of agriculture on the environment: the case of Russia. Environment Development and Sustainability. **2023**.
33. BALASUNDRAM S.K.K., SHAMSHIRI R.R.R., SRIDHARA S., RIZAN N. The Role of Digital Agriculture in Mitigating Climate Change and Ensuring Food Security: An Overview. Sustainability. **15** (6), **2023**.
34. FU L., XU Z., CHEN Q., ZHANG Q., ZOU Z., LI L., YTURRALDE C.C., VALENCIA L.G. Research on the integrated development of agriculture and tourism in inner Mongolia. Environment Development and Sustainability. **2023**.
35. COOK S., CAMMARANO D. Tracking the diverse pathways to value for digital agriculture. Crop & Pasture Science. **74** (6), 507, **2023**.